1. An inference is
A. The same as observation C. A statement involving numbers
B. A logical interpretation of an observation D. A way to avoid bias
2. To be useful in science, a hypothesis must be
A. Measurable B. Testable C. Observable D. Correct
3. Which of the following statement about a controlled experiment is true?
   A. All the variables must be kept the same
   B. Only one variable is tested at a time
   C. Everything can be studied by setting up a controlled experiment
   D. Controlled experiments cannot be performed on living things
4. A skeptical attitude in science
   A. prevents scientists from accepting new ideas
   B. Encourages scientists to readily accept new ideas
   C. Means a new idea will only be accepted if it is backed by evidence D. is unimportant

***Skepticism**: Good scientists are skeptics, which mean that they question existing ideas and hypotheses, and they refuse to accept explanations without evidence. Scientists who disagree with hypotheses design experiments to test them. Supporters of hypotheses also undertake rigorous testing of their ideas to confirm them and to address any valid questions raised.*
Open mindedness: Scientists must remain open minded, meaning that they are willing to accept different ideas that may not agree with their hypothesis.
Creativity: Researchers also need to think creatively to design experiments that yield accurate data.

***Peer Review**: Scientists share their findings with the scientific community by publishing articles that have undergone peer review.*
In peer review, scientific papers are reviewed by anonymous, independent experts.
Publishing peer-reviewed articles in scientific journals allows researchers to share ideas and to test and evaluate each other's work.
***Scientific articles** are like high-powered versions of your high school lab reports.*
They contain details about experimental conditions, controls, data, analysis, and conclusions.
Reviewers read them looking for oversights, unfair influences, fraud, or mistakes in techniques or reasoning.

5. The purpose of peer review in science is to ensure that
   A. All scientific research is funded
   B. A well-tested explanation that unifies a broad range of observations
   C. The same as the conclusion of an experiment
   D. The first step in a controlled experiment
6. The process in which two cells form different parents unite to produce the first cell of a new organism is called
   A. Homeostasis C. Development
   B. Sexual reproduction D. Asexual reproduction
7. The process by which organisms keep their internal conditions relatively stable is called
   A. Metabolism B. A genome C. Evolution D. Homeostasis
8. To ensure that a scientific work is free of bias and meet standards set by the scientific community, a research group's work is reviewed by
   A. Anonymous scientific experts C. The researchers' friends
   B. The general public D. Law makers
9. Which of the following characteristics is NOT shared by both a horse and the grass it eats?
   A. Uses energy C. Movement from place to place
   B. Response to stimuli D. Stable internal environment
10. Which of the following statements about a scientific theory is NOT true?
    A. It has the same meaning in science as it does in daily life
    B. It enables scientists to make accurate predictions about new situations
    C. Scientific theories tie many hypotheses together
    D. It is based on a large body of evidence
11. A bird-watcher sees unusual bird as a feeder. He takes careful notes on the birds color, shape, and other physical features and then goes to a reference book to see if he can identify the science.
    What aspect of scientific thinking is most apparent in this situation?
    A. Observation B. Hypothesis formation C. Inference D. Controlled experimentation
12. Unlike sexual reproduction, asexual reproduction involves
    A. Two cells B. Two parents C. One parent D. One nonliving thing
13. One meter is equal to: A. 1000 millimeters C. 1 millimeter
    B. 10 kilometers D. 10 millimeter

***Length**: 1meter=100cm=1000mm, 10000m=1km*	***Mass**:1kg=1000g*	***Temperature:***
***Volume**:1liter=1000ml=1000cm^3*	*1g=1000mg*	*0^0C=freezing point of water*
	1000kg=1metric ton(t)	*100^0C=boiling point of water*

14. The positively charged particle in an atom is called the: A. neutron B. Ion C. proton D. electron
15. Two or more different atoms are combined in definite proportions in any
    A. Symbol B. Isotope C. Element D. Compound
16. A covalent bond is formed by the
    A. transfer of electrons C. Sharing of electrons
    B. Gaining of electrons D. Losing of electrons
17. A compound that produces hydrogen ions in solution is a (an)
    A. Salt B. Acid C. Base D. Polymer
18. Compared to most other substances, a great deal of heat is needed to raise the temperature of water by a given amount. This is because water
    A. is an acid B. has a high heat capacity C. readily forms solution D. acts as a buffer
19. An enzyme speeds up a reaction by
    A. Lowering activation energy C. Releasing energy
    B. Raising the activation energy D. Absorbing energy
20. In a chemical reaction, a reactant binds to an enzyme at a region known as
    A. Catalyst B. Product C. Substrate D. Active site
21. The elements or compounds that enter into a chemical reaction are called
    B. Catalyst B. Product C. Substrate D. Active site
22. Chemical bonds that involve the total transfer of electrons from one atom or group of atoms to another are called:
    A. Covalent bonds B. Hydrogen bonds C. Ionic bonds D. Van der Waals bonds
23. Which of the following is NOT an organic molecule found in living organisms?
    A. Protein B. Nucleic acid C. Sodium chloride D. Lipid
24. Which combination of particle and charge is correct?
    A. Protons: positively charge C. Neutrons: negatively charged
    B. Electrons: positively charged D. Electrons: no charge
25. In which of the following ways do isotopes of the same element differ?
    A. In number of neutrons only C. In number of neutrons and protons
    B. In number of protons only D. In number of neutrons and in mass
26. Which of the following molecules is made up of glycerol and fatty acids?
    A. Sugar B. Starch C. Lipids D. Nucleic acids
27. Nucleotides consist of a phosphate group, a nitrogenous base, and a
    A. Fatty acid B. Lipid C. 5-carbon sugar D. 6-carbon sugar
28. All of life on Earth exists in:
    A. an ecosystem B. a biome C. the biosphere D. ecology
29. Which term describes a group of different species that live together in a defined area?
    A. A population B. A community C. An ecosystem D. A biosphere

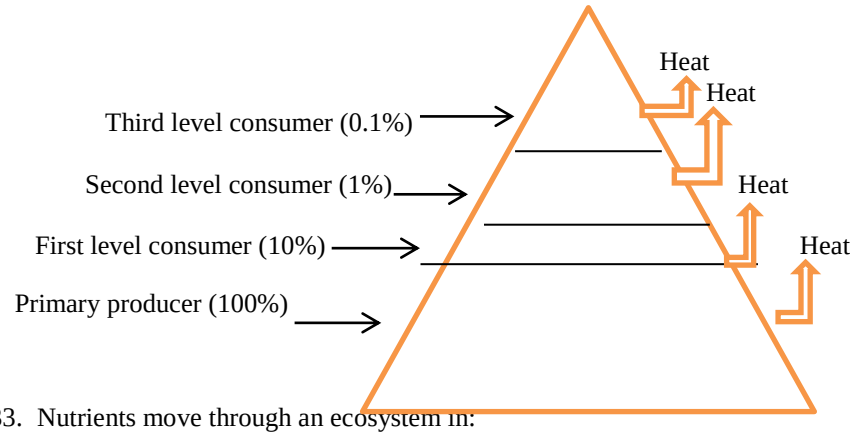
***Individual organism**: A species is a group of similar organisms that can breed and produce fertile offspring.*
*A **population** is a group of individuals that belong to the same species and live in the same area.*
*An assemblage of different populations that live together in a defined area is called a **community**.*
*All the organisms that live in a place, together with their physical environment, is known as an **ecosystem.***
*A **biome** is a group of ecosystems that share similar climates and typical organisms.*
Our entire planet, with all its organisms and physical environments, known as the biosphere.

30. Primary producers are organisms that
    A. Rely on other organisms for their energy and food supply
    B. Consume plant and animal remains and other dead matter
    C. Use energy they take in from the environment to convert inorganic molecules into complex organic molecules
    D. Obtain energy by using only plants
31. The series of steps in which a large fish eats a small fish that has eaten algae is a
    A. Food chain B. Food web C. Pyramid of numbers D. Pyramid of biomass
32. The total amount of living tissue at each trophic level in an ecosystem can be shown in a (an)
    B. Energy pyramid B. Biomass pyramid C. Pyramid of numbers D. Biogeochemical cycle

Each step in a food chain or food web is called a trophic level.
***Primary producers** always make up the first trophic level. Various consumers occupy every other level.*
One way to illustrate the trophic levels in an ecosystem is with an ecological pyramid.

Ecological pyramids *show the relative amount of energy or matter contained within each trophic level in a given food chain or food web.*
There are three different types of ecological pyramids: ***pyramids of energy, pyramids of biomass, and pyramids of numbers.***
Pyramids of energy *show the relative amount of energy available at each trophic level of a food chain or food web.*
The efficiency of energy transfer from one trophic level to another varies.
On average, about 10% of the energy available *within one trophic level is transferred to the next trophic level.*
The total amount of living tissue within a given trophic level is called its **biomass.**
Biomass is usually measured in **grams of organic matter per unit area.**
The amount of biomass a given trophic level can support is determined, in part, by the amount of energy available.
A pyramid of biomass illustrates the relative amount of living organic matter available at each trophic level in an ecosystem.
A pyramid of numbers shows the relative number of individual organisms at each trophic level in an ecosystem.
In most ecosystems, the shape of the pyramid of numbers is similar to the shape of the pyramid of biomass for the same ecosystem.
Unlike the one-way flow of energy, matter is recycled within and between ecosystems.
Elements pass from one organism to another and among parts of the biosphere through closed loops called **biogeochemical cycles**, which are **powered by the flow of energy.**
As that word suggests, cycles of matter involve **biological processes, geological processes,** and **chemical processes.**
Human activity can also play an important role.
As matter moves through these cycles, it is **transformed**. It is **never created** or destroyed—**just changed.**
Biological processes: consist of any and all activities performed by living organisms.
These processes include eating, breathing, "burning" food, and eliminating waste products.
Geological Processes: include volcanic eruptions, the formation and breakdown of rock and major movement of matter within and below the surface of the sea.
Chemical and Physical Processes: include the formation of clouds and precipitation, the flow of running water, and the action of lighting.
Human Activity: Human activities that affect cycles of matter on a global scale include the mining and burning of fossil fuels, the clearing of land for building and farming, the burning of forests, and the manufacture and use of fertilizers.

The trophic levels



33. Nutrients move through an ecosystem in:
    A. Biogeochemical cycles C. Water cycles
    B. Energy pyramids D. Ecological pyramids
34. Which biogeochemical cycle does NOT include a major path in which the substance cycles through the atmosphere?
    A. Water cycle B. Carbon cycle C. Nitrogen cycle D. Phosphorous cycle
35. A group of individuals that belong to a single species and that live together in a defined area is termed as a (an)
    A. population B. ecosystem C. community D. biome
36. Which is a source of energy for Earth`s living things?
    A. Wind energy B. Wind energy and sunlight C. Sunlight only D. Sunlight and chemical energy
37. Which of the following is a primary producer?
    A. A producer, like algae C. An omnivore, like a human
    B. A carnivore, like a lion D. A detritivore, like an earthworm
38. Human activities, such as the burning of fossil fuels, move carbon through the carbon cycle.
    Which other processes also participate in the carbon cycle?

A. Biological process only C. Geochemical processes only
B. Chemical processes only D. A combination of biological, geological, and chemical processes

39. What are the physical, or nonliving components of an ecosystem called?
A. Abiotic factors B. Temperature conditions C. Biotic factors D. Antibiotic factors
40. An increase in the greenhouse effect causes an increase in
A. Carbon dioxide B. Temperature C. Oxygen D. Water
41. The day-to-day condition of Earth's atmosphere is known as :
A. weather C. climate B. rainfall D. microclimate

*The main force that shapes our climate is **solar energy** that arrives as sunlight and strikes Earth's surface.*
Some of that energy is reflected back into space, and some is absorbed and converted into heat.
Some of that heat, in turn, radiates back into space, and some is trapped in the atmosphere.
The balance between heat that stays in the atmosphere and heat lost to space determines Earths average temperature.
*This balance is largely controlled by concentration of three gases found in the atmosphere—**carbon dioxide, methane** and **water vapor.***
*These gases, called **greenhouse gases**, function like glass in a greenhouse, allowing visible light to enter but trapping heat.*
*This phenomenon is called the **greenhouse effect.***
*If **greenhouse gas concentrations rise**, they **trap more heat**, so Earth warms. If their concentration fall, more heat escapes and, and **Earth cools**. Without the greenhouse effect, Earth would be about **30^0C cooler than it is today.***
*Note that all three of these gases pass in and out of the atmosphere as part of **nutrient cycle.***

42. A relationship in which one organism is benefited and another organism is neither benefited nor harmed is called:
A. Parasitism B. Mutualism C. Competition D. Commensalism
43. Fires, hurricanes, and other natural disturbances can result in
A. Commensalism B. Competition C. Parasitism D. Succession
44. The first organism to repopulate an area affected by a volcanic eruption are called
A. Keystone species B. Primary species C. Climax species D. Pioneer species
45. In a tropical rain forest, the dense covering formed by the leafy tops of tall trees is called the
A. Canopy B. Taiga C. Niche D. Understory
46. Permafrost characterizes the biome called
A. Taiga B. Boreal forest C. Savanna D. Tundra
47. Organisms that live near or on the ocean floor are called
A. Parasite B. Benthos C. Plankton D. Mangroves
48. The relationship between a tick and its host is an example of:
A. Mutualism B. Parasitism C. Commensalism D. Succession
49. All of the following are abiotic factors that affect global climate EXCEPT
A. Latitude B. Longitude C. Solar energy D. Ocean currents

***Global climate** is shaped by many factors, including solar energy trapped in the biosphere, latitude, and the transport of the heat by winds and ocean currents.*

50. The way an organism makes its living, including its interactions with biotic and abiotic factors of its environment, is called the organism's A. habitat B. niche C. life style D. biome
51. If a newly introduced species fills a niche that is normally occupied by a native species, the species compete. One of the species may die out as a result of
A. competitive exclusion B. predation C. commensalism D. mutualism
52. Photosynthetic algae are MOST likely to be found in
A. The open-ocean benthic zone B. The aphotic zone C. The photic zone D. Ocean trenches
53. The water in an estuary is
A. salt water only C. fresh water only
B. poor in nutrients D. a mixture of fresh water and salt water

Like organisms living on land, underwater organisms are affected by a variety of environmental factors.
Aquatic organisms are affected primarily by the water's depth, temperature, flow, and amount of dissolved nutrients.
Because runoff from land can affect some of these factors, distance from shore also shapes marine communities.
Water depth strongly influences aquatic life because sunlight penetrates only a relatively short distance through water.
The sunlit region near the surface in which photosynthesis can occur is known as the photic zone.
*The **photic zone** may be as deep as 200 meters in tropical seas, but just a few meters deep or less in rivers and swamps.*
Photosynthetic algae, called phytoplankton, live in the photic zone.
Zooplankton—tiny free-floating animals—eat phytoplankton. This is the first step in many aquatic food webs.
***Below the photic zone** is the dark aphotic zone, where photosynthesis cannot occur.*
Many aquatic organisms live on, or in, rocks and sediments on the bottom of lakes, streams, and oceans.

These organisms are called the benthos, and their habitat is the benthic zone.
Where water is shallow enough for the benthos to be within the photic zone, algae and rooted aquatic plants can grow.
***When the benthic zone** is below the photic zone, chemosynthetic autotrophs are the only primary producers.*

54. *In which biome do organisms have the greatest tolerance to dry conditions*
    A. Tundra B. Desert C. Tropical savanna D. Boreal forest
55. *The number of individuals of a single species per unit area is known as*
    A. Carrying capacity C. Logistic growth
    B. Population density D. Population growth rate
56. *The movement of individuals into an area is called*
    A. Demography B. Carrying capacity C. Immigration D. Emigration
57. *The area inhabited by a population is known as its*
    A. Growth rate B. Geographic range C. Age structure D. Population density
58. *The maximum number of organisms of a particular species that can be supported by an environment is called*
    A. Logistic growth B. Carrying capacity C. Exponential growth D. Population density
59. *A limiting factor that depends on a population size is called*
    A. Density-dependent limiting factor C. Predator-prey relationship
    B. Density-independent limiting factor D. Parasitic relationship
60. *One example of a density-independent limiting factor is*
    A. Predation B. Hurricanes C. Competition D. Parasitism

*The area inhabited by a population is called **its geographic range**.*
A populations range can vary enormously in size, depending on the species.
A bacterial population in a rotting pumpkin, for example, may have a range smaller than a cubic meter.
The population of cod (a marine fish) in the western Atlantic, on the other hand, covers a range that stretches from Greenland down to North Carolina.
In the concept of populations, a limiting factor is a factor that controls the growth of a population.
***Density-dependent limiting factors** operate strongly only when population density—the number of organisms per unit area—reaches a certain level. These factors do not affect small, scattered populations as much.*
***Density-dependent limiting factors** include competition, predation, herbivory, parasitism, disease, and stress from overcrowding.*
Density-independent limiting factors affect all populations in similar ways, regardless of population size and density.
Unusual weather such as hurricanes, droughts, or floods, and natural disasters such as wildfires, can affect as density independent limiting factors. In response to such factors, a population may "crash."

61. The scientific study of human population is called
    A. Immigration B. Emigration C. Demographic transition D. Demography
62. The demographic transition is considered complete when
    A. Population growth stops C. The birth rate is greater than death rate
    B. The death rate begins to fall D. The death rate is greater than the birth rate
63. The movement of individuals out of an area is called
    A. Immigration B. Emigration C. population growth rate D. Population density
64. All other things being equal, the size of a population will decrease if
    A. Birth rate exceeds death rate C. Death rate exceeds birth rate
    B. Immigration rate exceeds emigration rate D. Birth rate equals death rate
65. Which of the following is NOT an example of a density-dependent limiting factor?
    A. Natural disaster B. Predator C. Competition D. Disease
66. Action that can be taken to reduce rapid population growth includes:
    A. Reproductive (sex) education C. Access to condoms
    B. Improved resources for agriculture D. All of the above
67. In the presence of unlimited resources and in the absence of disease and predation, what would probably happen to a bacterial population?
    A. Logistic growth B. Exponential growth C. Endangerment D. Extinction
68. Which of the following statements best describes human population growth?
    A. The growth rate has remained constant over time
    B. Growth continues to increase at the same time
    C. Growth has been exponential in the last few hundred years
    D. Birth rate equals death rate
69. Which of the following refers when a population's birth rate equals its death rate?
    A. Limiting factor B. Exponential growth C. Carrying capacity D. Population density

Phases of Growth include:
Phase I *= Exponential Growth= After a short time, the population begins to grow exponentially.*
During this phase, resources are unlimited, so individuals grow and reproduce rapidly. Few individuals die, and many offspring are produced, so both the population size and the rate of growth increase more rapidly.
Phase II *= Growth Slows Down= In real world populations, exponential growth does not continue for long.*
At some point, the rate of population growth begins to slow down.
This does not mean that the population size decreases.
The population still grows, but the rate of growth slows down, so the population size increases more slowly.
Phase III *= Growth stops= at some point, the rate of population growth drops to zero.*
This means that the size of population levels off. Under some conditions, the population will remain at or near this size indefinitely.
The Logistic Growth Curve*: This, an S-shape curve occurs when a population's growth slows and then stops, following a period of exponential growth. Many familiar plant and animal populations follow a logistic growth curve. Remember that a population grows when more organisms are born (added to it) than die (or leave it). Thus, population growth may slow for several reasons.*
Growth may slow because the population's birth rate decreases. Growth may also slow if the death rate increases—or if births fall and deaths rise together.
Similarly, population growth may slow if the rate of immigration decreases, the rate of emigration increases, or both.
There are several reasons why these rates might change in a population.
Carrying Capacity: is the maximum number of individuals of a particular species that a particular environment can support.
Once a population reaches the carrying capacity of its environment, a variety of factors act to stabilize it at that size.

70. Which of the following human activities has NOT had an important role in transforming biosphere to date?
    A. Agriculture B. Industry C. Development D. Aquaculture

*Humans affect regional and global environments through **agriculture**, **development**, and **industry** in ways that have an impact on the quality of Earth's natural resources, including soil, water, and the atmosphere.*
Aquaculture *= raising (farming) of aquatic organisms for human consumption.*

71. A resource that cannot easily be replenished by natural processes is called
    A. common B. renewable C. nonrenewable D. conserved
72. The conversion of once soil-rich area to an area of little to no vegetation is called
    A. Fragmentation B. Deforestation C. Desertification D. Acid rain
73. The loss of fertile soils from an area through the action of water or wind is called
    A. Acid rain B. Erosion C. Desertification D. Monoculture
74. The strategy for using natural resources without depleting them and for providing human needs without causing long-term environmental harm is called
    A. Afforestation B. sustainable development C. Reforestation D. Successful use

Ecological science *can teach us how to use natural resources to meet our needs without causing long-term environmental harm.*
Using resources in such environmentally conscious way is called ***sustainable development.***
Sustainable development provides for human needs while preserving the ecosystems that produce natural resources.

75. A species that is introduced to an environment where it has not lived before is described as
    A. native B. exotic C. threatened D. attractive
76. The total impact a person has on the atmosphere can be represented by his or her
    A. Contribution to climate change C. Consumption of fossil fuel
    B. Ecological footprint D. Production of carbon dioxide

What is our impact on the biosphere today? *To answer this question, think about the kind and amount of resources each of us uses.Ecologists refer to the human impact on the biosphere using a concept called the* ***ecological footprint.***
Ecological footprint *describes the total area of functioning land and water ecosystems needed both to provide resources an individual or population uses and to absorb and make harmless the wastes that individual or population generates.*
Ecological footprint *takes into account the need to provide resources such as energy, food, water, and shelter, and to absorb such wastes as swage and greenhouse gases.*

77. Which of the following statements about renewable resources is true?
    A. They are only found in tropical countries C. They are replaceable by natural means
    B. They can never be depleted D. They regenerate quickly
78. Which of the following is a nonrenewable resource?
    A. Wind B. fresh water C. Coal D. Topsoil
79. Which of the following is NOT a direct effect of deforestation?

A. Decreased productivity of the ecosystem
B. Soil erosion
C. Biological magnification
D. Habitat destruction

Renewable resources *can be produced or replaced by a healthy ecosystem. Some resources are* ***nonrenewable resources*** *because natural processes cannot replenish them within a reasonable amount of time.*
Fossil fuels like ***coal, oil, and national gas*** *are nonrenewable resources formed from buried organic materials over millions of years. When existing deposits are depleted, they are essentially gone forever.*
Sustainable Resource Use*: Ecological science can teach us how to use natural resources to meet our needs without causing long-term environmental harm.*
Using resources in such an environmentally conscious way is called ***sustainable development****.*
It should consume as little energy and material as possible. Sustainable development must be flexible enough to survive environmental stress like droughts, floods, and heat waves or cold snaps.
Finally, sustainable development must take into account human economic systems as well as ecosystem goods and services. It must do more than just enable people to survive. It must help them improve their situation.
Sustainable development provides for human needs while preserving the ecosystems that produce natural resources.
Sustainable development should cause no long-term harm to the soil, water, and climate on which it depends.
When DDT gets into a water supply, it has disastrous effect on the organisms that directly and indirectly rely on that water—a function of a phenomenon called biological magnification.
Biological magnification occurs if a pollutant, such as DDT, or mercury is picked up by an organism and is not broken down or eliminated from its body. Instead, the pollutant collects in body tissues.

80. The total variety of organisms in the biosphere is called
    A. Biodiversity B. Species diversity C. Ecosystem diversity D. Genetic diversity
81. Ozone is made up of A. Hydrogen B. Oxygen C. Nitrogen D. Chlorine
82. Ozone depletion in the atmosphere has been caused by
    A. Monoculture B. CFCs C. Suburban sprawl D. Soil erosion

The Value of Biodiversity:
Biological diversity, or biodiversity, is the total of the all genetically based variation in all organisms in the biosphere.
Types of biodiversity*: Biodiversity exists on three levels: ecosystem diversity, species diversity, and genetic diversity.*
Ecosystem diversity *refers to the variety of habitats, communities, and ecological processes in the biosphere.*
The number of different species in the biosphere, or in a particular area, is called ***species diversity****.*
To date, biologists have identified and named more than 1.8 million species, and they estimate that at least 30 million more are yet be discovered. Much of this diversity exists among single-celled organisms. But new species of vertebrates, like the snake are still being found.
Genetic diversity *can refer to the sum total of all different forms of genetic information carried by a particular a particular species, or by all organisms on Earth.*

Within each species, ***genetic diversity*** *refers to the total of all different forms of genes present in that species. In many ways, genetic diversity is the most basic kind of biodiversity. It is also the hardest kind to see and appreciate.*
Yet, genetic diversity is vitally important to the survival and evolution of species in a changing world.
Biodiversity's benefits to society include contributions to medicine and agriculture, and the provision of ecosystem goals and services.
When biodiversity is lost, significant value to the biosphere and to humanity may be lost along with it.

Humans reduce biodiversity by altering habitats, hunting, introducing invasive species, releasing pollution into food webs, and contributing to climate change.
Altered Habitats*: When natural habitats are eliminated for agriculture or for urban development, the number of species in those habitats drops and some species may become extinct. But, habitats don't need to be completely destroyed to put species at risk. Development often splits ecosystems into pieces, a process called habitat fragmentation, leaving habitat "islands."*
The smaller a habitat island, the fewer the species that can live there and the smaller their populations.
Both changes make habitats and species more vulnerable to other disturbance.

To conserve biodiversity, we must protect individual species, preserve habitats and ecosystems, and make certain that human neighbors of protected areas benefit from participating in conservation efforts.
To make sure that conservation efforts are concentrated in the most important places, conservation biologists have identified ecological "hot spots."
An ecological hot spot is a place where significant number of species and habitats are in immediate danger of extinction. By identifying these areas, ecologists hope that scientists and governments can better target their efforts to save as many species as possible.

83. The food chain concentrations of harmful substances increase in higher trophic levels in a process is known as
A. Biological magnification C. Biological succession
B. Genetic drift D. Pesticide resistances
84. In many cells, the structure that controls the cells activities is the
A. cell membrane B. Organelle C. Nucleolus D. Nucleus
85. Despite differences in size and shape, at some point all cells have DNA and a
A. Cell wall B. Cell membrane C. Mitochondria D. Nucleus
86. In eukaryotic cells, chromosomes carrying genetic information are found in the
A. Ribosomes B. Lysosomes C. Nucleus D. Microfilaments
87. The organelles that break down lipids, carbohydrates, and proteins into small molecules that can be used by the cell are called: A. Vacuole B. lysosomes C. ribosomes D. microfilaments
88. Cell membranes consists mainly of
A. Lipid bilayer B. Protein pumps C. Carbohydrates D. Proteins
89. The movement of water molecules across a selectively permeable membrane is known as
A. Exocytosis B. Phagocytosis C. Endocytosis D. Osmosis
90. A substance that moves by passive transport tends to move
A. Away from the area of equilibrium C. Away from the area where it is less concentrated
B. Away from the area where it is more concentrated D. Towards the area where it is more concentrated
91. Which of the following is true of ALL single-celled organisms?
A. They are all prokaryotes C. They all reproduce
B. They are all bacteria D. They all have a nucleus
92. A tissue composed of a group of
A. Similar cells B. Related organelles C. Organ systems D. Related organs
93. Animal cells have all of the following EXCEPT
A. Mitochondria B. Chloroplasts C. A nucleus D. a cell membrane
94. The nucleus includes all of the following structures EXCEPT
A. Cytoplasm B. A nuclear membrane C. DNA D. A nucleolus
95. The human brain is an example of a (an)
A. Cell B. Tissue C. Organ D. Organ system
96. Which cell structures are sometimes found attached to the endoplasmic reticulum?
A. Chloroplasts B. Nuclei C. Mitochondria D. Ribosomes
97. Which process always involves the movement of materials from inside the cell to outside the cell?
A. Phagocytosis B. Exocytosis C. Endocytosis D. Osmosis
98. Which of the following is an example of active transport?
A. Facilitated diffusion B. Osmosis C. Diffusion D. Endocytosis
99. The difference between prokaryotic and eukaryotic cells involves the presence of
A. A nucleus .B. Chloroplasts C. Genetic material in the form of DNA D. A cell membrane
100. Which of the following are autotrophs?
A. Deer B. Plants C. Leopard D. Mushrooms
101. The principal chemical compound that living things use to store energy is
A. DNA B. ATP C. H_2O D. CO_2
102. The amount of energy stored in a molecule of ATP compared to the amount stored in a molecule of glucose is:
A. Greater B. Less C. The same D. Variable, depending on conditions
103. When a candle burns, energy is released in the form of
A. Carbon dioxide and water C. Light and heat
B. The chemical substance ATP D. Electricity and motion
104. In addition to light and chlorophyll, photosynthesis requires
A. Water and oxygen C. Oxygen and carbon dioxide
B. Water and sugars D. Water and carbon dioxide
105. The leaves of a plant appear green because chlorophyll
A. Reflects blue light B. Reflects green light C. Absorbs blue light D. Absorbs green light
106. The first process in light-dependent reactions of photosynthesis is
A. Light absorption B. Oxygen production C. Electron transport D. ATP formation
107. Which substance from light-dependent reactions of photosynthesis is a source of energy for the Calvin cycle?
A. ADP B. NADPH C. H_2O D. Pyruvic acid
108. The light-independent reactions of photosynthesis are also known as the
A. Calvin cycle B. Sugar cycle C. Carbon cycle D. ATP cycle
109. ATP synthase in the chloroplast membrane makes ATP, utilizing the energy of highly concentrated
A. Chlorophyll B. Electrons C. Hydrogen ions D. NADPH

Hydrogen ions *began to accumulate within the thylakoid space. Some were left behind from the splitting of water at the end of the electron transport chain. Other hydrogen ions were pumped in from the stroma.*

The buildup of hydrogen ions makes the stroma negatively charged relative to the space within the thylakoids.
This gradient, the difference in both charge and H^+ concentration across the membrane, provides the energy to make ATP.
H^+ ions cannot cross the membrane directly. However, the thylakoid membrane contains a protein called ATP synthase that spans the membrane and allows H^+ ions to pass through it.
Powered by the gradient, H^+ ions pass through ATP synthase and force it to rotate, almost like a turbine being span by water in a hydroelectric power plant.

As it rotates, ATP synthase binds ADP and a phosphate group together to produce ATP.
This process, which is known as chemiosmosis, enables light-dependent electron transport to produce not only NADPH (at the end of the electron transport chain), but ATP as well.
Note: The light dependent reactions produce oxygen gas and convert ADP and $NADP^+$ into energy carriers ATP and NADPH

110. CAM plants are specialized to survive under what conditions that would harm most other kinds of plants?
A. Low temperature B. Hot, dry conditions C. Excess water D. Long day lengths

C4 Photosynthesis: *C4 plants are have specialized chemical pathway that allows them to capture even very low levels of carbon dioxide and pass to the Calvin cycle.*
The name "C4 plants" comes from the fact that the first compound formed in this pathway contains 4 carbon atoms.
The C4 pathway *enables photosynthesis to keep working under intense light and high temperatures, but it requires extra energy in the form of ATP to function.*
C4 organisms include important crop plants like corn, sugar cane, and sorghum.
CAM plants*: Other plants adapted to dry climates use a different strategy to obtain carbon dioxide while minimizing water loss.*
These include members of the family Crassulaceae. Because carbon dioxide becomes incorporated into organic acids during photosynthesis, the process is called Crassulacean Acid Metabolism (CAM).
CAM plants *admit air into their leaves only at night. In the cool darkness, carbon dioxide is combined with existing molecules to produce organic acids, trapping the carbon within the leaves.*
During the day time, when leaves are tightly sealed to prevent the loss of water, these compounds release carbon dioxide, enabling carbohydrate production.
CAM plants *include pineapple trees, many desert cacti, and also the fleshy "ice plants" which are frequently planted near freeways along the west coast to retard brush fires and prevent erosion.*

111. Autotrophs differ from heterotrophs because they:
A. Utilize oxygen to burn food
B. Do not require oxygen to live
C. Make their own food from carbon dioxide and water
D. Make carbon dioxide as a product of using food
112. The principal pigment in plants is A. Chlorophyll B. Oxygen C. ATP D. NADFPH
113. Which of the following correctly summarizes the process of photosynthesis?
A. $H_2O+CO_2 \xrightarrow{light}$ sugars + O_2
B. Sugars + $O_2 \xrightarrow{light} H_2O + CO_2$
C. $H_2O + O_2 \xrightarrow{light}$ sugars + CO_2
D. Sugars + $CO_2 \xrightarrow{light} H_2O + O_2$

114. The color of light that is LEAST useful to a plant during photosynthesis is
A. Red B. Blue C. Green D. Violet
115. The first step in photosynthesis is the
A. Synthesis of water
B. Production of oxygen
C. Breakdown of carbon dioxide
D. Absorption of light energy
116. In a typical plant, all of the following factors are necessary for photosynthesis EXCEPT
A. Chlorophyll B. Light C. Oxygen D. Water
117. Cells use the energy available in food to make a final energy-rich compound called
A. Water B. Glucose C. ATP D. ADP
118. Each gram of glucose contains approximately how much energy?
A. 1 calorie B. 1 Calorie C. 4 calories D. 4 Calories

The energy stored in food is expressed in units of calories.
A calorie is the amount energy needed to raise the temperature of 1 gram of water by 1 degree Celsius.
The Calorie (capital C) that is used on food labels is a ***kilocalorie, or 1000 calories.***
Cells can use all sorts of molecules for food, including fats, proteins, and carbohydrates.
The energy stored in each of these molecules varies because their chemical structures, and therefore their energy storing-bonds, differ.
For example one gram of the sugar glucose releases 3811 calories of heat energy when it is burned.
By contrast, 1 gram of the triglyceride fats found in beef releases 8893 calories of heat energy when its bonds are broken.
In general, carbohydrates and proteins contain approximately ***4000 calories (4 Calories****) of energy per gram, while fats*

contain approximately 9000 calories (9 Calories) per gram.
Cells of course, don't simply burn food and release energy as heat.
Instead, they break down food molecules gradually, capturing a little bit of chemical energy in key steps.
This enables cells to use the energy stored in the chemical bonds of foods like glucose to produce compounds such as ATP that directly power the activity of the cell.

119. The process that releases energy in the presence of oxygen is
A. Synthesis B. Cellular respiration C. ATP synthase D. Photosynthesis
120. The first step in releasing the energy of glucose in the cell is known as
A. Fermentation B. Glycolysis C. The Krebs cycle D. Electron transport
121. The net gain of energy from glycolysis is
A. 4 ATP molecules B. 2 ATP molecules C. 8ADP molecules D. 3 pyruvic acid molecules
122. The Krebs cycle takes place within the
A. Chloroplast B. Nucleus C. Mitochondria D. Cytoplasm
123. The electron transport chain uses the high-energy electrons from the Krebs cycle to
A. Produce glucose C. Move H^+ ions across the inner mitochondrial membrane
B. Covert acetyl-CoA to citric acid D. Convert glucose to pyruvic acid
124. Because fermentation takes place in the absence of oxygen, it is said to be
A. Aerobic B. anaerobic C. Cyclic D. Oxygen-rich
125. The process carried out by yeast that cause bread dough to rise is
A. Alcoholic fermentation B. Cellular respiration C. Oxygen debt D. The Krebs cycle
126. What raw materials are needed for cellular respiration?
A. Glucose and carbon dioxide C. Carbon dioxide and oxygen
B. Glucose and oxygen D. Oxygen and lactic acid
127. During the Krebs cycle
A. Hydrogen ions and oxygen form water
B. The cell releases small amount of energy through fermentation
C. Each glucose molecule is broken down into two molecules of pyruvic acid
D. Pyruvic acid is broken down into carbon dioxide in a series of molecules
128. Which substance is needed to begin the process of glycolysis?
A. ATP B. NADP C. Pyruvic acid D. carbon dioxide
129. In eukaryotic cells, MOST of cellular respiration takes place in the
A. Nuclei B. Cytoplasm C. Mitochondria D. Cell walls
130. Which substance is broken down during the process of glycolysis?
A. Carbon B. NAD^+ C. Glucose D. Pyruvic acid
131. The human body can use all of the following as energy sources EXCEPT
A. ATP in muscles C. glycolysis
B. Lactic acid fermentation D. alcoholic fermentation
132. During cellular respiration, which of the following are released as byproducts?
A. CO_2 and O_2 B. H_2O C. O_2 and H_2O D. CO_2 and H_2O
133. Which of the following is an aerobic process?
A. The Krebs cycle C. Alcoholic fermentation
B. Glycolysis D. Lactic acid fermentation
134. The rate at which materials enter and leave the cell depends on the cell's
A. Volume B. Weight C. Speciation D. Surface area
135. In order for the cell to divide successfully, the cell must first
A. Duplicate its genetic information C. Increase its number of chromosomes
B. Decrease its volume D. decrease its number of organelles
136. The process that increases genetic diversity within a population is
A. Asexual reproduction B. Sexual reproduction C. Cell division D. Binary fission
137. Sister chromatids are attached to each other at an area called
A. A. Centriole B. Spindle C. Centromere D. Chromosome
138. If a cell has 12 chromosomes, how many chromosomes will each of its daughter cells have after mitosis and cytokinesis? A. 4 B. 6 C. 12 D. 24
139. The timing in the cell cycle in eukaryotic cells is believed to be controlled by a group of closely related proteins known as: A. Chromatids B. Cyclins C. Centromeres D. Centrioles
140. In the cell cycle, external regulatory proteins direct cells to
A. Speed up or slow down the cell cycle C. Remain unchanged
B. Produced and then stop the cell cycle D. Grow uncontrollably

How is the cell cycle regulated?

- *When scientists grow cells in the laboratory, most cells will divide until they come into contact with each other.*
- *Once they do, they usually stop dividing and growing.*
- *What happens if those neighboring cells are suddenly scraped away in the culture dish?*
- *The remaining cells will begin dividing again until they once again make contact with other cells.*
- *This simple experiment shows that controls on cell growth and division can be turned on and off.*
- *Something similar happens inside the body. When an injury such as a cut in a skin or a beak in a bone occurs, cells at the edges of the injury are stimulated to divide rapidly.*
- *New cells form, starting the process of healing. When the healing process nears completion, the rate of cell division, slows, controls on growth are restored, and everything returns to normal.*

The discovery of Cyclins:

- ❖ *For many years biologists searched for a signal that might regulate the **cell cycle**—something that would tell cells when it was time to divide, duplicate their chromosomes, or enter another phase of the cell cycle.*
- ❖ *In the early 1980s, biologists discovered a protein in cells that were in mitosis.*
- ❖ *When they injected the protein into a nondividing cell, a mitotic spindle would form.*
- ❖ *They named this protein **cyclin** because it seemed to regulate the cell cycle.*
- ❖ *Investigators have since discovered a family of proteins known as **cyclins** that regulate the timing of the cell cycle in eukaryotic cells.*

Regulatory Proteins**: The **discovery of cyclins** was just the start. Scientists have since identified dozens of other proteins that also help to regulate the cell cycle. The cell cycle is controlled by regulatory proteins both **inside and outside the cell.

I. Internal Regulators:

- ✓ *One group of proteins, internal regulatory proteins, **responds to events occurring inside a cell.***
- ✓ *Internal regulatory proteins allow the cell cycle to proceed only when certain events have occurred in the cell itself.*
- ✓ *For example, **several regulatory proteins make sure a cell does not enter mitosis until its chromosomes have replicated.***
- ✓ ***Another regulatory protein prevents a cell from entering anaphase until the spindle fibers have attached to the chromosomes.***

II. External Regulators

- *Proteins that respond to events outside the cell are called **external regulatory proteins.***
- ***External regulatory proteins** direct cells to **speed up or slow down the cell cycle.***
- *One important group of external regulatory proteins is the group made up of the **growth factors.***
- *Growth factors **stimulate the growth and division of cells.***
- *These proteins are especially important **during embryonic development and wound healing.***
- *Other external regulatory proteins on the surface of **neighborin**g cells often have an **opposite effect.***
- *They cause cells to **slow down or stop their cell cycle.***
- ***This prevents excessive cell growth and keeps body tissues from disrupting one another.***

Apoptosis

- ❖ *Just as new cells are produced every day in a multicellular organism, many other cells die.*
- ❖ *Cells end their life cycle in one of two ways. A cell may die by accident due to damage or injury, or a cell may actually be "programmed" to die.*
- ❖ ***Apoptosis** is a process of programmed cell death.*
- ❖ *Once apoptosis is triggered, a cell undergoes a series of controlled steps leading to its **self-destruction.***
- ❖ *First, the cell and its chromatin shrink, and then parts of the cell's membranes break off.*
- ❖ *Neighboring cells then quickly clean up the cell's remains.*
- ❖ ***Apoptosis** plays a key role in development by shaping the structure of tissues and organs in plants and animals.*
- ❖ *For example, if you look at a mouse foot, each foot is shaped the way it is partly because cells between the toes die by apoptosis during tissue development.*
- ❖ *When apoptosis does not occur as it should, a number of diseases can result.*
- ❖ *For example, the cell loss seen in AIDS and **Parkinson's** disease can result if **too much apoptosis occurs.***

Cancer: Uncontrolled Cell Growth

How do cancer cells differ from other cells?

- *Why is cell growth regulated so carefully? The principal reason may be that the consequences of uncontrolled cell growth in a multicellular organism are very severe.*
- ***Cancer**, a disorder in which body cells lose the ability to control growth, is one such example.*
- ***Cancer cells do not respond** to the signal that regulates the growth of most cells. As a result, the cells divide uncontrollably. Cancer cells form a mass of cells called a **tumor**. However, not all tumors are cancerous.*
- *Some tumors are benign, or noncancerous.*
- *A benign tumor does not spread to surrounding healthy tissues or other parts of the body.*
- *Some cancerous tumors are **malignant**. Malignant tumors invade and destroy surrounding healthy tissue.*

- *As the cancer cells spread, they absorb the nutrients needed by other cells, block other connections, and prevent the organs they invade from functioning properly.*
- *Soon, the delicate balances that exist in the body are disrupted, and life threatening illness results.*

What Causes Cancer?

- *Cancers are caused by defects in the genes that regulate cell growth and division.*
- *There are several sources of such defects, including smoking and chewing tobacco, radiation exposure, other defective genes, and even viral infection.*
- *All cancers, however, have one thing in common:* ***The control over the cell cycle has broken down.***
- ***Some cancer cells will no longer respond to external growth regulators, while others fail to produce the internal regulators that ensure orderly growth.***
- *An astonishing number of cancer cells have a defect in a gene called* ***p53,*** *which normally halts the cell cycle until all chromosomes have been properly replicated.*
- ***Damaged or defective p53 genes*** *cause cells to* ***lose the information*** *needed to respond to signals that normally control their growth.*

Cancer cells are particularly dangerous because of their tendency to spread once they enter the blood stream or lymph vessels.The cancer then moves into other parts of the body and forms secondary tumors, a process called metastasis.

Treatment for cancer*: When a cancerous tumor is localized, it can often be removed by surgery.*

- *Skin cancer, the most common form of the disease, can usually be treated this way.*
- *Melanomas, the most serious form of skin cancer, can be removed surgically but if only spotted very early.*
- *Other forms of treatment makes use of the fact that cancer cells grow rapidly and, therefore, need to copy their DNA more quickly than do most normal cells. This makes them especially vulnerable to damage from radiation.*
- *As a result, many tumors can be effectively treated with carefully targeted beams of radiation.*
- *Medical researchers have worked for ears to develop chemical compounds that would kill cancer cells, or at least slow their growth. The use of such compounds against cancer is known as chemotherapy.*
- *Great advances in chemotherapy have taken place in recent years and have even made it possible to cure some forms of cancer. However, because most chemotherapy compounds target rapidly dividing cells, they also interfere with cell division in normal, healthy cells.*
- *This produces serious side effects in many patients, and it is one of the reasons why scientists are so interested in gaining a better understanding of the role of the cell cycle proteins in cancer.*
- *The goal of many researchers is to find highly specific ways in which cancer cells can be targeted for destruction while healthy cells unaffected.*
- *Cancer is a serious disease. Understanding and combating remains a major scientific challenge, but scientists at least know where to start.*
- *Cancer is a disease of cell cycle, and conquering cancer will require a much deeper understanding of the processes that control cell division.*

Cell Differentiation

THINK ABOUT IT: The human body contains an estimated one hundred trillion cells.

- *That is a staggering number, but in one respect it is not quite as large as it you might think. Why?*
- *Try to estimate how many times a single cell would have to divide through mitosis to produce that many cells.*
- *It may surprise you to learn that as few as 47 rounds of cell division can produce that many cells.*
- *The results of those 47 cell cycles are truly amazing.*
- *The human body contains hundreds of distinctly different cell types, and every one of them develops from the single cell that starts the process.*
- *How do the cells get to be so different from each other?*

From One Cell to Many

How do cells become specialize?

- *Each of us started life as just one cell. So, for that matter, did did your pet dog, an earth worm, and the petunia on the windowsill. These living things pass through a developmental stage called an embryo, from which the adult organism is gradually produced.*
- *During the development process, an organism's cells become more and more differentiated and specialized for particular functions. The process by which cells become specialized is known as differentiation.*
- *During the development of an organism, cells differentiate into many different types of cells.*
- *A differentiate cell has become, quite literally, different from the embryonic cell that produced it, and specialized to perform certain tasks, such as contraction, photosynthesis, or protection.*
- *Our bodies, and the bodies of all multicellular organisms, contain highly differentiated cells that carry out the jobs we need to perform to stay alive.*
- *The process of differentiation determines a cell's ultimate identity, such as whether it will spend its life as a nerve cell or a muscle cell.*

- *In some organisms, a cells role is rigidly determined at a specific point in the course if development.*
- *Over organisms, including mammals like us, go through a more flexible process in which cell differentiation is controlled by a number of interacting factors in the embryo, many of which are still not well understood.*
- *What is known, however, is that adult cells generally do reach a point at which their differentiation is complete—when they can no longer become other types of cells?*

Stem Cells and Development

What are Stem cells?

- *One of the most important questions in biology is how all of the specialized, differentiated cell types in the body are formed from just a single cell. Biologists say that such a cell is a **totipotent**, literally able **to do everything**, to develop into any type of cell in the body (including the cells that make up the extra embryonic membranes and placenta).*
- *Only the **fertilized egg** and the **cells produced by the first few cell divisions of embryonic** development are truly **totipotent.***
- *If there is a secret by which cells start the process of differentiation, these are the cells that know that secret.*

Human Development:

- *After about **four days of development**, a human embryo forms into a **blastocyst**, a hollow ball of cells with a cluster of cells inside known as the **inner cell mass.***
- *Even at this early stage, the cells of the blastocyst have begun to specialize.*
- ***The outer cells form tissues that attach the embryo to its mother**, while the **inner cell mass** are said to be **pluripotent**.*
- *Cells that are pluripotent can develop into **most, but not all**, of the body's cell types. They cannot form the tissues surrounding the embryo.*

Stem Cells**: The unspecialized cells from which differentiated cells develop are known as **stem cells.

- *As the name implies, stem cell sit at the base of a branching "stem" of development from which different cell types form.*
- *Because of their potential to develop into other cell types, stem cells are the subject of intense interest by researchers around the world.*
- ***Embryonic Stem Cells**: As you have seen, the pluripotent stem cells of the inner cell mass eventually produce **all of the cells of the body.** Embryonic stem cells are **pluripotent** cells found in the early embryo.*
- *In 1998, researchers at the University of Wisconsin found a way to grow these embryonic stem cells in culture.*
- *Their experiments confirmed that such cells did indeed have the capacity to produce just about any cell type in the human body.*
- *In fact, scientists have managed to coax mouse embryonic stem cells to differentiate into nerve cells, muscle cells, and even into sperm and egg cells.*
- *Recently, sperm made from embryonic stem cells were used to generate live mice.*

***Adult Stem Cells**: For years, biologists have suspected that adult organisms might also contain some types of stem cells.*

- *Cells in the blood and skin, for example, have a limited life span and must be constantly replaced.*
- *This suggested that the body contains pools of stem cells from which new skin and blood cells can be produced.*
- *Adult stem cells are groups of cells that differentiate to renew and replace cells in the adult body.*
- *Because of their more limited potential, adult stem cells are referred to as **multipotent,** meaning that they can develop into many types of differentiated cells.*
- *Typically, stem cells of a given organ or tissue produces only the types of cells that are unique to that tissue.*
- *For example, **adult stem** cells in the **bone marrow** can develop into several different types of blood cells, while stem cells in the brain can produce neurons or nerve cells.*

141. Bone marrow cells that produce blood cells are best categorized as
    A. Embryonic stem cell B. Adult stem cells C. Pluripotent D. Totipotent
142. Which type of cell has the potential to develop into any type of cell?
    A. Totipotent B. Pluripotent C. Multipotent D. Differentiated
143. Which statement is true regarding a cell's surface area-to-volume ratio?
    A. As size of a cell increases, its volume decreases
    B. As a size of a cell decreases, its volume increases
    C. Larger cells will have a greater surface area-to-volume ratio
    D. Smaller cells will have a greater surface area-to-volume ratio
144. Which of the following is NOT an advantage of asexual reproduction?
    A. Simple and efficient C. Produces large number of offspring quickly
    B. Increases genetic diversity D. Requires one parent
145. At the beginning of cell division, a chromosome consists of two
    A. Centromeres B. Centrioles C. Chromatids D. Spindles
146. What regulates the timing of the cell cycle in eukaryotes?
    A. Chromosomes B. Cyclins C. Nutrients D. Spindles

147. The period between cell divisions is called
A. Interphase B. Prophase C. G3 phase D. Cytokinesis
148. Which of the following is TRUE about totipotent cells?
A. Embryonic stem cells are totipotent cells C. Totipotent cells are differentiated cells
B. Totipotent cells can differentiate into any type of cell and tissue D. Adult stem cells are totipotent cells
149. A cell enters anaphase before all of its chromosomes have attached to the spindle. This may indicate that the cell is not responding to: A. Internal regulators B. Mitosis C. Growth factors D. Apoptosis
150. Different forms of a gene are called
A. Hybrids B. dominant factors C. Alleles D. Recessive factors
151. Organisms that have two identical alleles for a particular trait are said to be
A. Hybrid B. Heterozygous C. Homozygous D. Dominant
152. A Punnett square is used to determine the
A. Probable outcome of a cross C. Actual outcomes of a cross
B. Result of incomplete dominance D. Result of meiosis
153. The physical characteristics of an organism are called
A. genetics B. heredity C. phenotype D. genotype
154. The probability of flipping a coin twice and getting two heads is
A. 1 B.1/2 C. 1/4 D. ¾
155. A situation in which a gene has more than two alleles is known as
A. Complete dominance B. Codominance C. Polygenic dominance D. Multiple alleles
156. A pink-flowered *Mirabilis* plant (RW) is crossed with a white-flowered Mirabilis (WW). What is the chance that a seed from this cross will produce a red-flowered plant? A. 0 B. 1/4 C. 1/2 D. 1
157. A gene map shows: A. The number of possible alleles for a gene C. Where chromosomes are in a cell
B The relative locations of genes on a chromosome D. How crossing –over occurs

Gene Linkage and Gene Maps

How can two alleles from different genes be inherited together?

- *Genes are located on different chromosomes assort independently, but what about genes that are located on the same chromosomes? Wouldn't they generally be inherited together?*

Gene Linkage The answer to this question, as Thomas Hunt Morgan first realized in 1910, is yes.

- *Morgan's research on fruit flies led him to the principle of gene linkage.*
- *After identifying more than 50 Drosophila genes, Morgan discovered that many of them appeared to be "linked" together in ways that, at first glance, seemed to violet the principle of independent assortment.*
- *For example, Morgan used a fly with reddish orange eyes and miniature wings in a series of test crosses.*
- *His results showed that the genes for those two traits were almost always inherited together.*
- *Only rarely did the genes separate from each other.*
- *Morgan and his associates observed so many genes that were inherited together that, before long, they could group all of the fly's genes into four linkage groups.*
- *The linkage groups assorted independently, but all of the genes in one group were inherited together.*
- *As it turns out, Drosophila has four linkage groups and four pairs of chromosomes.*
- *Morgan's findings led to two remarkable conclusions. First, each chromosome is actually a group of linked genes.*
- *Second, Mendel's principle of independent assortment still holds true.*
- *It is the chromosomes, however, that assort independently, not individual genes.*
- *Alleles of different genes tend to be inherited together from one generation to the next when those genes are located on the same chromosome.*
- *How did Mendel managed to miss gene linkage? By luck, or design, several of the genes he studied are on different chromosomes.*
- *Others are so far apart that they also assort independently.*

Gene Mapping

- *In 1911, in Columbia University student was working part time in Morgan's lab.*
- *This student, Alfred Sturtevant, wondered if the frequency of crossing-over between genes during meiosis might be a clue to the genes' location.*
- *Sturtevant reasoned that the further apart two genes were on a chromosome; the more likely it would be that crossing-over would occur between them.*
- *If two genes are close together, then crossover between should be more common.*
- *By this reasoning, he could use the frequency of crossing-over between genes to determine their distances from each other.*
- *Sturtevant gathered up several notebooks of lab data and look them back to his room.*
- *The next morning, he presented Morgan with a gene map showing the relative location of each known gene on one of the drosophila chromosomes.*
- *Sturtevant's method has been used to construct gene maps.*

158. Unlike mitosis, meiosis in male mammals results in the formation of
   A. One haploid gamete C. Three diploid gametes
   B. Four diploid gametes D. Four haploid gametes
159. What happens to the chromosome number during meiosis?
   A. It doubles B. It stays the same C. It halves D. It becomes diploid
160. Which ratio did Mendel find in his F_2 generation? A. 3:1 B. 1:3:1 C. 1:2 D. 3:4
161. During which phase of meiosis is chromosome number reduced?
   A. Anaphase I B. Metaphase I C. Telophase I D. Telophase II
162. Two pink-flowering plants are crossed. The offspring flower as follows: 25% red, 25% white, and 50% pink. What pattern of inheritance does flower color in these flowers follow?
   A. Dominance B. Multiple alleles C. Incomplete dominance D. polygenic trait
163. Which of the following is used to construct a gene map?
   A. Chromosome number B. Mutation rate C. Rate of meiosis D. Recombination rate
164. Alleles for the same trait are separated from each other during the process of
   A. Cytokinesis B. Meiosis I C. Meiosis II D. Metaphase II
165. Which of the following is NOT one of Gregor Mendel's principles?
   A. The alleles for different genes usually segregate independently
   B. Some form of a gene may be dominant
   C. The inheritance of characteristics is determined by factors (gene)
   D. Crossing-over occurs during meiosis
166. The process by which one strain of bacterium is apparently changed into another strain is called
   A. Transcription B. transformation C. Duplication D. Replication
167. Bacteriophages are: A. a form of bacteria B. enzymes C. coil of DNA D. viruses
168. Which of the following researchers used radioactive markers in experiments to show the DNA was the genetic material in cells?
   A, Frederick Griffith C. Alfred Hershey and Martha Chase
   B, Oswald Avery D. James Watson and Francis Crick
169. Before DNA could definitely be shown to be genetic material in cells, scientists had to show that it could:
   A. tolerate high temperature C. carry and make copies of information
   C. be taken down into small sub units D. be modified in response to environmental conditions

DNA Replication

- *Before a cell divides, its DNA must first be copied. How might the double-helix structure of DNA make that possible?*
- *What might happen if one of the nucleotides were damaged or chemically altered just before the copying process?*
- *How might this affect the DNA inherited by each daughter cell after cell division?*

Copying the Code

What role does DNA polymerase play in copying DNA?

- When Watson and Crick discovered the structure of DNA, they immediately recognized one genuinely surprising aspect of the structure.
- Base pairing in the double helix how DNA can be copied or replicated, because each base on one strand pairs with one—and only one—base on the opposite strand.
- Each strand of the double helix therefore has all the information needed to reconstruct the other half by the mechanism of base pairing.
- Because each strand can be used to make the other strand, the strands are said to be complementary.

The Replication Process:

- Before a cell divides, it duplicates its DNA in a copying process called replication.
- This process, which occurs during the interphase of the cell cycle, ensures that each resulting cell has the same complete set of DNA molecules.
- During replication, the DNA molecule separates into two strands and then produces two new complementary strands following the rules of base pairing.
- Each strand of the double helix of DNA serves as a template, or model for the new strand.
- During replication, the two strands of the double helix have separated, or "unzipped," allowing two replication forks to form.
- As each new strand forms, new bases are added following the rules of base pairing.
- If the base on the old strand is adenine, then thymine is added to the newly forming strand.
- Like-wise, guanine is always paired to cytosine. For example, a strand that has the base sequence TACGTT produces a strand with the complementary base sequence ATGCAA.
- The result is two DNA molecules identical to each other and to the original molecule.

- Note that each DNA molecule resulting from replication has one original strand and one new strand.

The Role of Enzymes:

- DNA replication is carried out by a series of enzymes.
- These enzymes first unzip a molecule of DNA by breaking the hydrogen bonds between base pairs and unwinding the two strands of the molecule.
- Each strand then serves as a template for the attachment of complementary bases. You may recall that enzymes are proteins with highly specific functions. For this reason, they are often named for the reactions they catalyze.
- The principal enzyme involved in DNA replication is called DNA polymerase.
- DNA polymerase is an enzyme that joins individual nucleotides to produce a new strand of DNA.
- Besides producing the sugar-phosphate bonds that join nucleotides together, DNA polymerase also "proofreads" each new DNA strand, so that each nucleotide is a near perfect copy of the original.

Telomeres

- DNA at the tips of chromosomes are known as telomeres. This DNA is practically difficult to replicate.
- Cells use special enzyme, called *telomerase*, to solve this problem by adding short, repeated DNA sequences to the telomerase.
- In rapidly dividing cells, such as stem cells and embryonic cells, telomerase helps to prevent genes from being damaged or lost during replication.
- Telomerase is often switched off in adult cells.
- In cancer cells, however, telomerase may be activated, enabling these cells to grow and proliferate rapidly.

Replication in Living Cells:

How does DNA replication differ in prokaryotic cells and eukaryotic cells?

- ❖ DNA replication occurs during **S phase** of the cell cycle.
- ❖ The cells of most prokaryotes have a single, circular DNA molecule in the cytoplasm, containing nearly all the cell's genetic information.
- ❖ Eukaryotic cells, on the other hand, can have up to 1000 times more DNA.
- ❖ Nearly the entire DNA of eukaryotic cells is found in the nucleus, packaged into chromosomes.
- ❖ Eukaryotic chromosomes consist of DNA, tightly packed together with proteins to form a substance called chromatin.
- ❖ Together, the DNA and histone molecules form beadlike structures called nucleosomes.
- ❖ Histones are proteins around which chromatin is tightly coiled.

Prokaryotic DNA Replication

- ❖ In most prokaryotes, DNA replication does not start until regulatory proteins bind to a single starting point on the chromosome.
- ❖ These proteins then trigger the beginning of the S phase, and DNA replication begins.
- ❖ Replication in most prokaryotic cell starts from a single point and proceeds in two directions until the entire chromosome is copied.
- ❖ Often, the two chromosomes produced by replication are attached to different points inside the cell membrane and are separated when the cell splits to form two new cells.

Eukaryotic DNA Replication

- ❖ Eukaryotic chromosomes are generally much bigger than those of prokaryotes.
- ❖ In eukaryotic cells, replication may begin at dozens or even hundreds of places on the DNA molecule, proceeding in both directions until each chromosome is completely copied.
- ❖ Although a number of proteins check DNA for chemical damage or base pair mismatches prior to replication, the system is not foolproof.
- ❖ Damaged regions of DNA are sometimes replicated, resulting in changes to DNA base sequences that may alter certain genes and produce serious consequences.
- ❖ The two copies of DNA produced by replication in each chromosome remain closely associated until the cell enters prophase of mitosis.
- ❖ At that point, the chromosomes condense, and the two chromatids in each chromosome become clearly visible.
- ❖ They separate from each other in anaphase of mitosis, producing two cells, each with a complete set of genes coded in DNA.

Gene Regulation and Expression

Prokaryotic Gene Regulation

- ✓ As it turns out, bacteria and other prokaryotes do not need to transcribe all of their genes at the same time.
- ✓ To conserve energy and resources, prokaryotes regulate their activities, using only those genes necessary for the cell to function.
- ✓ For example, it would be wasteful for a bacterium to produce enzymes that are needed to make a molecule that is readily available from its environment.
- ✓ By regulating gene expression, bacteria can respond to changes in their environment—the presence or absence of

nutrients, for example. How?

- ✓ DNA—binding proteins in prokaryotes regulate genes by controlling transcription.
- ✓ Some of these regulatory proteins help switch genes on, while others turn genes off.
- ✓ How does an organism know when to turn a gene on or off? One of the keys to gene transcription in bacteria is the organization of genes into operons.
- ✓ An operon is a group of genes that are regulated together. The genes in an operon usually have related functions.
- ✓ *E. coli*, provides us with a clear example. The 4288 genes that code for proteins in *E. coli* include a cluster of three genes that must be turned on together before the bacterium can use the sugar lactose as a food. These 3 lactose genes in E. coli are called the *Lac* operon.

The *Lac* Operon:

Why must *E. coli* be able to switch the *Lac* genes on and off?

- ✓ Lactose is a compound made up of two simple sugars, galactose and glucose.
- ✓ To use lactose for food, the bacterium must transport lactose across its cell membrane and the *break the bond* between glucose and galactose.
- ✓ These tasks are performed by proteins coded for by the genes of the *Lac* operon.
- ✓ This means, of course, that if the bacterium grows in a medium where lactose is the only food source, *it must transcribe these genes and produce these proteins.*
- ✓ If grown on another food source, such as glucose, *it would have no need for these proteins.*
- ✓ Remarkably, the bacterium almost seems to "know" when the products of these genes are needed.
- ✓ When lactose is not present, the *Lac* genes are turned off by proteins that bind to DNA and block transcription.

Promoters and Operators:

- ✓ On the side of the operon's three genes are two regulatory regions.
- ✓ The first is a **promoter (P),** which is a site where RNA-polymerase can bind to begin transcription.
- ✓ The other region is called the **operator (O).** The O site is where a DNA-binding protein known as the ***Lac* repressor** can bind to DNA.

Promoter is a specific region of a gene where RNA polymerase can bind and begin transcription.
Operon in prokaryotes is a group of adjacent genes that share a common operator and promoter and are transcribed into a single mRNA.
Operator is a **short DNA region**, adjacent to the promoter of the prokaryotic operon that binds repressor proteins responsible for controlling the rate of transcription of the operon.
One of the keys to genetic transcription in bacteria is the organization of genes into operons.
An **operon** is a group of genes that are regulated together. The genes in an operon usually have related functions.
** *E. coli* provides us with a clear example. The 4288 genes that code for protein in *E. coli* include a cluster of 3 genes that must be turned on together before the bacterium can use the sugar lactose as a food. These three lactose genes in E. coli are called the ***Lac* operon.**

The Lac Repressor Blocks Transcription:

- ❖ When the Lac repressor binds to the O region, RNA polymerase cannot reach the *Lac* genes to begin transcription.
- ❖ In effect, the binding of the repressor protein switches the operon "off" by preventing the transcription of its genes.

Lactose Turns the operon "On":

- ❖ If the repressor protein is always present, how can the *Lac* genes ever be switched on?
- ❖ Besides its DNA binding site, the Lac repressor protein has a binding site for lactose itself.
- ❖ When lactose is added to the medium, it diffuses into the cell and attaches to the Lac repressor.
- ❖ This changes the shape of the repressor protein in a way that causes it to fall off the operator.
- ❖ Now, with the repressor no longer bound to the O site, RNA polymerase can bind to the promoter and transcribe the genes of the operon. As a result, the operon is automatically switched on.

Eukaryotic Gen Regulation

- The general principles of gene regulation in prokaryotic also apply to eukaryotes, although there are differences.
- Most eukaryotic genes are controlled individually and have more complex regulatory sequences than those of the *Lac* repressor system.
- One of the most interesting features of eukaryotic genes is the TATA box, a short region of DNA, about 25 or 30 base pairs before the start of a gene, containing the sequence TATATA or TATAAA.
- The TATA box binds a protein that helps position RNA polymerase by marking a point just before a beginning of a gene.

Transcription Factors:

- Gene expression in eukaryotic cells can be regulated at a number of levels.
- One of the most critical is the level of transcription by means of DNA-binding proteins known as **transcription factor.**
- By binding DNA sequence in the regulatory region of eukaryotic genes, transcription factors control the expression of those genes.

- Some transcription factors enhance transcription by **opening up tightly chromatin.**
- Others help **attract RNA polymerase**. Still others **block** access to certain genes, much like prokaryotic repressor proteins.
- In most cases, multiple transcription factors must bind before RNA polymerase is able to attach to the **promoter region a**nd start transcription.
- **Promoters** have multiple binding sites for transcription factors, each of which can influence transcription.
- Certain factors activate scores of genes at once, dramatically changing patterns of gene expression in the cell.
- Other factors form only in response to chemical signals.
- **Steroid hormones,** for example, are chemical messengers that enter cells and **bind to receptor proteins.**
- These "receptor complexes" then act as transcription factors that bind to DNA, allowing a single chemical signal to activate multiple genes.
- Eukaryotic gene expression can also be regulated by many other factors, including the **exit** of mRNA, and even the **breakdown of a gene's protein products.**

170. A nucleotide does not contain:
A. a 5-carbon sugar B. an amino acid C. a nitrogen base D. a phosphate group
171. According to Chargaff's rule of base pairing, which of the following is true about DNA?
A. A=T, and C=G B. A=C, and T=G C. A=G, and T=C D. A=T=C=G
172. The bonds that hold the two strands of DNA together come from
A. The attraction of phosphate groups for each other
B. Strong bonds between nitrogenous bases and the sugar-phosphate backbone
C. Weak hydrogen bonds between nitrogen bases D. Carbon-to-carbon bonds in the portion of the nucleotides.
173. In prokaryotes, DNA molecules are located in the
A. Nucleus B. Ribosomes C. Cytoplasm D. Histones
174. The main enzyme involved in linking individual nucleotides into DNA molecules is
A. DNA protease B. Ribosome C. Carbohydrase D. DNA polymerase
175. During replication, which sequence of nucleotides would bond with the DNA sequence TATGA?
A. TATGA B. ATACT C. CACTA D. AGTAT
176. The scientist(s) responsible for the discovery of bacterial transformation is (are)
A. Watson and Crick B. Avery C. Griffith D. Franklin
177. Which of the following does NOT describe the structure of DNA?
A. Double helix C. Contain adenine-guanine pair
B. Nucleotide polymer D. Bacteria contain DNA but not protein
178. What did Hershey and Chase's work show?
A. Genes are probably made up of DNA C. Viruses contain DNA but not protein
B. Genes are probably made up of protein D. Bacteria contain DNA but not protein
179. The two backbones of the DNA molecule consist of
A. Adenine and sugars B. Phosphates and sugars C. Adenine and thymine D. Thymines and sugars
180. In eukaryotic chromosomes, DNA is tightly coiled around proteins called
A. DNA polymerase B. Chromatin C. Histones D. Nucleotides
181. When prokaryotic cells copy their DNA, replication begins at
A. One point on the DNA molecule C. Two points on opposite ends of the DNA molecule
B. Dozens of hundreds of points along the molecule D. Opposite ends of the molecule
182. Compared to eukaryotic cells, prokaryotic cells contain
A. About 1000 times more DNA C. Twice as much DNA
B. About one thousandth as much DNA D. The same amount of DNA
183. The process by which the genetic code of DNA is copied into a strand of RNA is called-386
A. Translation B. Transcription C. Transformation D. Replication
184. Which of the following describes RNA?
A. RNA is usually double-stranded and contains the base thymine
B. RNA is usually single-stranded and contains the base uracil
C. RNA is longer than DNA and uses fives bases to encode information
D. RNA is made in the nucleus of eukaryotic cells and stays there to carry out its function
185. In messenger RNA, each codon specifies a particular
A. Nucleotide B. Enzyme C. Amino acid D. Promoter
186. In eukaryotes, nearly all the DNA is found in the
A. Nucleus B. Ribosomes C. Cytoplasm D. Histones
187. Which of the following statements about the genetic code is true?
A. A codon can specify more than one amino acid C. Every codon specifies a different amino acid
B. Some codon specifies the same amino acid D. Some codons have no function at all

188. The process of making proteins on the ribosome based on instructions from messenger RNA is called:
A. Transcription B. Transformation C. Translation D. Molecular biology

189. Changes in DNA sequences that affect genetic information are known as
A. Replication B. Mutation C. Transformation C. Translation

190. A single-base mutation in a messenger RNA molecule could transcribe the DNA sequence CAGTAT into:
A. GTCATA B. GUCAUA C. GTCUTU D. GUAAUA

191. A substance that can cause a change to the DNA code of an organism is called a
A. Toxin B. Mutagen C. Nitrogenous base D. Nucleotide

192. The specific region of a gene where RNA polymerase can bind and begin transcription is a (an)
A. Promoter B. Operon C. Intron D, Allele

193. The 4288 genes that code for protein in *E. coli* include a cluster of 3 genes that must be turned on together before the bacterium can use the sugar lactose as a food. These three lactose genes in E. coli are called:
A. the *Lac* operon B. the *Lac* promoter C. the *Lac* repressor D. the *Lac* mRNA

194. Blocking gene expression in eukaryotes with microRNA strands is called RNA
A. Transcription B. Translation C. Interference D. Digestion

195. How does RNA differ from DNA?
A. RNA contains uracil and deoxyribose C. RNA contains uracil and ribose
B. RNA contains ribose and thymine D. RNA contains adenine and ribose

196. How would the DNA sequence GCTATA be transcribed to mRNA?
A. GCUAUA B. CGATAT C. CGAUAU D. GCUTUT

197. In eukaryotes, functional mRNA molecules are made from
A. Exons spliced together after introns are removed C. Introns spliced together after exons are removed
B. Exons spliced together with introns D. Long pieces of RNA shortened by the Dicer enzyme

Questions 198 and 199: Use the chart below to answer the questions

First base in Code Word	Second base in Code Word: A	G	U	C	Third Base in Code Word
A	Lys	Arg	Ile	Thr	A
	Lys	Arg	Met	Thr	G
	Asn	Ser	Ile	Thr	U
	Asn	Ser	Ile	Thr	C
G	Glu	Gly	Val	Ala	A
	Glu	Gly	Val	Ala	G
	Asp	Gly	Val	Ala	U
	Asp	Gly	Val	Ala	C
U	"Stop"	'Stop'	Leu	Ser	A
	"Stop"	Trp	Leu	Ser	G
	Tyr	Cys	Phe	Ser	U
	Tyr	Cys	Phe	SEr	C
C	Gln	Arg	Leu	Pro	A
	Gln	Arg	Leu	Pro	G
	His	Arg	Leu	Pro	U
	His	Arg	Leu	Pro	C

198. Which of the following codons signifies the end of translation?
A. CAA B. UGA C. AUC D. CCA

199. Which of the chains of amino acids corresponds to the nucleotide sequence UCAAGCGUA?
A. Glu-Cys-Pro B. Glu-Asp-"Stop" C. Thr-Arg-Met D. Ser-Ser-Val

200. Promoters are: A. Genes that code for individual proteins
B, Proteins that bind with DNA and prevent transcription
C, DNA sequences near operons that regulate transcription
D, Small molecules that bind with repressor proteins

Questions 201-202: Use the table below to answer the questions

Normal chromosome

A	B	C	D	E	F	G

Mutant 1

A	C	B	D	E	F	G

Mutant 2

A	B	B	C	D	E	F	G

201. Mutant 1 is a (an): A. Deletion B. Translocation C. Inversion D. duplication
202. Mutant 2 is a (an): A. Deletion B. Translocation C. Inversion D. duplication
203. A normal diploid human zygote contains
A. 23 chromosomes B. 46 chromosomes C. 44 chromosomes D. XXY chromosomes
204. A chart that traces the inheritance of a trait in a family is called a (an)
A. Pedigree B. Karyotype C. Genome D. Autosome
205. An example of a trait that is determined by multiple alleles is
A. Cystic fibrosis B. ABO blood groups C. Down syndrome D. Colorblindness

206. A mutation involving a change in a single DNA base pair
A. Will definitely result in a genetic disease C. Will have no effect on the organism`s phenotype
B. Will produce a positive change D. May have an effect on the organism's phenotype
207. Cystic fibrosis is caused by
A. Nondisjunction of an autosome C. Nondisjunction of a sex chromosome
B. A change of three base pairs in DNA D. Deletion of an entire gene from a chromosome
208. Malaria is a disease caused by a
A. Gene mutation C. Bacterium found in water
B. Defect in red blood cells D. Parasite carried by mosquitoes

The **Human Genome Project** in its haploid form contains **three billion nucleotide bases**.
Only about 2% of our genome encodes instructions for the synthesis of proteins, and many chromosomes contain large areas with **very few genes.**
As much as **half of our genome** is made up of DNA sequences from viruses and other genetic elements within human chromosomes. During the project, investigators completed the genomes of several other organisms, including unicellular ones. They found that **more than 40% of the proteins coded** for by our genome have strong similarity to proteins in many of those organisms, including **fruit flies, worms** and **even yeast.**
The human genome Project pinpointed genes and associated particular sequences in those genes with numerous diseases and disorders. It also identified about **three million locations** where single-base DNA differences occur in humans.
This information may help us find DNA sequences associated with diabetes, cancer, and other health problems.
The Human Genome Project also transferred important new technologies to the private sector, including agriculture and medicine.

209. The human genome consists of approximately how many DNA nucleotide bases?
A. 30,000 B. 3,000,000 C. 3000,000,000 D. 3,000,000,000
210. The fraction of the human genome that actually codes for proteins is about
A. 2% B. 20% C. 98% D. 100%
211. Cutting DNA into small pieces that can be sequenced is accomplished by
A. Restriction enzymes B. DNA polymerase C. Gel electrophoresis D. RNA polymerase
212. Which of the following disorders can be observed in a human karyotype?
A. Colorblindness B. Trisomy 21 C. Cystic fibrosis D. Sickle cell disease
213. A woman is homozygous for A^{--} blood type. A man has AB^{--} blood type. What is the probability that the couple's child will have type B^{--} blood? A. 0% B. 50% C. 75% D. 100%
214. Which of the following disorders is a direct result of nondisjunction?
A. Sickle cell disease B. Turner's syndrome C. Huntington's disease D. Cystic fibrosis
215. A cystic fibrosis is a genetic disease caused by
A. Single base substitution in the gene for hemoglobin
B. Deletion of an amino acid from a chloride channel protein
C. Defective gene found on the X chromosome D. Trisomy of chromosome 21

Huntington's disease is caused by a dominant allele for a protein found in brain cells. The symptoms of the Huntington's disease, namely **mental deterioration and uncontrollable movements** usually do not appear until middle age.
The **greater the number of codon repeats**, the earlier the disease appears, and the more severe are its symptoms.
The allele for this disease contains a long string of bases in which the codon—**CAG coding for the amino acid glutamine—repeats over and over again, more than 40 times.**
Cystic fibrosis known as **CF** for short, cystic fibrosis is most common among people of European ancestry.
CF is caused by a genetic damage almost as small as the ear wax allele. Most cases result from the **deletion of just three bases in the gene** for a protein called **cystic fibrosis trans membrane conductance regulator** (**CFTR**).
CFTR normally allows chloride ions (**Cl^-**) to pass across cell membranes.
The **loss** of these bases removes a single amino acid—**phenylalanine** –from **CFTR**, causing the protein to fold improperly.
The misfolded protein is then destroyed.
With cell membranes unable to transport chlorine ions, tissues throughout the body malfunction.

If **nondisjunction occurs during meiosis**, gametes with an abnormal number of chromosomes may result, leading to disorder of chromosome numbers. For example, **if two copies of an autosomal chromosome fail** to separate during meiosis, an individual may be born with **three copies of that chromosome**. This condition is known as a **trisomy, meaning "three bodies."The most common form of trisomy,** involving three copies of **chromosome 21, Down Syndrome**, which is often characterized by mild to severe mental retardation and a high frequency of certain birth defects.
Nondisjunction of the X chromosomes can lead to a disorder known as **Turner's syndrome (X-).**
A woman with Turner's syndrome usually inherits **only one X chromosome (X-).**
In males, nondisjunction may cause **Klinefelter's syndrome** (XXY), resulting from the inheritance of an extra X chromosome, which interferes with meiosis and usually prevents this individual from reproducing.

216. The technique used to separate DNA strands of different lengths is
A. Gel electrophoresis C. Shotgun sequencing
B. Restriction enzyme digestion D. Bioinformatics
217. The study of whole genomes, including genes and their functions, is called
A. Bioinformatics B. Information science C. Life science D. Genomics
218. DNA can be cut into shorter sequences by proteins known as
A. Haplotypes B. Polymerases C. Restriction enzymes D. Restriction fragments
219. Crossing dissimilar individuals to bring together their best characteristics is called
A. Domestication B. Inbreeding C. Hybridization D. Polyploidy
220. Crossing individuals with similar characteristics so that these characteristics will appear in their offspring is called:
A. polyploidy B. inbreeding C. hybridization D. recombination
221. Taking advantages of naturally occurring variations in organisms to pass wanted traits on to future generations is called: A. selective breeding B. in breeding C. hybridization D. mutation
222. Organisms that contain genes from other organisms are called:
A. Transgenic B. mutagenic C. donors D. clones
223. When cell transformation is successful, the recombinant DNA
A. Undergoes mutation C. becomes a nucleus
B. Is treated with antibiotics D. becomes part of the transformed cell's genome
224. Bacteria often contain small circular molecules of DNA known as
A. Clone B. Chromosomes C. Plasmids D. Hybrids
225. A member of a population of genetically identical cells produced from a single cell is a
A. Clone B. Plasmid C. Mutant D. Sequence
226. Which of the following characteristics is often genetically engineered into crop plants?
A. Improved flavor B. resistance to herbicide C. Shorten ripening time D. Thicker stems

One interesting development in transgenic technology is **golden rice**. This rice contains increased amounts of vitamin A, also known as beta-carotene – a nutrient that is essential for human health. Vitamin A deficiencies produce serious medical problems, including infant blindness. There is hope that vitamin A-rich golden rice will help prevent these problems.

227. A substance that have been engineered into transgenic rice has the potential to treat
A. Cancer B. High blood pressure C. Vitamin A deficiency D. malaria
228. Physicians can screen for a genetic disorder using
A. DNA microarray B. PCR C. restriction enzyme analysis D. DNA sequencing
229. The right to profit from a genetic technology is protected by
A. Getting a copy right for the method C. Publishing its description in a journal
B. Discovering a new gene D. Obtaining a patent
230. Which of the following is most likely to be used in a court case to determine who the father of a particular child is?
A. Microarray B. DNA fingerprinting C. Gene therapy D. Genetic engineering
231. Polyploidy may instantly produce new type of organisms that are larger and stronger than their diploid relatives in:
A. Animals B. Plants C. Bacteria D. Fungi
232. Which of the following characteristics does NOT apply to a plasmid?
A. Made in DNA B. Found in bacterial cells C. Has circular loops D. found in animal cells
233. To separate DNA fragments from one another, scientists use:
A. Polymerase Chain Reaction B. DNA microarrays C. Gel electrophoresis D. Restriction enzymes
234. Restriction enzymes cut DNA molecules
A. into individual nucleotides C. at random locations
B. at short sequences specific to each type of enzyme D. into equal-sized pieces
235. The expression of thousand types of genes at one time can be followed using
A. Polymerase Chain Reaction C. plasmid transformation
B. restriction enzymes D. DNA microarrays

236. Genetically engineered crop plants can benefit farmers by
   A. reducing the amount of land that is required to grow them
   B. increasing animal's resistance to antibiotics
   C. introducing chemicals into the environment
   D. changing the genome of other crop plants
237. Genetic markers allow scientists to
   A. clone animals
   B. Synthesize antibiotics
   C. Separate strands of DNA
   D. Identify transformed cells
238. Who observed variations in the characteristics of plants and animals on different islands of the Galapagos?
   A. James Hutton B. Charles Lyell C. Charles Darwin D. Thomas Malthus
239. In addition to observing living organisms, Darwin studied the preserved remains of ancient organisms called:
   A. fossils B. adaptations C. homologies D. vestigial structures
240. Which of the following ideas proposed by Lamarck was later found to be incorrect?
   A. Acquired characteristics can be inherited
   B. Living things change over time
   C. All species are descended from other species
   D. There is a relationship between an organism and its environment
241. Which of the following would an animal breeder use to increase the number of cows that give the most milk?
   A. overproduction B. Genetic isolation C. Acquired characteristics D. artificial selection
242. An inherited characteristics that increases an organisms ability to survive and reproduce in its specific environment is called a (an): A. Vestigial structure B. Adaptation C. Speciation D. Analogous structure
243. How well an organisms survives and reproduces in its environment can be described as its:
   A. Fitness B. homologies C. Common descent D. analogies
244. Structures that have different mature forms but develop from the same embryonic tissue are called
   A. Analogous B. Adaptations C. Homologous D. Fossils
245. Intermediate fossil forms are important evidence of evolution because they show
   A. How organisms changed over time
   B. How the embryos of organisms develop
   C. How animals behaved in their environment
   D. Molecular homologies
246. Which scientist formulated the theory of evolution through natural selection?
   A. Charles Darwin C. Thomas Malthus
   B. James Hutton D. Jean-Baptiste Lamarck
247. Lamarck's ideas about evolution were wrong because he proposed that:
   A. Species change over time
   B. Acquired characteristics can be inherited
   C. Species descended from other species
   D. species are adapted to their environments

Lyell's Principles of Geology == **Lyell** argued that laws of nature are constant over time and that scientists must explain past events in terms of processes they can observe in the present. This way of thinking, called ***uniformitarianism,*** holds that the geological processes we see in action today must be the same once that shaped Earth million years ago. E.g. Ancient volcanoes released lava and gases, just as volcanoes do now.
Hutton and Lyell concluded that Earth is extremely old and that the processes that changed Earth in the past are the same processes that operate in the present.
In **1785, Hutton** presented his hypotheses about how geological processes have shaped the Earth.
Lyell, who built on the work of Hutton and others, published the first volume of his great work, **Principles of Geology,** in 1830.

248. Lyell's principles of Geology influenced Darwin because it explained
   A. Organisms change over time
   B. The surface of Earth changes over time
   C. adaptations occur
   D. The Galapagos Islands formed
249. A. farmers use of the best livestock for breeding is an example of
   A. Natural selection B. Artificial selection C. Extinction D. Adaptation
250. The ability of an individual organism to survive and reproduce in its natural environment is called
   A. Natural selection B. Evolution C. Descent with modification D. Fitness
251. Which of the following is an important concept in Darwin's theory of evolution by natural selection?
   A. Descent with modification
   B. Processes that change the surface of the Earth
   C. Homologous molecules
   D. The tendency towards perfection
252. Which of the following does NOT provide evidence for evolution?
   A. Fossil record
   B. Natural variation within a species
   C. Homologous structures of living organisms
   D. Geographical distribution of living things
253. DNA and RNA provide evidence of evolution because
   A. All organisms have nearly identical DNA and RNA
   B. No two organisms have exactly the same DNA
   C. Each RNA codon specifies just one amino acid
   D. In most organisms, codons specify the same amino acids
254. A bird's wings are homologous to a (an)
   A. Alligator's claws B. Dog's front legs C. Mosquito's wings D. Fish's tailfin

255. The large ground finch obtains food by cracking seeds. Its short, strong beak is an example of:
A. the struggle for existence B. a vestigial organ C. the tendency toward perfection D. an adaptation
256. The combined genetic information of all members of a particular population forms a
A. Gene pool B. Niche C. Phenotype D. Population
257. Mutations that improve an individual's ability to survive and reproduce are
A. Harmful B. Neutral C. Beneficial D. Chromosomal
258. Traits, such as human height, that are controlled by more than one gene are known as
A. Single-gene traits B. Polygenic traits C. Recessive traits D. Dominant traits
259. The type of selection in which individuals of average size have greater fitness than small or large individuals are called
A. Disruptive selection C. Stabilizing selection
B. Directional selection D. Neutral selection

Genetic Drift==Natural selection is not the only source of evolutionary change. In small populations, an allele can become more or less common simply by chance.

In small populations, individuals that carry a particular allele may leave more descendants than other individuals leave, just by chance. Over time, a serious of chance occurrence can cause an allele to become more or less common in a population. This kind of random change in allele frequency is called **genetic drift.**

The founder Effect== Genetic drift may also occur when a few individuals colonize a new habitat.
These founding individuals may carry alleles that differ in relative frequencies from those of the main, just by chance.
The new gene pool may therefore, start out with allele frequencies different from most of the parent gene pool.
This situation, in which allele frequencies change as a result of the migration of small group of a population, is known as the **founder effect.**

Genetic Equilibrium== If a population is not evolving, allele frequencies in its gene pool do not change, which means that the population is in **genetic equilibrium.**

Sexual Reproduction and Allele Frequency = Gene shuffling during sexual reproduction produces many gene combinations.
But a century ago, researchers realized that meiosis and fertilization, by themselves, do not change allele frequencies.
So, hypothetically, a population of sexually reproducing organisms could **remain in genetic equilibrium.**

The Hardy-Weinberg Principle == States that the allele frequencies in a population should remain constant unless one or more factors cause those frequencies to change. The Hardy-Weinberg principle makes predictions like Punnett squares—but for populations, no for individuals. Here's is how it works. Suppose that there are two alleles *A* (dominant) & *a* (recessive*)*
A cross of these alleles can produce three possible genotypes; *AA*, *Aa*, and *aa.* The frequency of genotypes in genotypes in the population can be predicted by these equations, where *p* and *q* are the frequencies of the dominant and recessive alleles.
In symbols: p2 + 2pq + q2 = 1 and
In words: (frequency of ***AA***) + Frequency of ***Aa***) + (frequency of ***aa***) = 100% and (frequency ***A***) + (frequency of ***a***) = 100%
Suppose that, in one generation, the frequency of the *A* allele is 40% ($p = 0.40$) and the frequency of the *a* is 60% ($q = 0.60$).
If population doesn't show these predicted phenotype frequencies, evolution is taking place.
The Hardy – Weinberg principle predicts that **five conditions can disturb genetic equilibrium and cause equilibrium to occur: (1) nonrandom mating; (3) immigration or emigration;**
(2) Small population size; (4) mutations; (5) natural selection

260. A random change in small population's allele frequency is known as
A. a gene pool B. gene drift C. Variation D. fitness
261. Temporal isolation occurs when two different populations
A. develop different mating behaviors C. interbreed
B. become genetically separated D. reproduce at different times
262. When two populations no longer interbreed, what is the result?
A. Gene equilibrium C. Stabilizing selection
B. Artificial selection D. Reproductive isolation

Gene Duplication== Where did the roughly 25,000 working genes in the human genome come from? Modern genes probably descended from a much smaller number of genes in the earliest life forms. But how could that have happened? One way in which new genes evolve is through the **duplication, and then modification, of existing genes.**
Gene Families = Multiple copies of a duplicated gene can turn into a group of related genes called a gene family. Members of a gene family typically produce similar, yet slightly different, proteins.

263. A group of related genes that resulted from the duplication and modification of a single gene is called a:
A. gene pool B. molecular clock C. lateral gene transfer D. gene family
264. Each "tick" of a molecular clock is an occurrence of
A. Genetic drift B. Crossing-over C. DNA mutation D. Mitosis

265. Mutations and genetic combination that occurs during sexual reproduction are both source of
A. Genetic variation B. Stabilizing selection C. genetic equilibrium D. Genetic drift
266. In a population of lizards, the smallest and largest lizards are more easily preyed upon than medium-size lizards. What kind of natural selection is MOST likely to occur in this situation?
A. Genetic drift B. Stabilizing selection C. Sexual selection D. Directional selection
267. Populations of antibiotics-resistant bacteria are the result of the process of
A. Natural selection B. temporal isolation C. Genetic drift D. Artificial selection
268. If species *A* and *B* have very similar genes and proteins, what is probably true?
A. Species *A* and *B* share a relatively recent common ancestor.
B. Species *A* evolved independently of species *B* for a long period
C. Species *A* is younger than species *B* D. Species *A* is older than species *B*
269. When two species reproduce at different times, the situation is called
A. Genetic drift B. temporal selection C. Temporal isolation D. Lateral gene transfer
270. The length of time that two taxa have been evolving respectively can be estimated using
A. Genetic drift B. Gene duplication C. A molecular clock D. Hox genes
271. The science of naming and grouping organisms is called
A. anatomy B systematics C. botany D. paleontology
272. Solely from its name, you know that *Rhizopus nigricans* must be
A. a plant B. an animal C. in the genus *Nigricans* D. in the genus Rhizopus
273. A useful classification system does NOT
A. show relationships C. use different scientific names for the same organisms
B. reveal evolutionary trends D. change the taxon of an organism based on new data
274. In Linnaeus's system of classifying organisms, orders are grouped together into the
A. Classes B. species C. families D. genera
275. The largest and most inclusive of the Linnaeus taxonomic ranks is the
A. Kingdom B. order C. phylum D. domain

Monophyletic group== is a group that consists of a single ancestral species and all its descendants and excludes any organisms that are not descended from that common ancestor.

Phylogeny == The concept of descent with modification led to the study of phylogeny—the evolutionary story of a lineage. Advances in the phylogeny, in turn, led to phylogenetic systematics.

The goal of phylogenetic systematics, or **evolutionary classification**, is **to group species into larger categories** that reflect lines of evolutionary descent, rather than overall similarities and differences.

A **clade** == is a group of species that includes a single common ancestor and all descendants of that ancestor—living and extinct.

How are clades different from Linnaean taxa? A **clade** must be a monophyletic group.

A monophyletic group includes a single common ancestor and all its descendants.

In contrast to Linnaean taxonomy, cladistics analysis focuses on certain types of characters, called **derived characters,** when assigning organisms into clades.

A **derived character** is a trait that arose in the most recent common ancestor of a particular lineage and was passed along to its descendants.

276. A group that is limited to a common ancestor and all of its descendants is called a
A. Taxon B. phylogeny C. tree of life D. monophyletic group
277. A specific trait that is used to construct a cladogram is called a
A. Structural feature B. derived character C. taxon D. clade
278. A branch of a cladogram that consists of a single common ancestor and all the descendants of that ancestor is called:
A. cladistics B. a kingdom C. a clade D. a class
279. The three domains are
A. Animalia, plantae, and Archaebacteria C. Plantae, Fungi, and Eubacteria
B. Bacteria, Archaea, and Eukarya D. Protista, Bacteria, and Animalia
280. Which of the following kingdoms includes only heterotrophs?
A. Protista B. Fungi C. Plantae D. Eubacteria
281. Which of the following is NOT a characteristic of Linnaeus's system for naming organisms?
A. Two-part name C. Multipart name describing several traits
B. Name that identifies the organisms genus D. Name that includes the organism's species identifier
282. In which of the following are the Linnaeus ranks in correct order?
A. Phylum, kingdom, species C. Kingdom, phylum, class
B. Genus, order, family D. Order, class, family
283. In the six-kingdom system of classifying living things, which kingdom contains unicellular organisms?
A. Eubacteria only C. Archaebacteria only
B. Eubacteria and "Protista" only D. Eubacteria, Archaebacteria, and Protista

284. The taxon called eukarya is a (an) A. Order B. Phylum C. Kingdom D. Domain
285. Scientists who specialize in the study of fossils are called
A. Biologists B. paleontologists C. zoologists D. geologists
286. Sedimentary rocks usually form when layers of small particles are compressed
A. in the atmosphere B. in a snow field C. in mountains D. under water
287. using C-4 to analyze rock layers
A. is a method of estimating absolute age C. is impossible because rock layers do not contain carbon
B. is a method of estimating relative age D. can only be used on extremely ancient rock layers
288. Half-life is the time required for half the atoms in a radioactive sample to
A. Decay B. double C. expand D. be created
289. According to a theory of plate tectonics
A. Earth's climate has changed many times C. Earths continents move very slowly
B. Evolution occurs at different rates D. giant asteroids crushed into Earth in the past
290. The process that produces similar looking structures in unrelated groups of organisms is
A. Adaptive radiation B. coevolution C. convergent evolution D. mass extinction
291. The general term for large-scale evolutionary changes that take place over long periods of time is called:
A. macroevolution B. coevolution C. convergent evolution D. geologic time
292. Cladograms that are based on the fossil record always show
A. Which organisms are direct ancestors of the others C. Relationships based on shared derived characteristics
B. That clades are made up only of extinct species D. Relative ages of organisms in the clade
293. Earths early environment contained little or no:
A. Water vapor B. carbon dioxide C. nitrogen D. oxygen
294. In their experiment that modeled conditions on ancient Earth, Miller and Urey used electric sparks to stimulate:
A. temperature B. sunlight C. atmospheric gases D. lighting
295. Outlines of ancient cells that are preserved well enough to identify them as prokaryotes are
A. microfossils B. heterotrophs C. autotrophs D. phototrophic
296. Useful index fossils are found
A. In a small area for a long time C. Over a large area for a short time
A. In a small area for a short time D. Over a large area for a long time
297. What happens if the rate of extinction in a clade is greater than the rate of speciation?
A. The clade will eventually become extinct C. The species in the clade become more varied
B. The clade will continue to exist D. the number of species in the clade will stay the same
298. Which of the following is evidence for the endosymbiotic theory?
A. Mitochondria and chloroplasts contain DNA similar to bacterial DNA
B. Mitochondria and chloroplasts have similar functions in the cell
C. Mitochondria and chloroplasts have no DNA of their own
D. Mitochondria and chloroplasts can live independently when removed from eukaryotic cell
299. Carbon—14 is NOT useful for dating most fossils because
A. It has a very long half-life C. It is found only in certain rock layers
B. It has a very short half-life D. Most organisms contain more potassium than carbon
300. The movement of continents has played a significant role in evolution because
A. Continents move rapidly and some organisms cannot adjust
B. Without the movement of continents, there would be no water on Earth
C. The movement of continents has caused environments to change
D. All mass extinctions are the result of continental drift
301. Carbon-14 is NOT useful for dating most fossils because
A. It has a very long half-life C. It has a very short half-life
B. Most organisms contain more potassium than carbon D. It is found only in certain rock layers
302. Particles made up of proteins, nucleic acids, and sometimes lipids that can reproduce only by infecting living cells are called: A. bacteria B. capsids C. prophages D. viruses
303. One group of viruses that contain RNA as their genetic information is the
A. Bacteriophages B. retroviruses C. capsids D. prophages
304. Prokaryotes are unlike other organisms in that their cells
A. Lack nuclei B. have organelles C. have cell walls D. lack nucleic acids
305. Prokaryotes that thrive in oxygen-free environments are called
A. Aerobes B. retroviruses C. anaerobes D. heterotrophs
306. The process of converting nitrogen into a form plants can use is known as nitrogen
A. Formation B. ammonification C. decomposition D. fixation
307. Disease-causing organisms are known as: A. cocci B. bacteria C. pathogens D. archaea
308. Which of the following characteristics is responsible for developing the germ theory of disease?
A. Ivanovski B. Beinjerinck C. Pasteur D. Darwin

309. Viruses typically cause disease by
   A. Releasing toxins C. Causing mutations in the host cell DNA
   B. Infecting and then destroying cells D. Destroying red blood cells
310. Which of the following can be helpful in treating bacterial diseases but NOT viral diseases?
   A. Vaccines B. Antibiotics C. Antiviral drugs D. Aspirin
311. A type of virus that infects bacterial cells is called a
   A. Capsid B. Prion C. Bacteriophage D. Retrovirus
312. Prokaryotic cells that have a spherical shape are called:
   A. Cocci B. methanogens C. Spirilli D. Bacilli
313. What is a capsid?
   A. Viral DNA that inserts into a hosts DNA C. A type of plant virus
   B. A protein coat surrounding a virus D. A rod-shaped bacterium
314. Which of the following is NOT used to protect food against microorganisms?
   A. Heating B, Freezing C. Sterilization D. Vaccination
315. Which illness is caused by a bacterium?
   A. AIDS B. Polio C. Diphtheria D. Common cold
316. Which process is used for the exchange of genetic information between two bacterial cells?
   A. Endospore formation B. lysogenic cycle C. Conjugation D. Binary fission
317. All bacteria are classified as: A. Eukaryotes B. Protists C. Archae D. Prokaryotes
318. Which of the following descriptions applies to most protists?
   A. Unicellular prokaryotes C. Multicellular prokaryotes
   B. Unicellular eukaryotes D. Multicellular eukaryotes
319. Fossils over 10 million years old are best dated by
   A. Carbon 14 dating B. potassium-argon dating C. Stratigraphy D. none of the above
320. Alternation of generation is the process of alternating between
   A. Mitosis and meiosis C. Male and female reproductive structures
   B. Sexual and asexual reproduction D. diploid and haploid phases
321. African sleeping sickness is caused by:
   A. Trypanosoma B. Plasmodium C. Trichonympha D. Amoeba
322. Which of the following statements about fungi is false?
   A. All fungi are unicellular C. all fungi have cell
   B. All fungi are eukaryotic D. All fungi are heterotrophic
323. A symbiotic relationship between a fungus and a green alga or a cynaobacterium is a
   A. mycorrhiza B. fruiting body C. lichen D. mushroom
324. The structures in amoeba that help the organism move and feed are the
   A. flagella B. cilia C. food vacuole D. pseudopodia
325. In protists, the process of conjugation:
   A. produces offspring that are genetically identical to the parent C. linked to photosynthesis
   B. results in an exchange of some genetic material D. decreases the genetic diversity of a population
326. Algal blooms can be caused by
   A. Paramecia B. lichens C. dinoflagellates D. *trichonympha*
327. The primary carbohydrate found in the cell walls of fungi is
   A. chitin B. actin C. cellulose D. starch

Questions 328—330

Ripe grapes are covered with a grayish film, or bloom, that contains yeasts and sometimes other microorganisms. A group of students prepared three test tubes of fresh mashed grapes. They heated two of the test tubes to boiling and then cooled them. They inoculated one of those test tubes with live yeasts, incubated all three test tubes at 30^0C for 48 hours, and then examined the test tubes for signs of fermentation—an alcohol odor and bubbles.

Their data are summarized in the table below.

Evidence of Fermentation		
Test-tube contents	Alcohol odor (yes or no)	Bubbles (yes or no)
Unheated grape mash	Yes	Yes
Boiled grape mash	No	No
Boiled grape mash inoculated with yeast	Yes	Yes

328. What is the independent variable in the students' investigation?

A. The presence of live yeast B. an odor of alcohol C. Bubbles D. Time

329. What is the dependent variable in the students' investigation?
   A. An odor of an alcohol and the presence of bubbles
   B. The presence of live yeast C. Time D. Boiling

330. What can you conclude based on the students' result?
   A. Uninoculated, boiled grape mash does not seem to ferment over a a 48-hour period
   B. Boiled grape mash that contains live yeast undergoes fermentation
   C. Grape mash does not ferment unless live yeast is added D. Both A and B are correct

331. Genetically modified bacteria are used to produce:
   A. insulin B. Antibiotics C. Human growth hormone D. all

332. Vinegar is too acidic for most micro-organisms to grow and multiply, so keeping foods in vinegar is a good way of preserving them. This method of preserving food is called:
   A. pasteurization C. pickling B. vinegaring D. acidifying

333. Sulphur is released from proteins of dead matter as: A. SO_4 B. SO_3 C. H_2S D. SH

334. Which of the following does not contain nitrogen
   A. carbohydrates B. ATP C. proteins D. RNA E. DNA

335. Which of the following diseases cannot be transmitted through sexual intercourse?
   A. Salmonellosis B. Syphilis C. Candidiasis D. Gonorrhea

336. Which of the following can be considered as a reservoir of infection?
   A. Humans and other animals B. Soil and air C. Food and water D. All of the above

337. Which of the following is NOT the result of genetic engineering in most plants?
   A. Conversion of monocots to dicots C. Resistance to herbicides
   B. Resistance to viral infections D. Resistance to rot and spoilage pests

338. Which of the following occurs in viruses?
   A. Respiration and photosynthesis C. Protein synthesis
   B. Possession of life outside living cell D. Possession of genetic material

339. HIV is an example of: A. DNA virus B. retrovirus C. Bacteriophage D. A and B

340. Which of the following is correct?
   A. HIV has spikes on its surface, the heads of which are made from the glycoprotein known as gp120
   B. gp120 binds with CD4, a protein that protrudes from various types of human cell.
   C. A gp120 sticking out of an HIV virus particle connects with a CD4 sticking out of a cell
   D. Once the virus has attached to a cell, it can go on to the next stage and merge with the host cell.
   E. All of the above

341. Which of the following is NOT the social and economic impact of AIDS?
   A. Immunity from animal diseases C. Fear of losing a job
   B. Fear of being isolated D. Shame associated with admitting to being infected

342. Which of the following is an example of protozoa?
   A. Chlamydomonas B. Lactobacillus C. Streptococcus D. Plasmodium

343. What does reverse transcriptase do?
   A. It synthesizes proteins from mRNA C. It synthesizes DNA from RNA
   B. It synthesizes tRNA from DNA D. It synthesizes RNA from DNA

344. Which of the following is the correct sequence of the stapes in the process of viral infection?
   A. Attachment→ penetration→ assembly→ release→ replication
   B. Attachment →penetration→ replication→ assembly→ release
   C. Penetration →attachment →replication →release→ assembly
   D. Assembly →replication →penetration →release→ attachment

345. Which of the following characteristics makes viruses living?
   A. Presence of nucleic acid C. They show mutability
   B. They reproduce within the host cell D. All of the above

346. Though the various types of viruses differ in many ways, all are alike in possessing:
   A. Nucleic acid B. Ribosomes C. RNA transcriptase D. Mitochondria

347. When a virus acts as a vehicle for the transfer of genes from one bacterium to another, the process is called:
   A. Transduction B. Transformation C. Transcription D. Translation

348. Biodiversity includes:
   A. The species richness and species diversity of the planet (or the local area)
   B. The ecological variability of each species
   C. The genetic variability of each species D. All of the above

349. It is vital that the government makes available as many resources as possible to help local communities particularly rural communities with:
   A. General education to enable students to consider other options in their futures.
   B. Sex education C. Access to contraception D. All of the above

350. The sheer weight of population numbers makes it much more difficult to implement
   A. education programs C. health program
   B. proper sanitation and all similar measures. D. All
351. What factor/s influence/s the size of population?
   A. Natality rate B. Migration C. Mortality rate D. All
352. Not only too little, but also an excess of environmental factors such as nutrients could negatively affect the organism's survival. This principle is referred to as:
   A. Law of Tolerance B. Law of Dependence C. Law of Obesity D. Law of Hunge

For the following four questions(Q353, Q354 & Q355, Q56) insert one of the three population phases
1. Log 2. Lag 3. Stationary 4. Decline

353. The carrying capacity is reached and the same numbers dying as are produced in reproduction:
   A. 1 B. 2 C. 3 D. 4
354. Nutrients exhausted, a new disease strikes or toxic excretory products accumulate.
   A. 1 B. 2 C. 3 D.4
355. Population establishing itself; some organisms are not adapted to the environment and die, others reproduce.
   A. 1 B. 2 C. 3 D.4
356. All are adapted and reproduce rapidly due to plentiful resources and numbers increase rapidly.
   A. 1 B. 2 C. 3 D.3
357. What is/are the reason/s for the presence of high biodiversity in Ethiopia?
   A. The wide rage in altitude and climate, C. The isolation of high lands of Ethiopia
   B. The presence of many different biomes in the country D. All of the above
358. Which of the following practices directly or indirect affect biodiversity?
   A. Overgrazing by stock animals D. Introduction of improved crop varieties
   B. High population growth E. Deforestation
   C. Introduction of alien invasive species f. All of the above
359. Fresh water biome includes
   A. Ponds, lakes, rivers and wetlands C. estuaries, ponds, lakes, and rivers
   B. Wetlands, estuaries and rivers D. pelagic zone, wetlands, and estuaries
360. Tropical rainforest is characterized by
   A. low rainfall and low temperature C. low rainfall and high temperature
   B. high rainfall and low temperature D. high rainfall and high temperature
361. terrestrial biomes are largely defined by
   A. wind and temperature C. rainfall and wind
   B. temperature and wind D. rainfall and temperature
362. Density-dependent factors include:
   A. Competition B. Disease and parasitism C. Predation D. All of the above
363. Which of the following does NOT happen due to felling (cutting) tropical forests?
   A. There is a serious reduction in species diversity.
   B. There is an increase in the rate at which carbon dioxide is removed from the atmosphere.
   C. The local and global cycling of carbon is affected. D. Many ecological niches are destroyed.
364. The guiding ideas of conservation include:
   A. Research--we must know what we are doing
   B. Minimum intervention--the balance within and between ecosystems is delicate and can easily be upset,
   C. Repair rather than replace--it is always better to try to help an ecosystem to repair any damage rather than try to replace it. D. All of the above
365. The ecological principles that form the basis of conservation of biodiversity include:
   A. Any protection of species and varieties of species will support biodiversity
   B. Maintaining habitats is fundamental to conserve species
   C. Large areas usually contain more species than smaller areas with similar habitats D. All of the above
366. Biome is a geographical or regional area with:
   A. Specific plants and animals that are adapted in similar ways to the abiotic conditions within the area
   B. Specific climate C. Specific soil type D. All of the above.
367. The existence of biomes is based on
   A. Rain fall B. Climate C. Soil type D. Hydrological conditions E. All
368.------ refers to the population role in the ecosystem.
   A. Biosphere B. Community C. Ecological niche D. biome
369. ---------is the study of how living things interact with each other and with their environment
   A. Botany B. Ecology C. Biotechnology D. Zoology
370. The part of the earth that contains life refers to as:
   A. Lithosphere B. Hydrosphere C. Biosphere D. Atmosphere

371. Ecology mostly studies those biological levels beyond the
A. organism B. Tissue C. Organ system D. Biosphere
372. Which of the following is NOT a biological factor?
A. Animals B. Decomposers C. Plants D. Climatic condition
373. Which of the following is NOT correct about plants? They are:-
A. Producers B, Heterotrophs C. Autotrophs D. First trophic level
374. Which of the following consists all the others?
A. Carnivores B. Consumers C. Herbivores D. Omnivores
375. Materials are moved in the ecosystem when organisms------.
A. feed and excrete B. respire and breathe C. die and decompose D. All the above are answer
376. ----------is the study of the single species.
A. Ecology B. synecology C. Autecology D. Psychology
377. ----------is all the individuals of a particular species in a particular habitat at a particular time.
A. Community B. Ecosystem C. Population D. Habitat
378. Energy in the ecosystem is lost in the form of
A. Light B. Heat C. Chemical energy D. potential energy
379. Which of the following is INCORRECT about ecosystem?
A. It contains both biotic and abiotic factors C. It contains plants, animals and microorganisms only
B. It is a dynamic unit D. Organisms interact with each other and with their surroundings.
380. Which of the following does NOT contain Nitrogen?
A. RNA B. Protein C. DNA D. Carbohydrate
381. Which of the following does NOT increase nitrogen in the soil environment?
A. Ammonification B. Nitrification C. Nitrogen fixation D. Denitrification
382. The suitable form of nitrogen that can be used by plants is
A. N_2 B. NO_2 C. NO_3 D. NH_3
383. An ecosystem is a natural unit in which energy flows from the source to:
A. producers B. decomposers C. consumers D. All of the above
384. Which of the following is an inorganic substance? A. Glucose B. Protein C. Water D. Lipids
385. In the ecosystem, the balance of oxygen and Carbon dioxide is kept constant by two reactions called.
A. Photosynthesis and respiration B. Digestion and absorption C. Absorption and excretion D. None
386. Which of the following is density dependent factor?
A. Water salinity and nutrients E. Atmosphere (air content, air pressure, weather system)
B. Topography (aspect, gradient) altitude. F. Edaphic (soil) factors
C. Rain and humidity G. Light (quantity, intensity and duration)
D. Temperature H. Parasitism
387. Which of the following is vital to nitrogen cycle?
A. Ammonia B. Sulphur C. Phosphorus D. Carbon dioxide
388. Which of the following decreases the amount of carbon dioxide in the ecosystem?
A. Photosynthesis B. Nitrogen fixation C. Respiration D. burning of fossils
389. Which of the following processes is NOT involved in carbon cycle?
A. Photosynthesis and respiration C. Fossilization and combustion
B. Feeding and assimilation D. Ammonification
390. The process by which decomposers decay the excretory products and detritus, releasing ammonium ions into the soil is called: A. Nitrogen production B. Ammonification C. Denitrification D. Excretion
391. Which of the following is correct about nitrogen fixing bacteria?
A. Nitrogen fixing bacteria free in the soil (belonging to genera Azetobacter and Klebsiela) reduce nitrogen gas into NH_3 in the soil.
B. Ammonium ions can be oxidized immediately into nitrates by nitrifying bacteria.
C. The extra nitrogen becomes available to other organisms when the legumes die and are decomposed.
D. Rhizobium bacteria in the root nodules of leguminous plants form ammonium ions that are passed to the legumes and used by them to synthesize amino acids. E. All are answers.
392. Which of the following is INCORECT about phosphates?
A. Over millions of years phosphate ions can leach into the seas and become part of newly forming sedimentary rocks
B. Phosphates enter the soil or water as a result of weathering of rocks and in the form of fertilizers, which, themselves contain phosphates that have been obtained from rocks.
C. The dead bodies of herbivores and carnivores are decomposed and phosphate ions are released from compounds like phospholipids, ATP, DNA, and RNA and are returned to the soil or water. D. None of the above
393. Which of the following is CORRECT about sulphur cycle?
A. Sulphate ions in the soil are taken up by plants and incorporated in plant tissues.
B. Sulphate ions from plants are passed to animals by feeding and digestion

C, On death of plants and animals, sulphur reducing bacteria release the sulphur in proteins in the form of H_2S
D. Thiobacillus (sulphur bacteria) oxidize H_2S to sulphate. E. All of the above are correct.

394. Which of the following is INCORRECT about water?
A. Used in systems called hydroponics to grow plants in soil free medium.
B. It is an essential product of photosynthesis
C. It is the basis of all transport systems in organisms D. It provides a means of removing excretory products.

395. Which of the following is INCORRECT in any succession?
A. Organisms organize and colonize an area.
B. Organisms change the abiotic (physical) conditions in an area.
C. The changed abiotic conditions allow other species to colonize the area
D, The new species compete with the ones there before and become dominant.
E, They also change the biotic conditions, more species enter and the process continues.
F, The final, most complex state of a succession is the pioneer Community

396. Which of the following is NOT advisable?
A. Reduce the genetic diversity of stock animals and crop plants by breeding only those that produces certain desired traits (lean meat, high milk yield, high grain yield).
B. Grow fast areas of cereals in monoculture D. Overfish the oceans.
C. Fell rainforest in the current manner E. All of the above

397. Which of the following trends is NOT correct in any climax community?
A. The total biomass of the community increase D. The species diversity increases
B The number of ecological niches increases E. Food webs become complex
C. The community become more dynamic and can accommodate fast changes.

398. Which of the following is correct about population?
A, Population is all the individuals of a particular species in a particular habitat at a particular time.
B, Populations are not static, like ecosystems they are constantly changing.
C, Like ecosystems, populations that are there now have not been there all the time. D. All of the above

399. Factors that could influence the type of climax community include:
A. temperature B. soil type C. soil depth D. precipitation (rain fall) E. All the above

400. Secondary successions are usually much quicker than primary successions because:
A. The succession is not starting from bare rock/open water
B. There is a seed bank of many of the climax plant types available in remain in undamaged plants.
C. The soil is already present D. All of the above

401. Which of the following is INCORRECT about the transfer of energy and nutrient in the ecosystem?
A. The pattern of energy transfer is cyclical C. The pattern of nutrient transfer is cyclical.
B. The pattern of energy transfer is uni-directional D. B and C E. A and C

402. One of the following processes does not replace carbon back to the Atmosphere
A. Combustion B. Decay C. photosynthesis D. Cellular respiration

403. What will happen if all photosynthetic plants were removed from the earth's surface?
A. Increase in the level of atmospheric CO_2 C. Increase of global warming
B. Decrease of the level of CO_2 in the atmosphere D. A and C E. B and C

404. Which of the following bacterial species involves in the conversion of nitrate back into atmospheric nitrogen?
A. Azotobzcter B. Rhizobium C. Pseudomonas D. Klebsiella

405. In exponential growth, numbers increase:
A. by the same amount in each successive time period C. by a decreasing amount in each successive time period
B. by a increasing amount in each successive time period D. none of the above

406.The type of ecological succession that occurs after fire in woodlands and forests is referred to as
A. Secondary succession B. Xerosere C.Primary succession D. Hydrosere E. A and C

407. Which of the following is the concern of biodiversity describes
A. the number of living things C. the variability of living things
B. the dynamicity of living things D. all of the above

408. The biodiversity of Africa is threatened by:
A. population pressure C. climatic changes
B. backward food production methods D. introduction of exotic species E. all of the above

409. The variety of species within a region can be measured by:
A. Species richness B. Taxonomic diversity C. Species abundance D. All of the above

410. Which one of the following factors threatens biodiversity?
A. Pollution and settlement C. Overexploitation for commercial or subsistence reasons
B. introduction of exotic species D. Eradication of species considered to be pest E. All of the above

411. The loss of biodiversity through clearing of vegetation result in
A. Salinization of soils B. Loss of the land's productivity C. Leaching of nutrients D. All of the above

412. The protection of soils by maintenance of biological diversity:
A. Reduces the productive capacity of the soil C. Prevents landslides
B. Safeguards riverbanks D. Prevents a decline in riverine fisheries E. All except A

413. Tropical rain forest is characterized by
A. low precipitation and low temperature C. low precipitation and high temperature
B. high precipitation and low temperature D. high precipitation and high temperature

414. Depending on the magnitude or degree of ecological interactions, different levels of interactions exist in the environment. Which of the following is at its highest level of complexity?
A. Population B. Ecosystem C. Community D. Individual organism

415. Light, temperature, rain fall, and wind make up:
A. Biotic factors of the environment B. Climatic factors of the environment
C. Edaphic factors of the environment D. Topographic factors of the environment

416. What does an ecosystem possess that a community does not?
A. All living things in the habitat C. Biotic components of the ecosystem
B. Non-living components of the ecosystem D. A and C E. C and D

417. A biome can best be defined as:
A. a group of ecologically similar organisms in a geographically and climatically defined region
B. a group of ecologically similar organisms in a geographically defined region
C. a geographically and climatically defined region D. a geographically defined region

418. A particular terrestrial ecosystem (biome) is characterized and recognized wherever it occurs by
A. Climate type B. Soil type C. Distinctive fauna and flora D. All of the above

419. Which of the following characterizes tropical rain forest?
A. Large areas of grasses with scattered trees C. Ever-green and broad-leaved trees
B. Trees that shed their leaves D. Trees with needle like leaves

420. The biome characterized by low rainfall and sparse vegetation cover where xerophytes like cacti and euphorbia grow is:
A. tundra B. grassland C. desert D. savanna

421. Which of the following aquatic biomes have many strata like that of equatorial rain forest?
A. Wetland B. Pelagic zone C. Estuarine D. Coral reef

422. A cross between two contrasting traits or a hybrid with one pair of heritable characters is called
A.. the test cross B. the back cross C. monohybrid cross D. dihybrid cross.

423. Mendel studied the simultaneous inheritance of two pairs of characters. He did this by crossing plants that differed in two pairs of alternative characters. Such a cross is called
A. the test cross B. the back cross C. monohybrid cross D. dihybrid cross

424. Two parents of genotype Aa are cross-bred. The alleles show complete dominance. What proportion of the offspring will genotypically look like their parents? A. 1/2 B. 3/4 C. 1/4 D. 2/3

425. A mating between two heterozygous individuals such as Bb could produce offspring of genotype.
A. homozygous dominant C. homozygous recessive
B. heterozygous D. All of the above are produced

426. As was shown by Gregor Mendel in garden pea, what percentage of the F_2 generation of a monohybrid cross has the recessive phenotype? A. 25% B. 50% C. 75% D. 80%

427. Which of the following are not contrasting pairs in Mendel's breeding experiment
A. Yellow versus round seeds C. round versus wrinkled seeds
B. Inflated versus constricted pods D. Tall versus short plants

428. From which of the following generations did Mendel formulate his principle of dominance?
A. F_1 generation C. F_2 generation B. P_1 generation D. F_3 generation

429. A cross between two individuals that differ with respect to the alleles that carry for a single locus is known as:
A. Monohybrid cross B. Dihybrid cross C. Genotypic cross D. Genotypic cross

430.A plant has a genotype AaBb. If there is no linkage of genes, the gametes it produces are
A. AB and ab B. Aa and Bb C. AA, aa, BB, and Bb D. AB, Ab, aB, and ab

431. Mendel formulated his law of independent assortment from the results of
A. his monohybrid cross C. his test cross
B. his dihybrid cross D. incomplete dominance

432. Which concept of genetics came to be known after the death of Gregore Mendel?
A. The concept of incomplete dominance C. The concept of cytological nature of chromosome
B. The concept of multiple alleles D. All of the above

433. Why did Mendel opened all his experimental flowers at their bud stage and cut their stamens?
A. To promote the flowers to self-pollinate C. To prevent the flowers from self-pollinating
B. To enable him artificially cross pollinate the plants D. B and C E. A and B

434. If two phenotypically tall plants are crossed, the first generation of plants will always be
A. All phenotypically and genotypically tall
B. All phenotypically tall C. One fourth will be short D. half will be short

435. In a certain fly species gray body (B) is dominant over black body (b). Two gray flies were mated and produce 21 gray and 7 black. The parents were probably
A. Bb and Bb B. Bb and bb C. BB and bb D. BB and BB
436. If an organism produces a certain trait consistently generation after generation, the organism is said to be:
A. True breeding B. Pure breeding C. Hybrid D. A and B E. All
437. The forms of a gene such as those controlling tallness and shortness in a pea plant (T and t) are referred to as:
A. Homologous chromosome B. sister chromatids C. Alleles D. Polymorphs E. a and B
438. The genotypes of homozygous tall and heterozygous tall plants are
A. TT or Tt B. Tall C. Short D. tt E. A and B
439. Suppose 1000 pea plants are produced from Tt and tt crosses, how many of them are expected to be tall?
A. 750 B. 500 C. 50 D. 0 E. 250
440. If a cross between two tall plants gave you only tall plants, which of the following conclusions you arrive at? (Assume tallness is dominant).
A. The two parents are pure for tallness C. Shortness is dominant over tallness
B. One of the parents were pure tall and the other is hybrid tall D. Both parents were hybrid tall E. A and B
441. Which of the following is true statement?
A. The Y chromosome carries more genes than the X chromosome
B. In order to be viable, humans must have at least one functional X-Chromosome
C. Genes in the Y chromosome direct female development
D. Human males are homogametic E. None of the above
442. Suppose a cell with 14 chromosomes divides meiotically and one of the four new cell has 6 chromatids and the other 8 chromatids. At what stage in meiosis do you conclude a mistake occurred?
A. Prophase I B. Prophase II C. Anaphase I D. Telophase I

Nondisjunction == error in meiosis in which the homologous chromosomes fail to separate properly.

443. Mesfin is left handed. His parents are both right handed. If right handedness (R) dominates over left handedness (r), what was the genotype of the parents? A. RR and Rr B. Rr and Rr C. Rr and rr D. RR E. rr
444. In humans **blue eye** color is due to a **recessive** gene (**b)** and **brown** eye color is due to a dominant gene (**B**).
If the mother is BB and the father is Bb, what proportion of their children would be expected to be the blue eyed?
A. $1/4^{th}$ B. $1/2^{th}$ C. $3/4^{th}$ D. $1/8^{th}$ E. 0
445. W/o Chaltu said her baby is exchanged with W/o Almaz's. W/o Chaltu's baby was blood type O and W/o Almaz and her husband are both AB. The baby could belong to W/o Chaltu if
A. W/o Chaltu is heterozygous B, and her husband is heterozygous A
B. W/o Chaltu is homozygous A, and her husband is homozygous O
C. W/o Chaltu is AB and her husband O
D. W/o Chaltu is O and her husband is homozygous B E. B and D.
446. A woman is married for the second time. Her first husband was blood type A, and her child by that marriage was blood type O. Her new husband is blood type B and their child is type AB. What is the woman's genotype and blood type?
A. Homozygous A B. Homozygous B C. Heterozygous A D. Heterozygous B E. B and D
447. In a certain family, the father is blood type B, his wife's blood group is unknown. They have blood group AB child. What would be the possible blood group of the wife? A. A B. O C. AB D. B E. A and C
448. Codominance differs from complete dominance in that in codominance
A. The phenotype of the heterozygotes is different from either of the homozygote parents
B. the phenotypic ratio in a cross between the two heterozygotes is 1:2:1
C. the phenotypic ratio in a cross between the two heterozygotes is 3:1 D. A and B E. B and D
449. Upon crossing two green podded pea plants Mendel obtained 428 green and 152 yellow podded plants. What are the most likely genotype of the two green plants that he crossed?
A. Gg and Gg C. gg and GG B. Gg and gg D. GG and Gg E. A and B
450. Which of the following statements concerning multiple allele inheritance is NOT true?
A. A gene has more than two alleles C. An individual will have more than two alleles of the gene
B. There are more than two alleles in the population D. The alleles may be dominant, recessive, or codominant
451. Synthesis of new DNA occurs during: A. Prophase B. Interphase C. Mitosis D. Cytokinesis
452. Mitosis differs from meiosis in that mitosis:
A. has one division per cycle C. forms no chiasmata
B. is an equational division D. occurs in body cells E. all of the above
453. For haploid cells to be formed from diploid cells, a special type of cell division that reduces the chromosome number is required. This process is known as:
A. Meiosis B. Mitosis C. Reduction division D. A and C E. All
454. Which of the following is a CORRECT match between the phase in meiosis and the event happening?
A. Anaphase II –homologous chromosomes move to opposite poles

B. Prophase I—synapsis completed and crossing over occurs D. Anaphase I –sister chromatids separate
C, After Telophase II and cytokinesis—two haploid cells formed E. A and D

455. The process of breakage and rejoining of chromosomes so that genetic material may be exchanged between homologous (non-sister) chromatids is referred to as: A. Crossing over B. Chiasmata C. Kinetochore D. Linkage

456. The basic activities occurring in meiosis are:
A. The reduction of chromosome number C. The production of genetic variation in offspring
B. The reshuffling of genes by crossing over D. All of the above

457. When two organisms heterozygous for two individual traits are mated, the offspring demonstrate a phenotypic ratio of 9: 3: 3: 1. This is due to
A. Independent assortment during meiosis C. Dependent assortment during meiosis
B. Crossing over D. B and C E. None of the above

458. The chance of crossing over occurring between two genes depends how far apart they are on the chromosome. If they are **very close together**, then
A. it is unlikely that crossing over will occur between the genes
B. it is more likely that crossing over will occur between them
C. it is likely that there will be greater chance to form tetrads D. A and C are correct

459. Eye color in the fruit fly is said to be **sex-linked.** This simply means that the gene for eye color is
A. On the Y chromosome C. On the X and Y chromosomes
B. On an autosome D. On the x chromosome E. B and D

460. Identify the correct statement from the following
A. For an X-linked trait to be expressed in a female, two recessive X-linked alleles must be present
B, A color-blind female must have a color-blind father and a mother who is at least heterozygous for color–blindness.
C. X-linked traits are generally much more common in males than in females D. All of the above

461. Crossing-over: A. Occurs between non-sister chromatids C. Results in genetic recombination
B. Occurs when chromosomes pair and undergo synapsis during meiosis D. All are correct

462. Which of the following statements is correct?
A. Gametogenesis is the process by which sex cells are formed C. Human males are heterozygotic
B. Human females are homogametic D. A and B E. All of the above

463. Which of the following statements is NOT correct?
A. Genes present on the same chromosome can assort independently of one another
B, Assortment can be independent only when genes are on separate chromosomes
C, The number of genotypes and phenotypes during dependent assortment is less than that produced during independent
D, Crossing over increases the formation of different number of gametes E. C and D

464. Genes that are inherited together on the same chromosome are called
A. Equal B. Linked C. Synaptic D. Linear E. Non-linked

465. The frequency of crossing over depends on
A. The relative distance between genes on chromosome
B. The type of cell C. Whether the gene is dominant or not D. A and B

466. Mendel did not deal with: A. Segregation B. Incomplete dominance C. Linkage D. B and C E. A and C

467. The alternative forms of a gene known as: A. Isomers B. Alleles C. Loci D. Cross over E. Factors

468. Assuming complete dominance which is greater in a hybrid cross?
A. The number of genotypes C. Both the number of genotypes and phenotypes are equal
B. The number of phenotypes D. B and C

469. In meiosis chromosomes replicate
A. During prophase and metaphase C. During interphase
B. Only once during the entire process D. A and B E. B and C

470. In humans the number of tetrads formed during meiosis is: A. 23 B. 46 C. 4 D. 36

471. Which of the following phenomena makes meiosis to differ from mitosis?
A. The occurrence of synapsis during meiosis C. The occurrence of crossing over during meiosis
B. The process of tetrad formation in meiosis D. All of the above

472. Identify the correct statement from the following
A. In DNA molecules, the sequence of bases in the two chains are complementary, but not identical
B. The information on a DNA molecule is precisely copied by a semi-conservative mechanism
D. In DNA molecules, the sequence of nucleotides in one chain dictates the complementary sequence of nucleotides in the other. D. All of the above

473. The enzyme that catalyzes the linking together of nucleotides subunits is termed as
A. DNA polymerase B, DNA helicase C, DNA ligase D. DNA synthase

DNA polymerase: is an enzyme that synthesizes DNA molecules from deoxirebonucleotides (the building blocks of DNA) . These enzymes are essential for DNA replication and usually work in pairs to create two identical DNA strands from a single original DNA molecule.
DNA polymerase plays the central role in the processes of life. It carries the weighty responsibility of

duplicating our genetic information.

Synthase and synthetase enzymes: Both help in forming chemical bonds to synthesize a new molecule in a biological system. By definition, **synthetases** must cleave (hydrolyze) an ATP molecule to function, **while synthases, do not require energy** input provided by ATP hydrolysis. Both enzymes are the class of **ligases.**

When ATP is used by a synthase enzyme it is better called **synthetase.**

Medical definition of synthetase: an enzyme that catalyzes the linking together of two molecules especially by using the energy derived from the concurrent splitting off of a pyrophosphate group from a triphosphate (as ATP)—called also ligase.

The main difference between synthase and synthetase is that Synthase is an enzyme and Synthetase is a class of enzymes which can form bonds between molecules. In biochemistry, a synthase is an enzyme that catalyzes a synthesis process. e.g. ATP synthase, Citrate synthase, Fatty acid synthase, etc.

474. Which of the following can be considered as a manager molecule in protein synthesis?
A. DNA B. RNA C. Amino acid D. All of the above

475. Which of the following holds true about genetic code?
A. Ability to represent more than one amino acid C. Most amino acids have more than one code
B. The genetic code is universal D. B and C

476. Which of the following is correct regarding the number of adenine (A), guanine (G), thymine (T), and cytosine (C) in a DNA molecule? A. G = A B. A + C = G + T C. C = T D. A + T = G + C

477. For a DNA molecule that has 100 cytosine and 50 thymine base the correct number of base pairs are
A. 100 thymine – Cytosine and 50 Adenine – GuaninE C. 100 Guanine – Cytosine and 50 Adenine – Thymine
B. 50 Guanine – Cytosine and 100 Adenine – Thymine D. A and B

478. What property of DNA molecules make them easily separated and replicated?
A. The presence of a weak hydrogen bond between the bases C. Their double helical structure
B. The fact that they are made of pentose sugar D. The fact that the deoxyribose sugar is attached to phosphate

479. When a DNA replicates the two daughters DNA contains
A. One molecule each C. One old and one new molecule each
B. Two old nucleotides each D. Two nucleotides that are new

480. The clover leaf configuration of the tRNA has at one end a triplet of base called
A. an anticodon B. a codon C. a code D. antisense

481. RNA differs from DNA in that
A. Its sugar is ribose C. It is single strand
B. It contains the base uracil instead of thymine D. All of the above

482. If the sequence of bases in one of the strands of a DNA molecule is 5^1-ATTGCGGA-3^1, the complementary strand would read
A) 5^1-TAACGCCT-3^1 B) 1^1-ATTGCGGA-3^1 C) 3^1-TAACGCCT-5^1 D) 3^1-TAAGGCCT-5^1

483. Which of the following stages is not involved in the process of protein synthesis?
A, Addition of amino acids to the forming polypeptide
B, Initiation C. Elongation D. Termination E. All are involved

484. The process of precisely copying the information in a DNA is termed as
A. DNA replication B, DNA translation C. DNA termination D, DNA transcription

485. A group of three bases in the mRNA that specifies an amino acid is termed as:
A. codon B. anticodon C. decoder D. code

486. In DNA
A. The strands must unbound during replication C. Synthesis always proceeds in 5^1 ------->3^1 direction
B. Replication is semi conservative D. All of the above

487. The genetic code is:
A. a triplet code, degenerate and overlapping C. a double code, degenerate and universal
B. a double code, degenerate and non-overlapping D. a triplet code, degenerate and universal

488. When compared protein synthesis in prokaryotic cells and eukaryotic cells it is correct to say that transcription and translation are: A. separate in both C. separate in prokaryotes and coupled in eukaryotes
B. coupled in both D. separate in eukaryotes and coupled in prokaryotes

489. DNA is considered to be the genetic material because
A. The coded instructions it contains normally remain intact from one generation to the next
B. Its ability to replicate
C. It is able to control cell's activities by directing the synthesis of proteins D. All of the above

490. Which of the following codons do not specify the synthesis of any polypeptide chain?
A) UAA, UGA, UAG B) ACC, AGC, UAG C) UCC, UAC, CCG D) CCC, UUU, UGA

491. The DNA triplet AAT would code for an amino acid carried by tRNA with the anticodon:
A) AAU B). TTA C) AAT D) UUA

492. Which of the following statement is NOT true?
A. In DNA the relative amounts of adenine, thymine, cytosine and guanine vary for a given species
B. In DNA the amount of purines equals the amount of pyrimidine
C. In DNA the amount of adenine equals the amount of thymine
B. In DNA the uprights are made up of the sugars and phosphates

493. Which of the following is NOT true?
A. There are five types of nitrogenous bases
B. Adenine and Guanine are double ringed and are called purines
C. Cytosine, Thymine and Uracil are single ringed and are called Pyrimidines
D, The number or percentage of adenine is equals to that of thymine in RNA molecule

Purines and pyrimidenes are the nitrogen-containing bases found in the nucleotides that make up DNA and RNA.
Purines have **two rings** in their structure, while pyrimidines have just one.
The two-carbon nitrogen ring bases (adenine and guanine) are purines, while the one-carbon-nitrogen ring bases (thymine and cytosine) are pyrimidines.
Purines are larger than pyrimidines because they have a two-ring structure while pyrimidines only have a single ring.

494. Which of the following statements about transcription factors is WRONG?
A. They allow the RNA polymerase to transcribe the gene
B. They promote the expression of genes D. They are necessary to activate gene
C. They deactivate the gene expression pairing E. None of the above.

495. In the Watson—Crick model of a double helix, the "rugs" of the "twisted ladder" are composed of
A. Sugars B. Two purines C. A purine and a pyrimidine D. Two pyrimidines

496. Of the following codons which one is a terminator codon?
A. UAA B. UAG C. UGA D. AUG E. All except D

497. Which of the following is NOT true about RNA?
A. is a single stranded C. is much smaller molecule than DNA molecule
B. The thymine is replaced by uracil D. The sugar in the nucleotides is deoxyribose, not ribose

498. a special form of codon that signals the RNA transcription should cbegin is termed as
A. Initiation codon B. an anticodon C. a terminator codon D. polymerase E. elongation

499. The mRNA codon for the amino acid methionine is 5^1-AUG-3^1. The DNA base sequence from where it is transcribed is----------and the tRNA anticodon is ---------- respectively.
A) 3^1-TAC--5^1, 3^1-UAC-5^1 C) 3^1—UAC--5^1, 3^1--TAC-5^1
B) 5^1-TAC--3^1, 3^1--UAC--5^1 D) 5^1—UAC--3^1, 3^1--TAC-5^1

500. As transcription occurs in the nucleus, translation takes place
A. inside ribosome B. on mRNA C. on endoplasmic reticulum D. On nuclear envelope

501. Which of the following summarizes the "flow" of information in cells?
A) DNA→ RNA→Protein B) Protein→RNA→DNA C) RNA→DNA→Protein D) DNA→Protein→RNA

502, Transcription of part of a DNA molecule with a nucleotide sequence AAACAACTT results in an mRNA molecule with the complementary sequence of:
A) GGG AGA ACC C) TTT GAA GCC B) UUU GUU GAA D) CCC ACC CTCC

503. ----------are the monomeric units of nucleic acids:
A. Nucleotides B. Purines C. Polymers D. Pyrimidines

504. Which of the following is NOT the property of a tRNA molecule?
A. It must have a specific complementary binding sequence for the correct mRNA codon
B. It must have a region that serves as the attachment site for the charged amino acid
C. It must be recognized by ribosomes D. All the above are its properties

505. During protein synthesis, where in the cell does transcription take place?
A. Ribosome B, Nucleus C. Endoplasmic reticulum D. Golgi apparatus

506. In protein synthesis, what is produced during transcription?
A. Protein B. mRNA C. DNA D. Polypeptide

507. The sequence of bases in the two chains of a DNA molecule is
A. Complementary and identical C. Complementary but not identical
B. Non-complementary but identical D. Non complementary and not identical

508. Those bacterial enzymes which are able to cut DNA molecules only at specific base sequences are termed as:
A. Restriction enzymes C. Cloning enzymes
B. Vector enzymes D. Plasmids E. DNA ligase

509. The first genetically engineered protein to be commercially produced was:
A. Human insulin produced by E. coli C. Human growth hormone
B. Human blood clotting factor D. Human females menstrual cycle controlling hormone

510. Clones are: A. Genetically identical cells C. Produced from a single parent asexually
B. Results of mitotic cell division D. All of the above

511. The organism that is utilized now in recombinant DNA technology is
A, *Escherichia coli* B. Yeast C. Human being D. *Entamoeba histolytica*
512. Recombinant DNA technique makes use of
A. Restriction and ligase enzymes C. Bacteriophages and plasmids
B. Viruses that can serve as vectors D. All of the above
513. Inbreeding may be disadvantageous in that
A. It may cause loss of vigour, size and fertility
B. It may produce some harmful traits because the recessive alleles are no longer masked
C, It promotes homozygosity, which in turn decreases diversity or genotypes D. All of the above
514. A type of gene mutation that causes the whole gene to be misread is termed as
A. Frame shift mutation B. Missense mutation C. Nonsense mutation D. Chromosomal mutation
515. Which of the following could cause point mutation?
A. Deletion B. Inversion C. Duplication D. Insertion E. All of the above
516. When we say that mutations occur spontaneously, we mean that any gene can mutate.
A. Any time for no obvious reason C. In any part of the world
B. Directed by a known mutagen D. That any gene can mutate randomly and rarely
517. Which of the following statements is NOT true?
A. Mutations can be either spontaneous or induced
B. Thomas Hunt Morgan was the first person to perform artificial chromosome mutation by radiation
C, Somatic mutations contribute toward the malfunctioning of the body and can pass onto the next generation
D, Germ cell mutations are localized to the ovaries, testes, anthers or embryo sac
518. Which of the following is a frame shift mutation
A. A. Point replacement B. Deletion C. Inversion D. Substitution
519. The increase in bacterial resistance to penicillin is due to:
A. mutation C. the increased use of penicillin
B. natural selection D. a combination of all the above
520. During gamete formation sometimes one or more pairs of homologous chromosomes fail to separate so that some gametes contain extra while others contain too few. This condition is known as
A. Epistasis B. Translocation C. Non-disjunction D. Duplication
521. One of the following is different from the rest
A. Insertion B. Translocation C. Duplication D. Point mutation
522. Which of the following statement is NOT true?
A. Deletion mutation and addition mutation are less significant than substitution mutation
B. In frame shift mutations nucleotide pairs are inserted into or deleted from the molecule
C. Translocation is a type of chromosomal mutation in which a piece of one chromosome is transferred to another non-homologous chromosome D. A. Point mutation involves a change in only one pair of nucleotide
523. Mutations are important when A. adaptive B, spontaneous C. heritable D. dominant
524. Mutations result from a change in
A. The nucleotide base pairs of the gene C. The chromosome
B. The rearrangement of genes within chromosomes D. All of the above
525. If a base pair (or pairs) is omitted from a sequence of a DNA molecule, the change is called
A. Deletion B. Insertion C. Substitution D. Translocation E. Duplication
526. Which of the following factors can make gene mutations to occur frequently?
A. X-rays, UV light B. Cyanide C. Formaldehyde, colchicine D. all of the above
527. Non-disjunctions
A. produce an offspring with an extra chromosome (n+1), (2n+1)
B. produce an offspring with a chromosome missing (n-1), (2n-1)
C. occurs when pairs of homologous chromosomes fail to separate during anaphase I of meiosis
D. is a type of chromosomal mutation E, All of the above
528. In plant hybridization experiment, which one of the following is the best way to prevent self-pollination?
A. To remove the stamens C. To cross-pollinate flowers
B. To cover flowers with bags D. To make reciprocal crosses
529. Which of the following is a right vector to transfer alien genes to bacteria through genetic engineering?
A. Plasmid B. Mosquitoes C. Snails D. Yeasts
530. Suppose in a monohybrid cross of 80 F_2 plants were produced, what is the number of the plants that are expected to have the dominant and the recessive phenotypes?
A. 70 dominant + 10 recessive C. 60 dominant + 20 recessive
B. 50 dominant + 30 recessive D. 40 dominant + 40 recessive
531. Which one of the following is the correct direction of transferring genetic information in most living things?
A. Protein–-->DNA–---->mRNA C. Protein–-->RNA---->DNA
B. DNA –---->Protein–-->tRNA D. DNA–-->RNA–-->Protein

532. If, due to incomplete dominance, the F_1 plants from a cross of red flowered with white flowered parents are pink, which of the following ratios are expected in F_2 generation?
A. 2 red: 1 pink: 1white B. 1 red: 1 pink: 1white C. 1 red: 2 pink: 1white D. 3 red: 1 pink: 1white
533. Which one of the following refers to a change in a gene?
A. Replication B. Transcription C. Mutation D. Protein synthesis
534. Among the following traits of the garden pea studied by Gregor Mendel, identify the one that did not express itself in the F_1 generation? A. Green pod color C. Round seed shape
B. Purple flower color D. Constricted pod shape
535. Regarding seed characteristics, suppose a heterozygous round yellow pea plant of RrYy genotype is self-pollinated and produced 160 seeds, how many of the seeds are expected to be round yellow?
A. 30 B. 60 C. 90 D. 105 E. 120
536. The particular experiment to find out if an organism is homozygous or heterozygous for a dominant trait is called
A. crossing over B. monohybrid cross C. the test cross D. dihybrid cross.
537. Which of the following mechanisms can separate linked genes?
A. Crossing over B. Test cross C. Segregation D. Independent assortment
538. Suppose a lost and found baby is claimed by the four families whose blood genotypes are shown below. If a baby has blood type O, which of the families is the possible parent?
A. AO and BB B. AA X OO C. AO X BO D. AB X OO E. AB X BO
539. Which of the following types of gene mutations results in a replacement of just one amino acid by another amino acid in a Protein: A. Addition of a base pair C. substitution of a base pair
B. deletion of a base pair D. duplication of a base pair
540. Color blindness is due to an X-linked recessive gene. Suppose a woman heterozygous for color blindness marries a normal visioned man what proportion of their children will be color blind?
A. All the daughters B. Half the daughters C. All the sons D. Half the sons
541. Choose the alternative that illustrates the application of genetics in forensic medicine.
A. Recombinant DNA technology B. DNA finger printing technology C. Tissue culture D. A and C
542. Short interfering RNA (SiRNA) switch off genes by
A. interfering with mRNA C. translating codons of mRNA into amino acids
B. binding with tRNA and cleave RISC D. acting on the gene itself E. All of the above
543. Two parents of genotype Aa are cross bred. The alleles do not show codominance. What proportion of the offspring will Phenotypically look like their parents? A. none B. 3/4 C. 1/4 D. 1/2
544. A woman with blood group A and a man with blood group B could potentially have offspring with which of the following blood group? (A) A (B) B (C) O (D) all blood groups
545. In an organism of genotype Aa, half the gametes carry the 'A' allele and half carry the 'a' allele. This is due to:
A. dominance B. independent assortment C. recessiveness D. segregation
546. The genotype of a homozygote could be: A. AA B. aa C. Aa D. A and B
547. A plant has a genotype AaBb. There is no linkage of the genes. The gametes it will produce are
A. AB and ab B. Aa and Bb C. AA, aa, BB and Bb D. AB, Ab, aB and ab
548. A tall pea plant with purple flowers (both determined by dominant alleles) is crossed with a short plant with white flowers. There is no linkage of the genes. If the tall, purple-flowered plant is heterozygous for both traits, the offspring will be:
A. 1 purple tall: 1 white short C. 1 purple tall: 1 purple short: 1 white tall: 1 white short
B. 9 purple tall: 3 purple short: 3 white tall: 1 white short D. 3 purple tall: 1 white short
549. Cross- breeding results in:
A. an increase in heterozygocity **B.** an increase in the number of dominant alleles **C**. hybrid vigor **D**. all of the above
550. Which of the following is true of sex-limited traits?
A. They are determined by genes on the autosomes
B. They often result in sexual dimorphism (very different physical appearance in male and female animals)
C. They are carried on the X-chromosome D. They are expressed in only one sex (male or female)
551. Ligase is an enzyme that: A. cuts DNA molecules, leaving sticky ends C. Copies DNA fragments
B. joins sticky ends of DNA fragments D. separates DNA fragments
552. The number of different types of genotypes formed when monohybrid is selfed is
A. 1 B. 2 C. 3 D, 4
553. Which of the following is the recessive character on Mendel's experiment in pea plant?

A. Green pod B. Inflated pod C.Tall stems D. Terminal flower
554. A cross between two tall pea plants gave both tall and short plants. The genotypes of the two tall plants could be:
A. TT x TT B. Tt x Tt C. Tt x TT D. tt x tt
555. The person who discovered the laws of heredity and laid the foundation of the science of genetics is
A. Gregor Mendel B. Aristotle C. Carlos Linnaeus D. William Harvey
556. Some F1 (Tt) pea plants were self-pollinated and produced 1000 seeds. If these seeds are sown how many of them are expected to produce tall plants? A. 500 B. 300 C. 750 D. 250

557. The genotype of the organism showing the dominant trait can be determined by carrying out a:
A. Dihybrid cross B. Monohybrid cross C, Trihybrid cross D. Back cross
558. 8. When the F1 hybrid of a monohybrid cross is backcrossed with homozygous recessive parent, what percentage of the offspring would be homozygous recessive? A. 50% B. 25% C. 0% C. 75%
559. In a cross between round green pea of RRyy genotype and wrinkled yellow pea of rrYY genotype, which of the following is expected in F1? A. RRyy B. rrYY C. RrYy D. RRYY
560. The number of different types of phenotypes (phenotypic classes) formed when a dihybrid is selfed is:
A. 2 B. 4 C. 9 D. 3
561. Which of the following processes represents a test cross?
A. A. Tt x tt B. TT x Tt C. Tt x Tt D. tt x tt
562. If the genotype of an organism is DdRr, the possible gametes that can be produced are:
A) DR, Dr, dR and dr B) DD, Dd, DR, and Dr C) RR, RD, Rr and Rd D) Dd, DR, dd, and Dr
563. Which type of dominance is/are involved in the human ABO blood system?
A. Incomplete dominance only C. Complete dominance and codominance
B. Codominance only D. Complete dominance only
564. A gene is a portion of: A, a protein molecule C. an RNA molecule
B, a histone molecule D. a DNA molecule
565. When individuals of genotype AaBb were crossed with individuals of genotype AaBb, 3200 offspring are produced. How many of the offspring would be expected to have aabb genotype?
A. 800 B. 600 C. 200 D. 400
566. The stage of meiosis in which crossing over occurs is:
A. First prophase B. Second prophase C, First anaphase D. Second metaphase.
567. The stage of meiosis where pairs of homologous chromosomes separate is:
A. Prophase l B. Anaphase I C. Metaphase ll D. Anaphase II

568. If a cell having 40 chromosomes enters meiosis, it will produce four daughter cells each with chromosome number of:
A. 10 B. 20 C. 15 D. 40
569. Which of the following is NOT true about meiosis
A. Meiosis is used for gamete formation C. Four gametes are produced at the end of meiosis
B. Meiosis reduces the chromosome number by half D. Meiosis produces genetically identical daughter cells
570. Which of the following is referred to as the Mendel's first Law?
A. The dominance of one allele over the other C. The equal contribution of alleles by both parents
B. The separation (segregation) of alleles during gamete formation D. The occurrence of alleles in pairs
571. Which one of the following is best expressed if two plants with flower color cross breed and produce flower color "Z" which is an intermediate of the two?
A. Incomplete dominance B. Full dominance C. Complete dominance D. Over dominance
572. The DNA of certain organism has guanine as 30 percent of its bases. What percentage of its bases would be accounted for by adenine? A. 10% B. 15% C. 30% D. 20%
573. RNA differs from DNA in that it is: Much larger B. Stable C. single stranded D. Replicates itself
574. What percentage of short plants result from a cross between hybrid tall and pure shot pea plants?
A. 50% B. 25% C. 75% D. 100%
575. The hereditary phenomenon which was not discovered by Mendel is:
A. Independent assortment of genes B. Linkage of genes Dominance of genes D. Segregation of genes
576. Which of the following parts of the DNA ladder make up the cross bars?
A. Sugars B. Acids C. phosphates D. Bases
577. Which of the following ratios are expected in the F2 generation when F1 plants are self-pollinated due to dominance in flower color of a Snapdragon plant? A. 2 red: 1 pink :1 white C. 1 red: 1 pink: 1 white
B. 1 red: 2 pink : 1 white D. 3 red: 1 pink: 1 white
578. Which of the following is NOT correct about crossing over? It:
A. Occurs when chromosomes pair and undergo synapsis during meiosis
B. Occurs between non-sister chromatids of homologous chromosomes
C. Occurs between sister chromatids D. Results in genetic recombination

Meiosis

There two kinds of cell divisions in organisms, namely mitosis and meiosis.
Mitosis:- is a type of cell division in which the daughter cells receive the same number of chromosomes as the parent cell.

- For example, the human body cells with 46 chromosomes divide by mitosis and produce two identical daughter cells each containing 46 chromosomes as the parent cells.

Meiosis:- is the process by which sex cells (gametes) are formed. Unlike mitosis, meiotic division produces sex cells that contain half as many chromosomes as the parent cell.

Chromosome Number

How many sets of genes are found in most adult organisms?

- To hold true, Mendel's principles require at least two events to occur.
- First, an organism with two parents must inherit a single copy of every gene from each parent.
- Second, when that organism produces gametes. Those two sets of genes must be separated so that each gamete contains just one set of genes.
- As it turns out, chromosomes—those strands of DNA and protein inside the cell nucleus—are the carriers of genes. The genes are located in specific positions on chromosomes.

Diploid Cells: Consider the fruit fly that Morgan used, *Drosophila.* A body cell in an adult fruit fly has 8 chromosomes.

- Four of the chromosomes come from its male parent, and four come from its female parent.
- These two sets of chromosomes are homologous, meaning that each of the four chromosomes from the male parent has a corresponding chromosome from the female parent.
- A cell that contains both sets of homologous chromosomes is said to be diploid, meaning "two sets."
- The diploid cells of most adult organisms contain two complete sts of inherited chromosomes and two complete sets of genes.
- The diploid number of chromosomes is sometimes represented by the symbol 2N.
- Thus, for Drosophila, the diploid number is 8, which can be written as 2N=8, where N represents the single set of chromosomes found in a sperm or egg cell.

Haploid Cells: Some cells contain only a single set of chromosomes, and therefore, a single set of genes.
Such cells are haploid meaning one set.

- The gametes of sexually reproducing organisms, including fruit flies and peas, are haploid. For Drosophila gametes, the haploid number is 4, which can be written as N=4.

Phases of Meiosis

What events occur during each phases of meiosis?

- How are haploid N gamete cells produced from diploid 2N cell? That's where meiosis comes in.
- Meiosis is a process in which the number of chromosomes per cell is cut in half through the separation of homologous chromosomes in a diploid cell.
- Meiosis usually involves two distinct divisions, called meiosis I and meiosis II.
- By the end of meiosis II, the diploid cell becomes four haploid cells.
- Let's see how meiosis takes place in a cell that has a diploid number of 4 (2N=4).

Meiosis I

- Just prior to meiosis I, the cell undergoes a round of chromosome replication during interphase.
- As in mitosis, each replicated chromosome consists of two identical chromatids joined at the center.

1. Prophase I

- After interphase I, the cell begins to divide, and the chromosomes pair up.
- In prophase I of meiosis, each replicated chromosome pairs with its corresponding homologous chromosomes.
- This pairing forms a structure called a **tetrad,** which contains four chromatids.
- As the homologous chromosomes form tetrads, they undergo a process called crossing over.
- First, the chromatids of the homologous chromosomes cross over one another.
- Then, the crossed section of the chromatids—which contain alleles—are exchanged.
- Crossing-over therefore produces new combinations of alleles in the cell.

1. Metaphase I and Anaphase I

- As prophase I ends, a spindle forms and attaches to each tetrad.
- During metaphase I of the meiosis, paired homologous chromosomes line up across the center of the cell.
- As the cell moves into anaphase I, the homologous pairs of chromosomes separate.
- During anaphase I, spindle fibers pull each homologous chromosome pair toward opposite ends of the cell.

2. Telophase I and Cytokinesis

- When anaphase I is complete, the separated chromosomes cluster at opposite ends of the cell.
- The next phase is telophase I, in which a nuclear membrane forms around each cluster of chromosomes.
- Cytokinesis follows telophase I, forming two new cells.

- Meiosis I results in two cells, called **daughter cells.**
- However, because each pair of homologous chromosomes was separated, neither daughter cell has the two complete sets of chromosomes that it would have in a diploid cell. Those two sets have been shuffled and sorted almost like a deck of cards. The two cells produced by meiosis I have sets of chromosomes and alleles that are different from each other and from the diploid cell that entered meiosis I.

Meiosis II

- The two cells now enter the second meiotic division. Unlike the first division, neither cell goes through a round of chromosome replication before entering meiosis II.

1. Prophase II

- As the cells enter prophase II, their chromosomes—each consisting of two chromatids—before visible.
- The chromosomes do not pair to form tetrads, because the homologous pairs were already separated during meiosis I.

2. Metaphase II, Anaphase II, Telophase II, and Cytokinesis

- During metaphase of meiosis II, chromosomes line up in the center of each cell.
- As the cell enters anaphase, the paired chromatids separate.
- The final four phases of meiosis II are similar to those in meiosis I. However, the result is four haploid daughter cells.
- Each of the four daughter cells produced in meiosis II receive two chromosomes.
- These four daughter cells now contain the haploid number (N)—just two chromosomes each.

Gametes to Zygotes

- The haploid cells produced by meiosis II are the gametes that are so important to heredity.
- In male animals, these gametes are called sperms. In some plants, pollen grains contain haploid sperm cells.
- In female animals, generally only one of the cells produced by meiosis is involved in reproduction.
- The female gamete is called an egg in animals and an egg cell in some plants.
- After it is fertilized, the egg is called a zygote.
- The zygote undergoes cell division by mitosis and eventually forms a new organism.

579. Which of the following is a CORRECT much between the phase in meiosis and the event happening?
   A. Anaphase l ---sister chromatids separate
   B. Anaphase ll-- Homologous chromosomes move to opposite poles
   C. Prophase l—synapsis completed and crossing over occurs
   D. After Telophase ll and cytokinesis—two haploid cells formed
580. Which of the following is correctly matched?
   A. Baldness –sex linked trait C. Lactation—sex-influenced
   B. Hemophilia—sex-influenced D. Red-green color blindness---sex linked
581. A haemophliac man marries a normal homozygous woman. What is the possibility that their son will be haemophiliac? A. 50% B. 0% C. 75% D. 100%
582. On chromosomes the point at which crossing over occurs is known as:
   A. Chiasmata B. centromere C. centriole D. spindle fiber
583. For red-green color blindness, B represents the allele for normal vision and b represents the allele for red-green color blindness. Which of the following does NOT match the correct possible genotypes and phenotypes
   A. X^bY –carrier male B. X^BX^b--- carrier female C. X^BY—normal male D. X^bX^b----affected female
584. Which of the following is the correct constitution of the sex chromosome of a normal woman?
   A. XY B. XXY C. XO D. XX
585. Which of the following terms refers to the failure of homologous chromosomes to separate from one another during anaphase? A. Crossing over B. Nondisjunction C. Synapsis D. Replication
586. What percentage of the F_2 progeny of a monohybrid cross is expected to have the recessive phenotype?
   A. 25% B. 50% C. 75% D. 100%
587. How many chromosomes do humans inherit from each of their parents?
   A. 23 pairs of chromosomes B. 46 chromosomes C. 23 chromosomes D. 46 pairs of chromosomes
588. The phenomena by which the progeny produces better yield than the parents is known as
   A. Dominance B. Homozygosity C. Heterozygosity D. Hybrid vigour
589. Which of the following processes restores the chromosomes number from haploid state to diploid state?
   A. Meiosis B. Fertilization C. Chromosome replication D. Mitosis
590. What is the probability of getting the gamete Ab from the genotype AaBb?
   A. 25% B. 50% C. &5% D. 100%
591. The enzyme that assembles free DNA nucleotides into a new strand of DNA is
   A, DNA helicase B. DNA ligase C. DNA polymerase D. DNA transferase
592. What can be concluded about the parents if a couple produced one normal visioned and one colorblind son?
   A. The mother is color blind but the father is normal C. The mother is color blind but the father is carrier
   B. Color blindness cannot be inherited D. The mother is carrier but the father may be either normal or color blind
593. The components of a nucleotide are
   A. Phosphate, protein and nitrogenous base C. Deoxyribose sugar and nitrogenous base
   B. Phosphate, ribose sugar and nitrogenous base D. Ribose sugar and nitrogenous base
594. The machine used to clone DNA outside a cell is
   A. Golden gun B. Paper blot C. X-ray machine D. PCR machine
595. If one side a DNA molecule contains the sequence AGTCCG, the complementary sequence on the other side would be: A. CTGAAT B. TCAGGC C. AGTCCG D. GCCTGA

596. Which of the following can be considered as a manager molecule in protein synthesis?
A. DNA B. RNA C. Amino acid D. Glucose

597. Which of the following holds true about the genetic code?
A. Ability to represent more than one amino acid C. Usability by all living things
B. Having more than one meaning D. Ability to be none universal.

598. If the sequence of bases on one of the strands of a DNA molecule is 5^1-ATTGCGGA-3^1, the complementary strand would read
A. 5^1-TAACGCCT-3^1 B) 1^1-ATTGCGGA-3^1 C) 5^1- TACCGCCT-3^1 D) 3^1-TAACGCCT-5^1

599. Which of the following stages is NOT involved in the process of protein synthesis?
A. Initiation and elongation C) Termination
B. Addition of amino acids to the forming polypeptide D) All of the above are involved

600. The process of precisely copying the information in a DNA molecule is termed as:
A. DNA replication B) DNA translation C) DNA termination D) DNA transcription

601. A group of three bases in the mRNA that specifies an amino acid is termed as:
A. a codon B. an anticodon C. a decoder D. a code

602. The conversion of genetic information into protein requires the linking together of amino acids in the correct order by peptide bonds. This is accomplished by: A. Ribosomes B. mRNA C. DNA D. tRNA

603. The molecules of DNA in prokaryotes are different from eukaryotes because they are:
A. much smaller C. not associated with histones to form chromosomes
B. circular, not linear as in eukaryotes D. All of the above

604. The combination of a 5-carbon sugar and an organic base with no attached phosphate group is called
A. nucleoside B. nucleotide C. polypeptide D. nucleosome

605. Which of the following codons do NOT specify the synthesis of any polypeptide chain?
A. UAA, UGA, UAG B) UCC, UAC, CCG C) ACC, AGC, UAG D) CCC, UUU, UGA

606. If the mRNA codon for the amino acid methionine is 5^1-AUG-3^1, then which statement is true?
A. The codon is transcribed from the DNA base sequence is 3^1-TAC-5^1
B. The tRNA anticodon is 3^1-UAC-5^1 C. The tRNA anticodon is 5^1-UAC-3^1 D. A and B

607. From the following codons which one is not a terminator codon?
A. UAA B. UAG C. UGA D. AUG

608. special form of codon that signals that RNA transcription should begin is termed as
A. Initiation codon B. Terminator codon C. Anticodon D. Elongation

609. As transcription occurs in the nucleus, translation takes place
A. inside the ribosome B.in the endoplasmic reticulum C. on mRNA D. on nuclear membrane

610. The first genetically engineered proteins to be commercially produced was
A. Human insulin produced by *Escherichia coli* (*E. coli*.) C. Human growth hormone
B. Human blood clotting factor D. Human female's menstrual cycle controlling hormone

611. Inbreeding may be disadvantageous in that:
A. It may produce some harmful traits because the recessive alleles are no longer masked
B. It promotes homozygosity, which in turn decreases diversity or genotypes
C. It may cause loss of vigor, size and fertility D. All of the above

612. The organism that is utilized now in recombinant DNA technology is
A. *Escherichia coli* B. *Endameba histolytica* C. Human being D. Yeast

613. In DNA: A. The strands must unwound during replication C. Replication is semiconservative
B. Synthesis always proceeds in a $5^1 \rightarrow 3^1$ direction D. all of the above

624. Which of the following is an example of a chromosomal mutation?

A. A base duplication B. A base insertion C. A translocation D. A base addition

614. Which of the following is a frame shift mutation?
A. Point replacement B. Inversion C. Insertion D. Substitution

615. The only source of new genetic material during evolution is
A. Mutation B. Segregation C. Crossing over D. Random assortment

616. The increase in bacterial resistance to penicillin is due to
A. mutation C. The increased use of penicillin
B. Natural selection D. A combination of all the above

617. A type of gene mutation that causes the whole gene to be misread is termed as
A. frame shift mutation C. none-sense mutation
B. mis-sense mutation D. Chromosomal mutation

618. The number of codon in the genetic code is: A. 3 B. 4 C. 20 D. 64

619. The first photoautotrophic organisms were likely to have been:
A. green algae B. sulphur bacteria C. plants D. blue green algae
620. Evolution by natural selection requires.
A. heritable genetic difference C. Differential adaptation
B. Differential reproduction D. Variation E. All of the above--
621. Some species gradually evolve into a new species without splitting into two or more species. Which mode of evolution is operating in this case? A, Allopatric speciation C. Convergent speciation
B. Sympatric speciation D. Phyletic speciation E. Divergent
622. Allopatric speciation involves:
A. a period when individuals of two populations are prevented from interbreeding
B. geographical isolation C. a period of increasing genetic diversity of two populations D. All of the above
623. In earliest fossils found in the geologic record are:
A. Protozoa B. Fungi C. Bacteria D. Angiosperms
624. On which of the following evolutionary ideas do Lamarck and Darwin fully agree?
A. Life is a result of natural process C. Acquired characteristics are inherited
B. Natural selection leads to evolution D. A and B
625. In sympatric speciation, the isolating mechanisms could be
A. Temporal B. seasonal C. behavioral D. any of the above
626. Which evolutionary evidence was very unlikely to have been used by Darwin in the formulation of the theory of evolution? A. Comparative anatomy C. Geographical distribution
B. Comparative biochemistry D. Fossils
627. Which of the following theories is most accepted by scientists?
A. Neo-Darwinism B. Darwinism C. Lamarckism D. A and B
628. The paper entitled 'philosophie zoologique' was written in 1809 by:
A. Aristotle B. Darwin C. Lamarck D. Alexander
629. According to Lamarck's theory of evolution, what is the origin of new structures that are necessary for evolution?
A. Mutation C. Gene recombination
B, Natural selection D. Use and dis-use of body parts
630. The bones in human hands, flippers of the whale and wings of the birds are known as what?
A. Homologous structures C. Analogous structures
B. Divergent selection D. Vestigial structures
631. Which kind of selection does a bell-shaped curve in a variable indicate?
A. Disruptive selection C. Stabilizing selection
B. Unidirectional selection D. Divergent selection
632. Which of the following processes of evolution best explains the phenomenon known as industrial melanism?
A. Adaptive radiation C. Stabilizing selection
B. Disruptive selection D. Directional selection
633. Animals without close evolutionary relations are sometimes seemed to have similar structures adapted for the same function. Which evolutionary principle is illustrated by this observation?
A. Convergent evolution B. sympatric evolution C. Divergent evolution D. Allopatric evolution
634. What is the reproductive isolating mechanism called if two species of frogs do not interbreed because they cannot understand the mating calls of one another?
A. Habitat isolation B. Temporal isolation C. Behavioral isolation D. Seasonal isolation
635. What percentage of the amount of carbon 14 originally present in a fossil would be left after its second half life?
A. 75% B. 50% C. 25% D. 12.5% E. 6.25%
636. According to the theory of evolution as proposed by Charles Darwin, which one of the following is the most important driving force of evolution?
A. Mutation C. Over-reproduction B. Genetic recombination D. Natural selection
637. Directional selection:
A. Operates in response to gradual change in environmental conditions
B. Favors one extreme phenotype from the population
C. Reduces variation D. Leads to a shift in the population mean for the selected character E All of the above
638. Divergent evolution is an alternative name for:
A. allopatric speciation B. adaptive radiation C. Sympatric speciation D. disruptive selection
639. To which genus of human like organism does Lucy belong?
A. The genus *Australopithecus* B. The genus *Homo* C. The genus *Ardipithecus* D. None of the above
640. Which of the following features is more characteristic of human than of apes?
A. Large supraorbital ridges B. Opposable big toe C. Small canines D. A and B
641. Which of the following is considered as "handy man"?
A. *Homo habilis* C. *Australopithecus anamensis*

B. *Ardipithecus ramidus* D. *Australopithecus afarensis*

642. The first hominid to have enough human features to be placed in the same genus as modern humans is:
A. *Homo erectus* B. *Homo sapiens* C. *Homo habilis* -- D. *Homo afarensis*

643. The hominoids (Great apes) in the lineage that led to humans are: :
A. Australopithecus B. Hominine C. Afarensis D. Prosimians

644. *Homo habilis*
A. Is the first hominid to have enough human features?
B. Had a large cranial capacity
. C. Was the first to consciously design tools D. All of the above--

645. The story of modern human over the past 200,000 years involves two main species in the genus homo are:
A. *Homo neanderthalensis* and *Homo sapiens* *C. Homo eructus* and *homo sapiens*
B. *homo habilis* and *Homo sapiens* *D. Homo antecessor* and *Homo sapiens*

646. The first hominid to have enough human features to be placed in the same genus as modern humans is:
A. *Homo erectus* B. *Homo habilis* C. *Homo neanderthalensis* D. *Homo rudolfensis*

647. One of the most significant features of primates is that:
A. The have five digits on their hands and feet C. They have an opposable thumb
B. Their eye is located in front of the head D. All of the above

648. In convergent evolution
A. Populations of the same species become increasingly different
B. Species in the same environment have evolved in similar ways
C. Two species look very much alike and are adapted to similar evolutionary conditions, but they are evolutionary unrelated D. A and B

649. If two species look very much alike and adapted to similar environmental conditions, but are evolutionary unrelated, the type of their evolution is referred to as:
A. Parallel evolution B. Divergent evolution C. Convergent evolution D, Sympatric evolution

650. An individual that possesses multiple sets of chromosomes, in which one or more of those sets came from a different species is known as: A. Polyploid B. Cladogenetic C. Anagenetic D. Trisomic

651. The most important method of speciation in animal evolution is
A. Polyploidy B. Allopatric speciation .C. Sympatric evolution D. Ecological isolation

652. When two closely related species that are found in the same geographical range reproduce at different times of the year, this is known as:
A. Temporal isolation C. ecological isolation C. behavioral isolation D. hybrid inevitability

653. What does an etiologist study?
A. Insect diet B. Soil type C. Fossil fuel D. Animal behavior

654. Which one of the following behavioral biologists is known for his study about imprinting behavior in animals?
A. W. Kohler B. B.F. Skinner C. Ivan Pavlov D. Konrad Lorenz

655. Baby ostriches tend to follow the first moving object that they see as they hatch out of the eggs. What kind of animal behavior does this demonstrate?
A. Positive taxis B. Positive kinesis C. Innate behavior D. Learned behavior

656. Behavior that is repeated on a daily basis is referred to as
A. Lunar B. Circadian C. Imprinting D. Seasonal

657. Innate behavior involving a set of complicated responses to a stimulus or stimuli is called
A. Imprinting B. Instinct C. Conditioning D. Operant

658. An experimental animal stopped responding to a stimulus that has been repeated to many times. What type of learned behavior is this (2006 E.C)?
A. Latent learning B. Imprinting C. Habituation D. Operant conditioning

659. Choose the one that had the LEAST contribution to human evolution (2008 E.C)?
A. Development of bipedalism C. Attaining opposable thumb
B. Adaptation to flight D. Increasing brain size

660. Which of the following component is NOT needed for behavior of an organism?
A. A receptor C. Well-developed nervous system
B. An effector D. None of the above

661. A mouse is more active during certain times of the night. The behavior involves
A. Reflex B. A biological clock C. Learning D. None of the above

662. Which of the following involves trial and error learning (2008 E.C)?
A. Operant conditioning B. Sensitization C. Habituation D. Classical conditioning
663. Which of the following is a learned behavior (2008E.C)?
A. Suckling of the new born at mothers breast C. Salivation by conditioned dogs at the sound of a bell
B. Withdrawal of hands suddenly from hot objects D. Blinking the eyes when something gets into them
664. Which of the following is an example of an orientational innate behavior
A. Kinesis in woodlice C. Sudden withdrawal of limbs from hot object
B. Blinking of the eyes D. Nest Building by weaver birds
665. Which of the following is necessary for learning to occur?
A. Punishment B. Reward C. Motivation D. All of the above--
666. In Pavlov's experiment on the classical conditioning of dogs, what does the reaction to the sound of the bell represent (2007E.C)? A. The conditioned stimulus C. The unconditioned stimulus
B, The conditioned response D. The unconditioned response
667. Suppose when you first enter a room you notice an unpleasant smell which you eventually forget about its presence, what is this behavior called (2007 E.C)?
A. Latent B. Insight learning C. Habituation D. Operant conditioning
668. The unicellular organism, Euglena, swims using its flagellum towards areas of increased light intensity. What is the kind of response to stimulus called?
A. Positive phototaxis B. Negative phototaxis C. Positive kinesis D. Negative kinesis
669. Which of the following is true about an innate behavior (2003 E. C)?
A. It is non-adaptive behavior C. It is learned behavior
B. Members of a species behave similarly D. It is environmentally determined
670. Which one of the following do bees use to inform other bees about the location and distance of a new source of nectar they discover? A. Pheromones B. waggle dance C. Buzzing noise D. vibration of wings
671. The modification of behavior as the result of experience is called
A. Sensitization B. Innate C. Learning-- D. Instinct
672. In which of the activities of the honey bee colony are worker bees involved (2006 E.C)?
A. Laying eggs B. Reproductive functions C. Serving as queens D. Taking care of the larva
673. Which one of the following do bees use to inform other bees about the location and distance of new nectar discover?
A. Pheromones B. Buzzing noise C. Waggle dance D. Vibration of wings
674. Which of the following is NOT classified as a learned behavior (2005 E.C)?
A. Insight B. Innate C. Latent D. Conditioned
675. Which of the following scientists was credited for his experiment on trial and error?
A. Pasteur B. Pavlov C. Skinner-- D. Rudolf Virchow
676. What do we call the learned behavior in a mouse that had just escaped from the mouth of a cat jumped violently at a sight touch by a trivial object (2005 E.C)?
A. Latent learning B. Conditioning C. Sensitization D. Imprinting
677. In the classical conditioning experiment performed by Pavlov on dogs, which of the following alternatives is the unconditioned stimulus?
A. The salivation of at the sound of the bell C. The salivation at the smell of food
B, The sound of the bell D. The smell of the food—
678. To what kind of animal behavior can a spinning of a web by spider be classified (2005 E.C)?
A. Learned behavior C, Experimental behavior
B. Instinctive behavior D. Accidental behavior
679. In the classical conditioning experiment performed by Pavlov on dogs, which of the following alternatives is the unconditioned stimulus (2004E.C)?
A. The sound of the bell C. The salivation at the sound of the bell
B, The smell of the food D. he salivation at the smell of food
680. Which of the following types of movements in response to a stimulus has no specific direction (200E.C)?
A. Taxis B. Kinesis C. Gravitropism D. Phototropism

681. What do you call the learned behavior if the mouse that had escaped from the mouth of a cat jumped at a slight touch by a trivial object? A. Imprinting C. Latent learning
B. Sensitization D. Classical conditioning
682. What is the role of the worker honey bee just after it emerges (2003 E.C)?
A. Forage for nectar, pollen and water C. Guard the hive
B. Clean out dirt honeycomb D. Build the honey comb
683. During seasons of reproduction, the males of some species of birds produce colorful feathers to attract females. What do etiologists call this method of communication in animals (2004 E.C)?
A. Visual B. Chemical C. Auditory D. Touch
684. Why is it that the wood lice are typically found under logs, stones, bark and amongst leaf litters (2004E.C)?
A. To be sheltered in a dry windy environment
B. To run away from the area where the air is humid
C. To make sure that they are in the hottest place all the time
D. To reduce the rate at which water is lost from their bodies
685. Wood lice increase their movement in different directions in response to increased light intensity. This is an example of which of the following (2003E.C)?
A. Positive taxis B. Kinesis C. Negative taxis D. Phototropism
686. An experimental animal stopped responding to a stimulus that has been repeated so many times. What type of learned behavior is this?
A. Operant conditioning B. Imprinting C. Habituation D. Latent learning
687. It said that a goat mother accepts and nurses as her own kid any young that she smells at a certain critical period, and rejects all others. This is an example of (2003E.C) ;
A. Habituation B. Insight learning C. Imprinting D. Sensitization
688. Among the following, which one is learned behavior (2003 E.C)?
A. Reflex action C. Imprinting C. Habituation D. Fixed action pattern
689. Instinctive behavior A. Does not require learning C. Occurs instantly the first time it is needed
B, Is sometimes alterable by experiences D. All of the above
690. In Pavlov's classical conditioning experiment on dogs, which one of the following is the unconditioned response (2003)
A. The sound of the bell before presenting food C. The site of food from far away
B. The salivation of the dog at the site of food D. The salivation of the dog at the sound of the bell
691. Which type of animal behavior happens without learning (2009 E.C.)?
A. Innate D. Latent C. Insight D. Conditioned
692. The form of learning where an animal performs a task without reward is called
A. Associative B. Latent-- C. Insight D. Imprinting
693. Which of the following activities of an organism do we call a behavior (2009 E.C.)?
A. Reception of external stimuli C. Responding to stimulus
B. Reception of internal stimuli D. Lack of receptors to receive stimuli
694. Classical conditioning is different from operant conditioning in that:
A. Operant conditioning includes rewards whereas classical conditioning does not
B. Classical conditioning includes rewards whereas operant conditioning does not
C. In classical conditioning the experimental animals are dogs whereas in operant conditioning rats are used D. The experiments are the same but the scientists are different
695. A reflex action that involves internal organs such as the heart is referred to as (2009 E.C.)?
A. Somatic reflex B. External reflex C. Spinal cord reflex D. Autonomic reflex
696. Which of the following organs serve as a coordinating system in the reflex action (2009 E.C.)?
A. Spinal cord B. Sense organs C. Nerve cells D. Muscle
697. To which category of behavior does the human behavior that involves the strengthening of existing responses or the formation of new responses to existing stimuli that occur because of practice or repetition belong (2009 E.C.)?
A. Learned behavior B. Innate behavior C. Instinctive behavior D. Inborn behavior
698. Which of the following is NOT grouped under genetically pre-programmed pattern of behavior (2009 E.C.)?
A. Reflex action in humans C. Orientational behavior
B. Conditioned behavior D. Instinctive behavior

699. The first photo-autotrophic organisms were likely to have been:
A. green algae B. sulfur bacteria C. plants D. blue green algae

700. All forms of the cosmozoan (panspermia) theory suggest that:
A. Organic molecules arrived on Earth in meteorites
B. Other celestial bodies have been important in the origin of life on Earth.
C. Life forms arrived on Earth from other celestial bodies D. Life forms arrived on Earth due to radiation pressure

701. From the time when oxygen was first produced on the planet, it took approximately how many years for the levels to begin to rise? A. 1 billion B. 0.1 billion C. 2 billion D. 0.6 billion

702. The eternity of life theory suggests that:
A. all life forms are eternal C. life will go on forever
B. life has always existed and always will D. all of the above

703. The scientists who developed the theory of abiogenesis were
A. Miller and Bernal B. Miller and Oparin C. Bernal and Haldane D. Oparin and Haldane

704. In the process of evolution of life on earth, which of the following four processes evolved at last?
A. Aerobic respiration B. Anaerobic respiration C. Chemosynthesis D. Photosynthesis

705. Which of the following are the first autotrophic organisms in the evolution of living things?
A. Cyanobacteria B. Sulphur bacteria C. Blue green algae D. Green algae

Cyanobacteria (blue green algae) are the first **photo-autotrophs.**
Archaebacteria such as **sulphur bacteria** are the **first autotrophs** but **not photosynthetic,** rather **chemosynthetic.**

706. The idea that the earth and organisms were created at some specific time and stayed unchanged was challenged for the first time by: A. Charles Darwin B. George Buffon C. George Mendel D. Jean-Baptiste Lamarck

707. According to the theory of evolution as proposed by Charles Darwin, which one of the following is the most important driving force of evolution? A. Over-reproduction C. Mutation B. Genetic recombination D. Natural selection

708. Which of the following is consistent with the concept of the gene pool?
A. Species with large gene pool have low potential of adaptation
B. Endangered species usually have small gene pool
C. Large gene pool is a hindrance for live stock improvement
D. Species with large gene pool are prone to disease

709. A genetic change in population that passes on through successive generation is known as
A. Mutation B. Evolution C. Adaptation D. Selection

- *To accept or reject hypothesis we have to test it with experiment*
- *Hypothesis supported by the experiment develop to theory*

710. In the scientific method which one of the following is used to test a hypothesis (2004)?
A. Testing hypothesis C. Making observations
B. Conducting experiments D. Drawing conclusions

- Observation–> Hypothesis–>Experimentation–>Conclusion

711. Which tool of the biologist is suitable for culturing bacteria in the laboratory (2004)?
A. Test tubes B. Petridish C. Microscope D. Beakers

- *Test tube—too take sample, to see chemical reaction*
- *Microscope---magnify and resolve specimen*
- *Beakers—to measure volume, for water bath (to boil test tube in water bath)*

712. Which of the following laboratory equipment is used to separate the organelles of the cell according to their density (2004)? A. Incubator B. Measuring cylinder C. Centrifuge D. Filter paper with fine pores

- Spinning centrifuge at lower speed, large sized (more dense) material such as the nucleus settle out first. As speed increases, chloroplasts, mitochondria and ribosome separate respectively.

713. Which of the following is NOT in agreement with the scientific method (2004)?
A. Putting forward testable hypothesis C. Carrying out experiments in duplicates
B. Putting forward personal value judgment D. Analyzing results and drawing conclusions

714. Which of the following steps in the scientific method comes following observation (2005)?
A. Prediction B. Experiment C. Hypothesis D. Theory

Scientific method is a process in which scientists can approach to their work. This scientific method consists of several steps. These are:

- *Asking questions about the problem*
- *Observation/doing the background research*
- *Construct the hypothesis and can make prediction*
- *Experiment to test the hypothesis*
- *Drawing the conclusion*
- *Making the theory*

In science the word theory applies to a well-tested explanation that unifies a broad range of observations and hypotheses and that enables scientists to make accurate predictions about new situations. Scientific theory describes a well-tested explanation for a range of phenomena.

715. If after dividing plant materials into two groups, an experimenter has applied a fertilizer to group A plants and NOT to group B plants. What are group B plants (2003)?
A. Control group B. Experimental group C. Test group D. Variable group

- The independent variable for the experiment is the fertilizer
- The dependent variable for the experiment is growth of plants
- The controlled group---the group that do not receive the independent variable (the fertilizer)
- The experimental group----the group that receives the dependent variable

716. A field biologist who studies the behavior of primates in the forest is most likely expected to frequently use which method data collection (2003 E.C.)
A. Experiment B. Comparative biochemistry C. Animal dissection D. Observation

717. Data that are quantitative are always
A. Described in words C. Recorded on a tape recorder
B. Represented by numbers D. Seen through a microscope

718. In an experiment that is testing the effect of temperature on the germination rate of certain seeds, in which one of the following should the experimental and the control groups differ (2004)?
A. The amount of water they receive C. The age of the seeds assigned to them
B. The number of the seeds assigned to them D. The temperature at which they are kept

- Group that receives independent variable (the temperature) is the experimental group
- Control group---does not receive IV, used for comparison

719. In an experiment assigned to test the effect of different concentrations of a fertilizer on the growth rate of a plant, which one of the following is the dependent variable (2004 E. C)?
A. The growth rate of the plant C. Plants assigned to the control group
B. Concentrations of the fertilizer applied D. Plants assigned to the experimental group

720. Which of the following field equipment is used to determine an exact location of a plant (2005)?
A. Theodolite B. Global positioning system C. Field pH kit D. Field microscope

721. What is the specialist in biology called if he/she studies fossils (2005 E.C.)?
A. Geneticist B. Ecologist C. Paleontologist D. Comparative biochemist

722. Which of the following are all the tools mainly used in the laboratory rather than in field situation (2007 E.C.)?
A. Centrifuges, microscopes, measuring cylinders, petri-dish
B. Flow meter, centrifuges, theodolites, microscopes
C. Centrifuges, plant presses, flow meters, microscopes
D. Theodolites, petri-dishes, GPS receiver, measuring cylinders

723. For which of the following is the theodolite used in biology education (2005 E.C.)?
A. Measuring the height of trees C. Recording position where the species is found
B. Measuring the rate of the flow of water in a cell D. Measuring the pH of the water or soil

724. In one of his experiments on micro-organisms, Fleming found green fuzzy spots forming clear area on the plate that was free of microorganisms. This is a good example of
A. interpretation B. reasoning C. an observation D. hypothesis formation
725. What does an ornithologist study (2003 E.C.)?
A. The study of mammals C. The biology of frogs and reptiles
B. The biology of fishes D. The biology of birds
726. While conducting research, which of the following should a biologist do first (2006 E.C.)?
A. Generate hypothesis C. Communicate the results
B. Conducts experiments D. Identify a research question/ problem
727. In scientific method, what is the importance of a background research for a given problem (2007 E.C.)?
A. To formulate a hypothesis C. To make a prediction
B, To prepare report of the result D. To make a conclusion

728. If a hypothesis is NOT supported a scientist should
A. Give up B. Form a new hypothesis C. Change the data D. Change the results
729. Suppose in an experiment conducted to test a new drug, 20 people were given the drug and 20 people a placebo, what is the control of the experiment (2006 E.C.)?
A. People who received the placebo C. The new drug itself
B. People who received the new drug D. The new drug and the placebo
730. Which of the following step of the scientific method comes before all the rest (2007 E.C.)?
A. Hypothesis B. Experiment C. Conclusion D. Reporting the result
731. What do we call a scientist who specializes in studying insects (2007 E.C.)?
A. An ecologist B. An entomologist C. A paleontologist D. A microbiologist
732. A hypothesis is a statement that
A. is always true B. is identical to the theory C. is usually true D. can be tested
733. Choose the steps that comes at the last step in the scientific method
A. Proposing the research hypothesis C. Conducting experiments
B. Formulation of a scientific theory D. Making predictions
734. Which tool of the biologist is more suitable for culturing bacteria (2004 E.C.)?
A. Test tubes B. Microscopes C. Petri-dishes D. Beaker
735. To test the effect of a certain vitamin on dogs, which group gets the vitamins?
A. Experimental B. Both C. Neither D. Control
736. Which tool of the biologist is more frequently used to study cell structures in the laboratory (2007E.C.)?
A. Dissecting kit B. Centrifuge C. Petri-dish D. Microscope
737. Which one of the following parts of the cell can one easily see with the light microscope?
A. Lysosomes B. Mitochondria C. Nucleus D. Golgi apparatus
738. For what purpose do biologists use the GPS receiver (2007 E.C.)?
A. To produce area maps C. To estimate tree ages
B. To measure tree heights D. To count tree rings
739. What is the ultimate source of all scientific knowledge (2007 E.C.)?
A. Observation C. Guessing
B. Trial and error D. Observation and experimentation
740. Which of the following corresponds to the beginning steps of scientific work (2004 E.C.)?
A. Testing hypothesis C. Conducting experiments
B. Making observations D. Drawing conclusions
741. In which of the following are all the tools mainly used in the laboratory rather than in the field situation (2007 E. C
A. Centrifuges, microscopes, measuring cylinders, petri-dishes
B. Centrifuges, plant presses, flow meters, microscopes
C. Centrifuges, plant presses, flow meters, microscopes
D. Theodolites, petri-dishes, GPS receivers, measuring cylinders
742. Which of the following events happened before all the others (2007 E.C.)?
A. The cell theory was proposed C. The protozoa were discovered
B. The compound microscope was invented D. The structure of DNA was discovered

743. To which major area of relevance and applications of biology is the production of transgenic organisms related (2004 E.C.)? A. Agriculture B. Biotechnology C. Environment D. Medicine
744. The word science comes from the Latin word 'Scientia' means what (2009 E.C.)?
A. Study B. Life C. Experiment D. Knowledge
745. Which of the following laboratory tools is LEAST accurate to measure 1 ml of liquid (2009 E.C.)?
A, Pipette B. Burette C. Measuring cylinder D. Beaker
746. Which of the following has the highest risk of HIV transmission (2009 E.C.)?
A. Hand shaking B. Towel sharing C. Needle sharing D. Toilet sharing
747. Which of the following human cell types is attacked by HIV(2009 E.C.)?
A. Red blood cells B. T-lymphocytes C. White blood cells D. Leukocytes
748. Who was the person that first observed living cells moving around when he examined drops of water under the microscope (2008 E.C.)? A. Robert Brown C. Anton Van Leeuwenhoek
B, Robert Hooke D. Theodor Schwann
749. A cell was examined under a compound light microscope with an eye piece lens marked 13x and an objective lens marked 40x. How many times larger would the cell appear to the viewer (2004 E.C.)?
A. 40x B. 53x C. 400x D. 520x
750. Which of the following is true about the antiretroviral drugs currently used to treat AIDS patients (2004 E.C.)?
A. They cure AIDS C. They serve as anti-HIV vaccine
B, They stop HIV transmission D. They slow down HIV multiplication
751. Which one of the following cellular forms did Robert Hooke observe under his crude microscope (2006 E.C.)? A. Bacteria B. Protozoa C. Yeast D. Empty cell wall
752. Which of the following is true about those bacteria which dwell in hot springs (2003)?
A. They use non-protein enzyme C. They get energy of activation from the spring heat
B. Their enzymes do not denature at that temperature D. They are not metabolically active
753. What is the term used to express the ability of a microscope to show details clearly (2003 E.C.)?
A. Enlargement B. Reduction C. Magnification D. Resolution
754. Which of the following properties of water makes sweat an effective body cooler?
A. Its high specific heat C. Its low density when frozen
B. Its high surface tension D. Its high latent heat of vaporization
755. Which of the following is different from the other three (2009 E.C.)?
A. Starch B. Cellulose C. Glycogen D. Maltose
756. How are unsaturated fats distinguished?
A. They are made up of glucose and fructose C. They have only singe bonds at the points of attachment
B. They have double bonds in their carbon atoms D. They are solid at room temperature
757. Which of the following elements is the most abundant in living things (2009 E.C.)?
A. Nitrogen B. Carbon C. Hydrogen D. Oxygen
758. Among the following organic molecules, identify the one that does not contain nitrogen (2009 E.C.).
A. Starch B. Protein C. DNA D. RNA
759. How many hydrogen and oxygen atoms are there in a disaccharide molecule?
A. 24 and 12 B. 22 and 11 C. 2 and 6 D. 6 and 3
760. Which of the following alternatives contains ONLY organic molecules (2009 E.C.)?
A. Calcium carbonate, glucose, methane C. Carbon dioxide, sodium chloride, lysine
B. Linoleic acid, glycine, methane D. Water, carbon dioxide, calcium carbonate
761. Which test is suitable for checking the presence of lipids in food staffs (2009 E.C.)?
A. Biuret test B. Emulsion test C. Benedict's test D. Iodine test
762. Which alternative currently matches the polymer with its monomer (2003 E.C.)?
A. Carbohydrate—amino acid C. Protein—monosaccharide
B. Nucleic acid—nucleotide D. Lipid—fat
763. All the following carbohydrates are polysaccharides EXCEPT which (2003 E.C.)?
A. Glucose B. Cellulose C. Starch D. Glycogen
764. Which of the following carbohydrates is highly branched in its structure?
A. Sucrose B. Starch C. Glycogen D. Glucose
765. Which of the following sugars do babies get from the milk of their mother (2003 E.C)?
A. Maltose B. Sucrose C. Lactose D. Fructose

766. Which of the following is true about the substance represented by the chemical formula "$C_2H_5NO_2$"?
A. Fatty acid B. Amino acid C. Simple sugar D. Inorganic substance
767. Which of the following classes of fatty acids is without carbon—carbon double bond (2007 E.C)?
A. Monounsaturated fatty acids C. Saturated fatty acids
B. Unsaturated fatty acids D. Poly unsaturated fatty acids
768. Which of the following pairs of elements are found in all carbohydrates in addition to the element carbon (2004)?
A. Nitrogen and oxygen C. Hydrogen and nitrogen
B. Hydrogen and oxygen D. Phosphorus and nitrogen
769. Which one of the following contains phosphate group in its molecule?
A. Simple sugar B. Cellulose C. Nucleotide D. Protein
770. How many carbon atoms are contained in a single molecule of sucrose (2004 E.C.)?
A. 6 B. 12 C. 24 D. 48
771. Which energy-rich organic compound contains adenine in its molecule (2005 E.C.)?
A. Lipids B. Glucose C. Carbohydrates D. ATP
772. Which of the following is NOT one of the four most common elements?
A. Sulphur B. Nitrogen C. Hydrogen D. Carbon
773. All proteins contain carbon, hydrogen, oxygen and what other elements (2005 E.C.)?
A. Chlorine B. Flourine C. Nitrogen D. Sulphur
774. What makes unsaturated fatty acids different from saturated fatty acids (2005E.C)?
A. The presence of long chain of carbon C. The presence of one or more double bond
B. The presence of large number of hydrogen atoms D. Their occurrence as solid at room temperature
775. Which property of water keeps lake-inhabiting organism from freezing in winter in cold regions?
A. High heat of fusion C. Low density of the solid state
B. High surface tension D. High latent heat of vaporization
776. What is the name of the sugar found in milk (2005 E.)?
A. Glucose B. Lactose C. Maltose D. Sucrose
777. A combination of two or more atoms joined by covalent bonds is called a(an)
A. acid B. solution C. molecule D. isomer
778. Which of the following is NOT a structural polysaccharide?
A. Cellulose B. Chitin C. Murein D. Ribose
779. In which of the following compounds are both members of the pair are polymers of carbohydrates that naturally occur in plants (2005E.C.)?
A. Starch and chitin B. Glycogen and cellulose C. Starch and cellulose D. Glycogen and chitin
780. The main component of the plant cell wall is (2005 E. C)?
A. Starch B. Cellulose C. Protein D. Chitin
781. Which level of a protein structural organization is represented by its amino acids sequence?
A. Quaternary structure B. Tertiary structure C. Primary structure D. Secondary structure
782. Two monosaccharides are bonded together by
A. Ketone group B. Removal of water C. Glycosidic bond D. Alcohol group
783. Which of the following is true about saturated fatty acids (2006 E.C.)?.
A. They have single bonds between carbon atoms
B. They are the same as polyunsaturated fatty acids
C. They are the same as monounsaturated fatty acids
D. They have double bonds between the carbon atoms
784. Choose the one that represents a chemical formula of an organic compound (2006 E.C.)?
A. $C_{12}H_{22}O_{11}$ B. $mg(OH)_2$ C. NH_3 D. NaCl
785. Which of the following is produced when a lipid molecule is hydrolyzed (2006 E.C.)?
A. Amino acid and water C. Fatty acids and glycerol
B. Amino acid and glucose D. Glucose and glycerol
786. A carbohydrate compound is known to have 12 carbon atoms in the whole molecule. What could this compound be (2007 E.C.)?
A. A polypeptide B. A monosaccharide C, A disaccharide D. A polysaccharide

787. Which of the following molecules is NOT a polymer (2007 E.C.)?
A. Protein B. Lipid C. RNA D. Starch
788. The most complex structure of protein is called (2007E.C.)
A. Primary structure B. Tertiary structure C. Secondary structure D. Quaternary structure
789. At which level of structural organization do proteins have the alpha-helix shape (2007 E.C.)?
A. Primary structure B. Tertiary structure C. Secondary structure D. Quaternary structure
790. In a formation of macro molecules what type of reaction should join two subunits together (2007 E.C.)?
A. Hydrolysis reaction C. Denaturation reaction
B. Dehydration reaction D. Hydrophobic reaction
791. To which group of organic compounds do the triglycerides and waxes belong (2007 E.C)?
A. Carbohydrates B. Proteins C. Lipids D. Vitamins
792. Which of the properties of water allows mosquito larvae to protect themselves from sinking down into the water from the water surface (2007 E.C.)?
A. Its high surface heat capacity C. Its high surface tension
B. Its high latent heat of vaporization D. Its low density in solid state
793. Which of the following is a functional group of a fatty acid (2007E.C.)?
A. A ketone group B. An amino group C. An aldehyde group D. A carboxyl group
794. How many fatty acids would a cell need to form a molecule of triglyceride (2008 E.C.)?
A. Two B. Four C. Five D. Three
795. Which of the following food types would most likely give a negative result upon addition iodine solution (2008)? A. Bread B. Biscuit C. butter D. Potato
796. Of the following functions, which one do triglycerides accomplish in cells (2008 E.C.)?
A. Increase density of tissues and cells C. Yield limited amount of ATP for cells
B. Increase thermal insulation of cells D. Facilitate entry of excess water
797. Which of the following are NOT included in lipids (2003 E.C.)?
A. Nitrogenous bases B. Waxes C. Phospholipids D. Steroids
798. Which of the following compounds is important component of the exoskeleton of arthropods such as insects (2003)? A. Oil B. Sugar C. Protein D. Chitin
799. What type of molecules CANNOT pass across the cell membrane by simple diffusion (2004 E.C.)?
A. Charged molecules C. Lipid soluble molecules
B. Non-polar molecules D. Molecules of very small size
800. Which statement describes all enzymes?
A. They control the transport of materials C. They provide energy for chemical
B. They affect the rate of chemical reaction D. They absorb oxygen from the environment
801. Which of the following substances can be used over and over again in an enzyme catalyzed reaction (2009 E.C.)?
A. Enzyme-substrate complex B. Enzyme C. Substrate D. Reaction product
802. When a chemical binds to an enzyme and change the shape of the enzyme so that the enzyme can facilitate catalysis, the chemical is said to be: A reverse B. an activator C. an effector D. an inhibitor
803. What is the intermediate compound that is formed during an enzyme catalyzed reaction (2009 E.C.)?
A. Reactant B. Product C. Substrate D. Enzyme-substrate complex
804. For biological detergent to effectively remove oily and greasy dirt, which of the following enzymes should it contain?
A. Amylase B. Lipase C. Protease D. Cellulase
805. Most co-enzymes are the derivatives of which of the following nutrients (2009 E.C.)?
A. Proteins B. Carbohydrate C. Vitamins D. fats
806. To produce glucose from starch, which of the following enzymes would one use (2009 E.C.)?
A. Isomerases B. Lyases C. Hydrolases D. Ligases
807. Which class of enzyme inhibitors has similar shape as that of the normal substrate (2009 E.C.)?
A. Allosteric B. Competitive C. Denaturing D. Irreversible

808. Which of the following pairs of molecules are known to have catalytic activity?
   A. Proteins and DNA C. Proteins and lip[ids
   B. Proteins and RNA D. Proteins and carbohydrates
809. Which type of enzyme catalyzes the joining of two molecules by the formation of new bonds (2009 E.C.)?
   A. Decarboxylase B. Ligase C. Dehydrogenase D. Oxidoreductase
810. Which of the following statements about enzymes is NOT correct (2009 E.C.)?
   A. Enzymes speed up a chemical reaction
   B. Enzymes are very specific in their reaction
   C. The presence of an enzyme will change the outcome of a reaction
   D. Enzymes lower the energy of activation for a reaction to occur
811. What happens when enzymes become denatured (2009 E.C.)?
   A. They can normally catalyze the reactions C. Their active sites are changed
   B. Rate of reaction increases D. Bonds holding amino acids are unaffected
812. Which of the following types of enzyme inhibitions can be removed when the end product of the metabolic pathway is depleted? A. Competitive inhibition C. Non-reversible-inhibition
   B, Allosteric inhibition D. Reversible competitive inhibition

813. Which of the following can reverse an enzyme inhibition that is caused by an allosteric inhibitor (2009 E.C.)?
   A. Adding more substrate C. Depleting the end product
   B. Adding more end product D. Depleting the substrate
814. What is an Apoenzyme (2009 E.C.)?
   A. A protein molecule C. An active enzyme
   B. A non-protein molecule D. A non-protein cofactor
815. Into which of the following organic compounds can lipase, maltase, and sucrase be grouped (2007 E.C.)?
   A. Hormones B. Carbohydrates C. Nucleic acids D. Enzymes
816. If an enzyme is provided with the normal substrate plus another molecule having the same shape and size as the substrate, which one of the following would happen ((2003E.C)?
   A. Allosteric inhibition C. Competitive inhibition
   B. Irreversible inhibition D. End product inhibition
817. If one keeps on adding a substrate to a fixed amount of an enzyme, when does the reaction rate reach a plateau (2003)?
   A. When all the substrate is converted to products
   B. When most of the enzyme molecules are consumed
   C. When all the active sites of the enzyme are occupied
   D. When much of the products are accumulated
818. What do we call a substance upon which an enzyme acts (2004E.C)?
   A. Product B. substrate C. Activation energy D. Enzyme-substrate complex
819. Which of the following mechanisms do cells use to regulate enzyme catalyzed reaction in metabolic pathways (2004E.C)?
   A. Enzyme denaturation C. Irreversible inhibition
   B. End product inhibition D. Competitive inhibition
820. Which factor has a more negative effect on the function of enzymes than others (2004E.C)?
   A. Neutral pH C. Optimal amount of salt concentration
   B. Very high temperature D. Optimal amount of substrate concentration
821. If the temperature enzyme catalyzed reaction is increased from 40% to 70%, the rate of the reaction will:
   A. Decrease to zero because the enzyme denatures
   B. Increase indefinitely C. Decrease immediately D. Decrease and then increase
822. In competitive inhibition, in which one of the following factors determines the rate of the inhibition
   A. The reaction temperature C. The enzyme concentration
   B. The substrate concentration D. The ratio of inhibitor to enzyme concentration
823. Which factor has a more negative effect on the functions of enzymes than the others (2004 E.C.)?
   A. Neutral pH C. Optimal amount of substrate concentration
   B. Very high temperature D. Optimal amount of salt concentration

824. What are the environmental advantages of using enzymes in industry (2004 E.C)?
   A. It makes high production possible with less input of heat
   B. It makes high production possible with high input of heat
   C. It makes high production possible with emission of CO_2
   D. It helps high production with supply of more heat and emission of more CO_2
825. Which of the following classes of enzymes digests carbohydrate (2005 E.C)?
   A. Amylase B. Lipases C. Proteases D. Nucleases
826. One of the following molecules is building units of an enzyme molecule (2005)?
   A. Amino acids B. Glucose C. Nucleic acids D. Fatty acids
827. What is true about the rate of an enzyme catalyzed reaction if the enzyme concentration is kept constant and the substrate is excess? The rate would
   A. not be determined B. stay constant C. increased continuously D. decrease sharply
828. One of the following principles is most of the anti-HIV drugs currently in use working (2005 E.C)?
   A. Inhibition of enzyme action C. Digesting viral particles
   B. Degradation of the viral DNA D. Phagocytosis of the viruses
829. When an enzyme is denatured by heat or extreme pH, which one of the following does it lose (2004 E.C.)?
   A. The peptide bond B. Secondary structure C. Primary structure D. Tertiary structure
830. In the cause of enzymatic chemicals, what do you call the substance that is acted up on by an enzyme (2006)? A. Polypeptide B. Coenzyme C. Vitamin D. Substrate
831. According to IUB the first part of "trivial" name of enzyme refers to the
   A. Substrate B. Product C. Reaction D. Co-enzyme
832. Which of the following are the common characteristics of all enzymes (2006 E.C)?
   A. They act inside cells only C. They are proteins
   B. They require cofactors D. They operate at any pH
833. To which class of enzymes do the digestive enzymes belong (2005)?
   A. Esterases B. Transferases C. Hydrolases D. Isomerases
834. Which of the following types of enzyme inhibition can be removed when the end product of the metabolic pathway is depleted (2005 E.C)?
   A. Allosteric inhibition C. Competitive inhibition
   B. Non-reversible inhibition D. Reversible competitive inhibition
835. On which of the following principles are most of the anti-HIV drugs currently in use working (2005 E.C)?
   A. Inhibition of enzyme action C. Digesting of viral particles
   B. Degradation of viral DNA D. Phagocytosis of the viruses
836. Which group of organic compounds includes the enzymes (2006 E.C.)?
   A. Proteins B. Lipids C. Starches D. Carbohydrates
837. An enzyme sucrase is an example of
   A. Hydrolases B. Lyases C. Transferases D. Oxidoreductases
838. Which of the following pH values represents the strongest base (2006 E.C.)?
   A. 2 B. 7 C. 13 D. 15
839. Which region of human digestive tract contains enzymes that perform well at low pH (2006 E.C.)?
   A. Mouth B. Stomach C. Small intestine D. Large intestine
840. For a biologist detergent to effectively remove oily and greasy dirt, which of the following enzymes should it contain (2006 E.C.)? A. Cellulose B. Protease C. Amylase D. Lipase
841. In the cause of enzymatic chemical reactions, what do you call the substance that is acted up on by on enzyme (2006 E.C.)? A. Polypeptide B. Coenzyme C. Vitamin D. Substrate
842. Which of the following is a coenzyme (2007 E.C.)?
   A. NAD B. Systematic errors C. Water D. Proteins
843. Which one of the following substances has a shape which is similar to that of the substrate of an enzyme (2007 E.C.)?
   A. The reaction product B. A competitive inhibitor C. A cofactor D. An allosteric inhibitor
844. Which one of the following terms refers to how fast an enzyme acts on its substrate (2007 E.C.)?
   A. Turn over number B. Enzyme number C. Substrate number D. product number
845. The optimum temperature of enzymes found in thermophilic bacteria is (2007 E.C.)?
   A. Lower than for enzymes in the human body C. Higher than enzymes in the human body
   B. The same as enzymes found in human body D. Lower than enzymes found in warm blooded animals

846. Which of the following properties of enzymes makes it possible that a single enzyme molecule can act on many substrate molecules (2007 E.C.)?
   A. Enzymes are proteins C. Enzymes lower the activation energy
   B. Enzymes are reused over and over again B. Enzymes are substrate specific
847. The enzyme that breaks a complex molecule into two products by hydrolysis belongs to class
   A. Hydrolases B. Transferases C. Ligases D. Lyases
848. The enzyme that breaks covalent bonds without hydrolysis
   A, Hydrolases B. Transferases C. Ligases D. Lyases

849. How many classes of enzymes are there in the Enzyme Commission classification?
   A. 3 B. 4 C. 5 D. 6
850. If the rate of the enzyme catalyzed reaction remains constant even when more substrate is added to the reaction, which of the following might be the reason (2007 E.C.)?
   A. Inhabitation of enzyme-substrate complex formation C. Saturation of the enzyme
   B. Loss of substrate specificity by the enzyme D. Inactivation of the enzyme
851. Which part of human alimentary canal contains digestive enzymes that function at acidic pH (2008 E.C)?
   A. Stomach B. Mouth C. Esophagus D. Small intestine
852. According to lock-and-key hypothesis, an enzyme might not be effective?
   A. With a changed shape B. Without heat C. More than once D. Without ATP
853. In which area of enzyme application is inverase injected to sucrose paste in order to produce liquid chocolate (2008 E.C)?
   A. Detergent making industry C. Pharmaceutical industry
   B. Pulp and paper industry D. Food processing industry
854. Which characteristic of RNA makes it suitable for moving out of the nucleus (2008 E.C.)?
   A. Inability to replicate C. its unstable nature
   B. Absence of thymine D. Smallness of its size
855. Which one of the following functions at high optimum pH than all the rest (2008 E.C)?
   A. Pepsin B. Pancreatic lipase C. Trypsin D. Enzymes in stomach
856. Which class of enzymes joins two molecules together by formation of new bonds (2008 E.C)?
   A. Ligase B. Isomerase C. Lyase D. Hydrolase
857. In enzymes that contain non-protein organic molecules, in addition to the protein component called
   A, Apoenzyme B. Coenzyme C. Holoenzyme D. Cofactor

858. What causes tomato fruits to ripen much more slowly when kept in a refrigerator than if left on a table at room temperature (2008 E.C)?
   A. Low temperature slows the normal action of ripening enzymes
   B. Enzymes produced by bacteria normally inhibit ripening
   C. Humidity accelerates enzyme activity and ripening process
   D. Normal temperature asserts the action of ripening enzymes
859. Among the following factors that affect enzyme activity, which one does NOT cause enzyme denaturation (2009 E.C)? A. High pH B. Low pH C. High temperature D. Competitive inhibitor
860. Choose the name of the researcher/scientist who introduced term cell for the first time (2003 E.C.)?
   A. Aristotle B. Robert Hooke C. Anton Van Leeuwenhoek D. Robert Brown
861. Which of the following organelles are likely to be more abundant in active cells such as the muscle cells of human heart (2003 E.C.)?
   A. Lysosomes B. Chromosomes C. Mitochondria D. Golgi bodies
862. Which of the following pairs are both organelles concerned with energy transformation (2003 E.C.)?
   A. Nucleus and nucleolus C. Chloroplast and vacuole
   B. Mitochondria and nucleus D. Chloroplast and mitochondria
863. If the size of a cell increases, which one of the following gets smaller (2005)?
   A. The volume of cell C. The surface area to volume ratio of the cell
   B. Volume to surface area ratio of the cell D. the surface area of the cell
864. Sodium ions pass from a region where they are at lower concentrations to a region where they are found at higher concentration in human cells. This is an example of which of the following processes (2003 E.C)?
   A. Osmosis B. Simple diffusion C. Passive transport D. Active transport

865. Why is it that the leaves and the soft young stems of plants that have started wilting become stiff again when they are provided with water? This is because of (2003 E.C.)?
   A. Fast intake of minerals C. Increased turgor pressure
   B. The cooling effect of water D. Increased rate of photosynthesis
866. Choose the structure that is usually present only in the animal cells (2003 E.C)?
   A. Vacuole B. Cell wall C. Nucleus D. Centriole
867. What is the general term for the part of protoplasm that lies outside the nucleus?
   A. Plasma membrane B. Cytoplasm C. Cell wall D. Central vacuole
868. Which of the following ideas in the cell theory was contributed by Rudolf Virchow (2003 E.C.)?
   A. All plants are made up of cells C. Cells are the structural unit of life
   B. All animals are made up of cells D. Cell come from pre-existing cells
869. Which of the following modes of material transport across the cell membrane is NOT governed by the concentration gradient of the transported material (2003 E.C.)?
   A. Simple diffusion B. Osmosis C. Facilitated diffusion D. Active transport
870. Which means of particle transport requires input or energy by the cell
   A. Simple diffusion B. Osmosis C. Facilitated diffusion D. Active transport
871. Which of the following cell types can be reaching in lysosomes?
   A. Nerve cell B. Muscle cell C. Phagocytic cells D. Red blood cells
872. Which of the following requires expenditure of ATP (2004 E.C.)?
   A. Osmosis B. Simple diffusion C. Facilitated diffusion D. Endocytosis
873. Among the following identify the cellular structure in which nucleic acid is not found
   A. Chloroplast B. Golgi body C. Mitochondria D. Ribosome
874. Suppose we consider four hypothetical cells (designated A,B,C and D) having cubic shape with their sides measuring 2,4,6,and 8 arbitrary units, respectively which of these cells has the largest surface area to volume ratio (2004 E.C.)? A) Cell A B) Cell B C) Cell C D) Cell D
875. Suppose three potato cylinders are kept for some time in 15%, 8% and 4% sucrose solutions respectively, and the fourth cylinder is kept in distilled water, which of the cylinders will more flaccid (2005 E.C.)?
   A. The cylinder in 4% solution C. The cylinder in 15% solution
   B. The cylinder in 8% solution D. The cylinder in distilled water
876. Which of the following scientist (s) is (are) most closely associated with the statement of cell theory?
   A. Darwin and Mendel B. Louis Pasteur C. Schwann and Scheleiden D. Robert Hooke
877. Which one of the following is the main constituent of biological membranes (2005 E.C.)?
   A. Phospholipids B. Glycoproteins C. Glycolipids D. Cholesterol
878. If a suspension of a mixture of cellular organelles is spun in a centrifuge which organelle settles to the bottom first (2005 E.C.)?
   A. Mitochondria B. Nuclei C. Chloroplast D. Ribosomes
879. If a size of a cell increases, which one of the following gets smaller (2005 E.C.)?
   A. The volume of cell C. The surface area to volume ratio of the cell
   B. The surface area of the cell D. Volume to surface area ratio of the cell
880. Which of the following is an important function of the Goli apparatus (2005 E.C.)?
   A. Protein synthesis C. Packaging of protein for export out of the cell
   B. Removing of debris from the cell D. Storage of waste materials not needed by the cell
881. What distinguishes living cells from non-living matter?
   A. The organization of the different molecules C. The environment in which they are found
   B. The molecules from which they are made D. The creator
882. In which of the following features are prokaryotic cells distinguished from eukaryotic cells (2005 E.C.)?
   They: A. lack nuclei C. have no DNA C. lack cytoplasm D. have no ribosome
883. What will happen if human red blood cells are kept in in a hypotonic solution (2005 E.C.)?
   A. Lose water by osmosis and burst C. Lose water by osmosis and shrink
   B. Taking in water by osmosis, swell and burst D. Take in water by osmosis, swell and remain unchanged
884. The detailed structure of cell as seen through electron microscope is known as
   A. Homogenization B. Cyton C. Ultra structure D. Cell fractionation
885. In which types of solution is the water potential more negative than in the cells (2005 E.C.)?
   A. Hypotonic B. Hypertonic C. Isotonic D. Equal solute and solvent concentration

886. Which of the following paired organelles are membranes bounded (2005 E.C.)?
   A. Ribosomes and peroxisomes C. Mitochondria and ribosomes
   B. Chloroplasts and ribosomes D. Chloroplasts and mitochondria
887. Most cell membranes are primarily composed of which compounds (2005 E.C.)?
   A. Proteins and lipids C. Chitin and starch
   B. DNA and ATP D. Nucleotides and amino acids
888. If the red blood cells shrink when placed in a certain solution, what is the strength of the solution relative to the strength of the protoplasm of the cells (2005 E.C.)?
   A. Hypotonic B. Isotonic C. Hypertonic D. Isoosmosis
889. Which of the following cell types can be rich in lysosome (2005 E.C.)?
   A. Red blood cells B. Phagocytic cells C. Nerve cells D. Muscle cells
890. One of the following would be harder to see under the ordinary light microscope that is more likely to the available in school laboratories (2005 E.C.)?
   A. Nucleus B. A bacterium C. A mitochondrion D. Ribosome
891. Which of the following is largely made up of phospholipids (2003 E.C.)?
   A. Cell wall B. Nucleus C. Cell membrane D. Chromosomes
892. The growth of cells is limited by the ratio between
   A. Nucleus and cytoplasm C. Organelles and cytoplasm
   B. Organelles and surface area D. Volume and surface area
893. One of the following organelles is the site for protein synthesis (2006 E.C.)?
   A. The nucleus B. The chloroplast C. The ribosome D. The mitochondria
894. Which of the following structures is NOT present in animal cells (2006E.C.)?
   A. Cell wall B. Nucleus C. Protoplasm D. nucleic acid
895. What is the general term for the part of the protoplasm that lies outside the nucleus (2006 E.C.)?
   A. Cytosol B. Cytoplasm C. Central vacuole D. Plasma membrane
896. In the cell membrane, the phospholipids
   A. Are arranged so that poplar head parts face water
   B. Are arranged so that non-polar parts face the outside of the cell
   C. Form a single layer interrupted by spaces and pores D. Cannot move
897. Which of the following cellular structures is possessed by all cells (2006 E.C.)?
   A. Cell membrane B. nucleus C. Cell wall D. Golgi apparatus
898. Which of the following eukaryotic cell organelles was a free living cell before eukaryotic cells evolved (2006 E.C.)? A. Nucleus B. Ribosome C. Chloroplast D. Nucleolus
899. Which of the following mechanisms moves digested amino acids and glucose across the plasma membrane of the cell lining the wall of the small intestine (2006E.C)?
   A. Osmosis B. Simple diffusion C. Facilitated diffusion D. Active transport
900. If a cell fails to clear its cellular debris, which one of its organelles is most likely not functioning (2006E. C)? A. Nucleus B. Mitochondria C. Endoplasmic reticulum D. Lysosomes
901. Among the following identify the organelle in which nucleic acid is NOT found (2006 E.C)?
   A. Mitochondria B. Chloroplast C. Ribosome D. Golgi apparatus
902. The cell membrane consists principally of :
   A. proteins embedded in a polymer of glucose C. Proteins embedded in carbohydrate bilayer
   B. Proteins embedded in phospholipids bilayer D. Proteins embedded in a protein layer
903. Suppose a hypothetical cube-shaped cell has sides of 10 micrometers, what is the surface area to volume ratio of this cell (2006 E.C)? A. 6:10 B. 10:10 C. 3:6 D. 4:8

Area=10x10=100, surface area= 6x100=600, Volume=10x10x10=1000 & Surface area to volume ratio = 600/1000=6/10 =(6:10)

904. In which of the following solutions does an animal cell undergo haemolysis (2006 E.C)?
   A. In hypotonic solution B. In Hypertonic solution
   B. In Isotonic solution C. In both hypotonic and hypertonic solutions
905. Which of the following will happen if a plant cell is kept in a solution that is stronger than its protoplasm (2006 E.C.)?
   A. The cell will become liquid C. The central vacuole will expand
   B. The protoplasm will get plasmolysed D. The cell will swell and burst
906. Which of the following methods is a passive transport
   A. Endocytosis B. Phagocytosis C. Facilitated diffusion D. Exocytosis

907. Which of the following is NOT true about mitochondria and chloroplast (2007 E.C.)?
   A. Both contain chlorophyll C. Both have double membrane
   B. Both contain nucleic acid D. Both transduce energy
908. Among the following scientists who contributed to the cell theory, identify the one who stated that *'a cell can arise only from another cell like it'*. A. Robert Hooke C. Theodor Schwann
   B, Matthias Schleiden D. Rudolf Virchow
909. Which one of the following modes of transport is used by cells to move substances against their concentration gradient (2006 E.C.)? A. Osmosis B. Simple diffusion C. Facilitated diffusion D. Active transport
910. Which of the following will primarily happen if the enzymes in the lysosomes of a cell are defective (2006 E.C.)?
   A. Cellular debris will not be removed C. Chromosome replication will cease
   B. ATP production will stop D. Diffusion process will stop
911. By what mean do red blood cells obtain glucose from their surroundings?
   A. By the use of channel proteins C. By simple diffusion
   B. By facilitated diffusion D. A and B are answers
912. Of the following four cells whose surface area to volume ratio is given, which cell can more efficiently transport its needs of materials across the cell surface (2006 E.C.)?
   A. 24:8 ratio B. 54:27 ratio C. 96:64 ratio D. 150:125 ratio
913. The movement of particles from higher concentration gradient to lower concentration gradient is called
   A. Osmosis B. Facilitated diffusion C. Simple diffusion D. Active transport
914. The role of cholesterol is to:
   A. Increase the semi-liquid nature of the cell membrane C. Gives color to the membrane
   B. Increase the flexibility of the membrane D. Increase the solid nature of the membrane
915. Which of the following parts of a plant cell is NOT a living component of a cell (2006 E.C.)?
   A. Cell membrane B. cell wall C. cytoplasm D. Nucleus
916. According to the fluid-mosaic model of the plasma membrane what does the word "mosaic" refers to (2006 E.C.)?
   A. The hydrophobic property of fatty acids C. The bilayer nature of the membrane
   B. The arrangement of the proteins D. The movement of phospholipids
917. Sodium-potassium pump transports
   A. Na^+ out of the cell and K^+ into the cell B) Na^+ into the cell and K^+ out of the cell
   B. Both Na^+ and K^+ into the cell D) Both Na^+ and K^+ out of the cell
918. In certain cell, if 2K+ ions are pumped into the cell and 3Na+ ions are pumped out of the cell, then which of the following statement holds true?
   A. The condition created will favor the diffusion of cations into the cell
   B. The conditions created will restrict the entry of negatively charged ions
   C. The inner side of the cell becomes more negative than the outer D. All of these are correct

The transfer of **sodium** and **potassium** across the membrane is brought about by the changes in the shape of the protein. Note that for **every 2K+** ions taken into the cell, **3Na+ ions are removed** from inside of the cell. Thus a potential difference is built up across the membrane, with the inner side of the cell being **negative**. This tends to restrict the entry of negatively charged ions (anions) such as chloride and favoring diffusion of positively charged ions (cations) into the cell. This explains why chloride concentration inside red blood cells is less than the outside despite the fact that chloride ions can diffuse in and out by facilitated diffusion. Similarly, positively charged ions (cations) tend to be attracted into the cells. Thus, both concentration and charge are important in deciding the direction in which ions cross the membrane.

919. The sodium-potassium pump is an example of
   A. Active transport B. Passive transport C. Facilitated diffusion D. Osmosis
920. What substance helps to keep the biological membrane in a fluid state (2006 E.C.)?
   A. Waxes B. Water C. Cholesterol D. Phospholipids
921. What happens when a plant cell absorbs in more water (2009 E.C)?
   A. It shrinks B. It becomes wilted C. It becomes turgid D. It swells and bursts
922. Which of the following organelles is common to both plant and animal cells (2009 E.C)?
   A. Cell wall B. Chloroplast C. Mitochondria D. Central vacuole

923. If a cell fails to form lysosomes, which of the following cellular functions will get disrupted first (2009 E.C)?
   A. Protein synthesis C. Removal of cellular debris
   B. Chromosome replication D. Transport across cell membrane
924. When a cell takes liquid substances into its cytoplasm the process is
   A. Exocytosis B. Pinocytosis C. Phagocytosis D. Osmosis
925. For a substance to easily pass across the cell membrane by simple diffusion which of the following properties should it possess (2009 E.C)? A. Large size B. Positive charge C. Ability to dissolve in lipid D. Negative charge
926. What happens when red blood cells are ke.pt in a hypertonic solution (2009 E.C)?
   A. The same net gain and loss of water C. More water gets into the cell than leaving it
   B. More water goes out of the cell than getting in
   C. More water gets into the cell than leaving it
   D. The cells prevent water from getting in or leaving out
927. Among the following which one best describes the cells of bacteria (2009 E.C)?
   A. Eukaryotic C. Prokaryotic
   B. Both eukaryotic and prokaryotic D. Neither prokaryotic nor eukaryotic
928. Groups of plastids that are primarily involved in storage functions are
   A. Amyloplasts B. Leucoplasts C. Chloroplasts D. Chromoplasts
929. The matrix of chloroplast is: Grana B. Lamellae C. Stroma D. Thylakoid
930. The endosymbiotic hypothesis for the origin of eukaryotic cells provides an explanation for the origin of which of this furniture (s)?
   A, Mitochondria B. Chloroplasts C. Nucleus D. A and B are correct answers

931. Which of the following structures are always present in a typical prokaryotic cell?
   A. Cell wall B. cytoplasm C. 70s ribosomes D. DNA E. all of the above
932. Which of the following plants use CAM photosynthesis (2009 E.C.)?
   A. Sugar cane B. Sorghum C. Maize D. Cactus
933. When a drop of iodine solution is added to a solution of food stuff and the food stuff turns dark blue, what does the food stuff contain (2009 E.C.)?
   A. Reducing sugar B. glucose C. Disaccharide D. Starch
934. Which of the following stages of photosynthesis can take place in the dark (2009 E.C.)?
   A. Photolysis of water B. Photosystem II C. Photosystem I D. Calvin cycle
935. The molecule of which pigment is located at the reaction center of the photosystem?
   A. Chlorophyll a B. Chlorophyll b C. Carotenoid D. Xanthophyll
936. At which stage is most of the ATP generated in aerobic respiration?
   A. Krebs cycle B. Glycolysis C. ETC D. Link reaction
937. Glycolysis occurs in the ---------- (2009 E.C.)?
   A. Cytoplasm B. Mitochondria C. Nucleus D. Chloroplast
938. In photosynthesis which of the following does NOT happen?
   A. Organic compounds are produced from inorganic substances
   B. Water is split to generate electrons and proteins
   C. Carbohydrate is synthesized from H_2O and CO_2
   D. Oxygen is produced from CO_2
939. Anaerobic metabolism refers to the generation of ATP (2009 E.C.);
   A. Without the involvement of ADP C. Without the use of glycogen
   B. Without the use of the oxygen D. By the conversion of pyruvate to lactate
940. WC4 photosynthesis is most efficient in conditions of :
   A. Low CO_2 concentration B. high light intensity C. high temperature D. All of the above
941. The conversion of one molecule of glucose to two molecules of pyruvate results in the net formation of (2009 E.C.); A. Two molecules of ATP C. Six molecules of water
   B, 3 molecules of ATP D. 38 molecules of ATP
942. Which of the following is a reactant in the Calvin cycle?
   A. O_2 B. CO_2 C. H_2O D. Glucose
943. C-4 plants: A. Lose more water than C-3 plants during photosynthesis C. Have no stomata
   B, Are usually found in cool, and moist environment D. Fix CO_2 into four carbon compounds

944. An ATP molecule is composed of a:
   A. Base adenine, a ribose sugar and three phosphates
   B. Base adenine, a ribose sugar and two phosphates
   C. Base adenine, a deoxyribose sugar and three phosphates
   D. Base adenine, a ribulose sugar and a phosphates
945. If present in the fermentation system, which one of the following would negatively affect alcohol production by yeasts? A. Oxygen B. Water C. Glucose D. Fermentation enzyme
946. During thew Krebs cycle:
   A. Hydrogen ions and oxygen f
   B. The cell releases small amount of energy through fermentation
   C. Each glucose molecule is broken down into two molecules of pyruvic acid
   D. Pyruvic acid is broken down into carbon dioxide in a series of reactions.
947. How many ATP can be produced if 4$FADH_2$ and 12 NADH give their electrons to the ETC in the presence of oxygen? A. 18 ATP B. 44 ATP C. 38ATP D. 48 ATP
948. The Krebs cycle occurs in the: A Space between the inner and outer mitochondrial membrane
. B. Outer mitochondrial membrane C. Cytosol D. Mitochondrial matrix
949. Which of the following compounds can be metabolized to intermediates that can enter glycolysis of the Krebs cycle and serve as source of energy? A. Amino acids B. Nucleic acids C. Fatty acids and glycerol D. All of the above
950. The advantage of anaerobic respiration is:
   A. many ATP molecules are produced from each molecule of glucose
   B. energy can be produced when oxygen is in short supply
   C. pyruvic acid is converted into lactic acid
   D. more efficient than aerobic respiration
951. During the Krebs cycle, to which of the following molecules is most of the energy released from food transferred (2009 E.C.)? A. ATP B. NAD C. ADP D. AMP
952. When 4 ADP is phosphorylated it means
   A. 4 ATP is catabolized releasing energy C. Energy is released to be used for other reactions
   B. Energy is absorbed to form 4 ATP D. Energy is wasted
953. How many Calvin cycle would be required to form one glucose molecule using 6CO_2?
   A. One cycle B. Two cycles C. Three cycles D. Four cycles
954. Which of the following happens during the dark reaction of photosynthesis?
   A. Carbon dioxide is fixed C. Oxygen is produced from split of water
   B. NADH is produced D. ATP is produced
955. The enzyme for ETC are present in the
   A. Outer mitochondrial membrane B. Matrix C. Inner mitochondrial membrane D. Cytosol
956. Which of the following is true about the first stage of photosynthesis?
   A. Temperature dependent B. ATP driven C. Light dependent D. Glucose-driven
957. The ATP molecule is sometimes described as:
   A. a phosphorylated nitrogenous base C. a glycolated nucleotide
   B. a phosphorylated nucleotide D. a glycolated nitrogenous base
958. In which process is ATP generated during short distance high speed running?
   A. Anaerobic respiration C. Mitochondrial energy transformation
   B. Aerobic respiration D. The Kreb's cycle
959. During which stage of aerobic respiration does oxidative phosphorylation occur (2009 E.C.)?
   A. Glycolysis B. Krebs' cycle C. Link reaction D. Chemiosmosis
960. C-4 photosynthesis is more efficient in conditions of :
   A. Low carbon dioxide concentration
   B. High light intensity C. High temperature D. all of the above
961. Oxidative phosphorylation is: A. Production of ATP driven by ETC C. reduction of CO_2
   B, Addition of phosphorus D. Addition of enzymes
962. Which of the following processes of photosynthesis does NOT require the presence of light to take place?
   A. Reduction of NADP B. Carbon fixation C. ATP formation D. The splitting of water
963. During anaerobic respiration, what is the gross number of ATP molecules that are produced per glucose molecule (2009 E.C.)? A. Two B. Three C. Four D. Six

964. In cellular respiration, which of the following molecules enters the Krebs' cycle?
A. Acetyl CoA B. Pyruvic acid C. Glucose D. Lactic acid
965. Examples of processes requiring ATP includes:
A. Simple diffusion and active transport C. Conduction of nerve impulse and osmosis
B. Active transport and facilitated diffusion D. active transport and protein synthesis
966. During chemiosmosis, what substance diffuses from one side to the other side of the membrane?
A. Water molecule B. protons C. Electrons D. ATP molecules

When the concentration of proton gradient increases in the outer mitochondrial membrane, it diffuses through the ATP synthase to the inner membrane of mitochondria

967. If an actively growing potted seedling is kept horizontally, which of the following would eventually happen to the seedling (2009 E.C.)?
A. The shoot would bend upwards C. The root would bend up wards
B. The seedling would stop growing D. The root and the shoot never bend
968. The importance of chemiosmosis in photosynthesis and cellular respiration
A. Combing hydrogen and carbon C. Splitting of water molecules
B. Synthesizing of ATP D. Operating the proton pump
969. Which of the following is NOT one of the stages in cellular respiration?
A. Glycolysis B. Calvin cycle C. Krebs' cycle D. ETC
970. How many molecules of ATP will be generated as a result of $FADH_2$ in an actively respiring mitochondrion?3 A. 3 B. 4 C. 3 D.2
971. Before the Krebs cycle is proceed, pyruvic acid must be converted into
A. NADH B. Glucose C. Acetyl CoA D. Citric acid
972. In lactic acid fermentation
A. Electrons pass through the ETC C. NAD^+ is generated for use in glycolysis
B. Lactic acid is converted into pyruvic acid D. Oxygen is consumed
973. What does the absence of chloroplasts in unicellular organism indicate (2006E.C.)?
A. Reproduction by sexual means C. Heterotrophic nutrition
B. Autotrophic nutrition D. Complete lack of metabolic processes
974. When bacteriophages infect bacteria:
A. They inject their DNA only C. They inject their entire body
B. They inject their enzymes D. They inject their capsid
975. Their genetic information of viruses is enclosed in a molecule of
A. Either RNA or DNA but not both B. RNA C. DNA D. Protein
976. A virus is a biologically active particle composed of
A. ATP and carbohydrates C. Fats and enzymes
B. Lysosomes and mitochondria D. Protein coat and nucleic acid
977. If a new anti-HIV drug is to be developed to prevent the virus from entering the host cell, which one of the following processes should be drug target (2005)?
A. Reverse transcriptase C. Binding of Gp-120 and CD4
B. Integration of viral DNA into host DNA D. Assembly of viral parts into a whole virus
978. Viruses are considered non-living because
A. They do not move from place to place C. They cannot reproduce independently
B. They do not mutate and therefore do not adapt D. Their nucleic acid does not code for protein
979. The cells of which group of micro-organisms can be described as prokaryotic (2003 E.C)?
A. Viruses B. Protozoa C. Algae D. Bacteria
980. What is the total magnification power of a microscope with a 10x ocular lens and 25x objective lens (2003 E.C.)? A. 2.5x B. 35x C. 250x D. 2500x
981. Which of the following organisms do not consist of micro-organisms?
A. Algae B. Worms C. Bacteria D. Fungi
982. What are bacteriophages (2003 E.C.)? A. Bacteria B, Protozoa C. Viruses D. Fungi
983. Which one of the following human diseases can be prevented by taking proper diet?
A. Deficiency diseases B. Degenerative diseases C. Genetic diseases D. Social diseases
984. Which one of the following is the major killer of AIDS patients (2003 E.C.)?
A. Pneumonia B. Anaemia C. Opportunistic disease D. Malnutrition

985. Among the following human infectious diseases, identify the one that is caused by a virus (2003 E.C.)?
A. Yellow fever B. Pneumonia C. Cholera D. Typhoid
986. Which of the following is the right vector to transfer alien genes to bacteria through genetic engineering (2003 E.C.)? A. Plasmids B. Snails C. Mosquitoes D. Bacteria
987. Which one of the following is NOT one of the roles that micro-organisms play in ecosystems?
A. Nitrogen fixation B. Nutrient recycling C. Carbon fixation D. Energy recycling
988. Why are T- lymphocytes more vulnerable to HIV infection (2003 E.C.)?
A. Thin cell membrane C. HIV receptor protein
B. Gp120 on their surface D. Large pores in their cell membrane
989. Retroviruses have special enzyme that
A. Disintegrates host DNA C. Translates host DNA
B. Transcribes viral RNA to DNA D. Polymerizes host DNA
990. Which of the following statements is true about bacteria (2003 E.C.)?
A. Bacteria found in the human body are all parasitic
B. All bacteria are harmful because they spoil foods
C. All bacteria cause diseases to plants, animals and humans in some ways
D. Some bacteria living in the human body make vitamins needed by the body
991. Which of the following compounds is an important component of the bacterial cell wall (2003 E.C.)?
A. Chitin B. Peptidoglycan C. Cellulose D. Pectin
992. What is the term used to express the ability of a microscope to show details clearly (2003 E.C.)?
A. Enlargement B. Reduction C. Magnification D. Resolution
993. The cells of which group of micro-organisms can be described as prokaryotic (2003 E,C) ?
A. Viruses B. Protozoa C. Algae D. Bacteria
994. Which of the following are rod-shaped bacteria (2003 E.)
A. Cocci B. Spirochetes C. Spirilla D. Bacilli
995. Which of the following is the best collective name for all bacteria with spherical shapes (2004 E.C.)?
A. Cocci B. Bacilli C. Spirochaetes D. Streptococcus
996. Lytic cycle in viruses
A. Kills the host cell C. Allows the multiplication of the host DNA
B. Stops the multiplication of the host DNA D. A and C are answers
997. In which kingdom of life is the unicellular eukaryotes grouped (2004 E.C.)?
A. Monera B. Protista C. Plantae D. Animalia
998. Surface appendages used by some bacteria to attach to one another, an d to host organism are:
A. Pilli B. Spirilla C. Peudopodia D. Cilia
999. In DNA cloning technology, which of the following molecules serves as a vector of gene of interest to be transferred to bacterial host (2003 E.C.)?
A. Bacterial DNA B. Plasmid DNA C. Nuclear DNA D. Mitochondrial DNA
1000. Viruses are better characterized as (2003 E.C.)?
A. Decomposers B. Producers C. Carnivores D. Parasites
1001. A virus is a biologically active particle composed of
A. Mitochondria and lysosomes C. Enzymes and fats
B. Protein and nucleic acid D. Carbohydrates and ATP
1002. The genetic information of viruses is encoded in a molecule of
A. Either DNA or RNA but not both B. Proteins C. DNA only D. RNA only
1003. In which part of the cell do Gram-positive and Gram-negative bacteria differ regarding their staining property with Gram's stain (2004 E.C.)?
A. Cytoplasm B. Cell membrane C. Cell wall D. Nucleus
1004. An essential aspect of the viral replication is the
A. Entry of the viral envelope to the cytoplasm of the host cell
B. Release of the viral nucleic acid in the cytoplasm of the cell
C. Union of the viral envelope with the nuclear membrane of the cell
D. Release of the viral capsid into the host cell nucleus
1005. What are the individual strands of a fungal mycelium called (2004 E.C.)?
A. Fungus B. spores C. Hyphae D. Hydra
1006. Choose the one that is NOT a requirement of all living things (2005 E.C.)?
A. Ability to think C. Response to the stimuli

B. Organization of parts D. Maintenance of internal constancy

1007. Which of the following kingdoms of life consisting of prokaryotic organisms (2005 E.C.)?
A. Fungi B. Monera C. Protista D. Plantae

1008. Viruses are considered as non-living because
A. They do not move C. They do not mutate and therefore do not adapt
B. They cannot reproduce independently D. Their nucleic acid does not code for protein

1009. Which of the following particles does not normally transmit HIV (2005 E.C.)?
A. Sexual intercourse through anus C. Blood transfusion
B. Sharing infected needles D. Shaking hands

1010. What are bacteriophages (2003 E. C)?
A. Bacteria B. Viruses C. Protozoa D. Bacteria

1011. RNA retroviruses have a special enzyme that :
A. Translates host DNA C. Disintegrates host DNA
B. Transcribes viral RNA to DNA D. Polymerases host DNA

1012. To which of the following groups do those bacteriophages that integrate their DNA into the chromosome of bacterial host belong (2005 E.C.)?
A. Virulent viruses B. Lytic viruses C. Lysogenic viruses D. Non-parasitic viruses

1013. Which step in the lytic cycle follows attachment of virus and release of DNA into the cell?
A. Disintegration of the host DNA
B. Assemblage C. Production of the lysosome D. DNA replication

1014. Which group of microorganisms causes the disease known as athlete's foot (2005 E.C.)?
A. Bacteria B. Fungi C. Protozoa D. Viruses

1015. Under which of the following groups can the fungi be more conveniently placed (2005 E.C.)?
A. Autotrophs B. Heterotrophs C. Prokaryotes D. Plants

1016. What is the advantage of using HAART (Highly Active Anti-Retroviral Therapy) (2005 E.C.)?
A. It gives a lasting immunity to HIV C. It prevents mutation of HIV
B, It prevents reinfection by HIV D. It helps to break the life cycle of HIV

1017. Which one of the following objective and ocular combinations of the light microscope, respectively, gives the largest field of vision (2003 E. C.)?
A. 10x and 10x B. 4x and 10x C. 40x and 12x D. 100x and 10x

1018. Which of the following is true about those bacteria which dwell in hot springs (2003 E.C).
A. They get energy of activation from the spring heat C. They use non-protein enzymes
B. Their enzymes do not denature at that temperature D. They are not metabolically active

1019. Which one of the following types of microscopes is the best to show the details of the surface of an object (2004 E. C)?
A. Optical microscope C. Scanning electron microscope
B. Compound microscope D. Transmission electron microscope

1020. If a few anti-HIV drugs are to be developed to prevent the virus from entering the host cell, which one of the following processes should be the drug target (2005 E.C.)?
A. Reverse transcriptase C. Integration of viral DNA into host DNA
B. Binding Gp120 and CD4 B. Assembly of viral parts into a whole virus

1021. Select the function that living things are NOT capable of performing (2003 E.C.)?
A. Maintain their internal body temperature
B. Pass genetic information to their offspring
C. Respond to other organisms found in their surroundings
D. Determine the amount of radiation reaching the environment

1022. A cell was examined under a compound light microscope with an eyepiece lens marked 13x and an objective lens marked 40x. How many times larger would the cell appear to the viewer (2004 E.C)?
A. 40 times B. 53 times C. 400times D. 520 times

1023. What is the most frequent cause of the agents of food poisoning (2005 E.C.)?
A. Bacteria B. Protozoa C. Viruses D. Worms

1024. Which of the following is true about the antiretroviral drugs currently used to treat AIDS patients (2004 E.C.)?
A. They cure AIDS C. They serve as anti-HIV vaccines
B. They stop HIV transmission D. They slow down HIV multiplication

1025. Which of the following living characteristics UNNECESSARY for an object to be considered a living (2006 E.C.)?
A. Ability to respond to stimuli B. Ability to grow C. Ability to reproduce D. Ability to move
1026. Which of the following cellular forms did Robert Hooke observe under his crude microscope (2006 E.C)?
A. Bacteria B. Protozoa C. Yeast D. Empty cell wall
1027. Which of the followings do viruses share with cells (2006 E.C.)?
A. Cell wall B. Cytoplasm C. Nucleic acid D. Protoplasm
1028. Choose the organism that belongs to the eukaryotes (2006 E.C.)
A. Bacteria B. Blue green algae C. Amoeba D. Virus
1029. Which of the following is true about protozoa (2006 E.C.)
A. They are a group of bacteria C. They represent both plants and animals
B. They are one celled plants D. They are unicellular animal like eukaryotes
1030. Choose the characteristics that viruses share with living things (2006 E.C.)
A. They are made up of many specialized cells C. They reproduce by mitosis
B. They contain genetic material D. They contain chlorophyll
1031. Which stage in the life cycle of HIV is inhibited by the antiretroviral drug known as *integrase*—inhibitor (2006 E.C.)?
A. Conversion of viral RNA to DNA C. Insertion of the viral genome into host genome
B. Replication of the viral genome D. Release of the viral progeny from the cell
1032. From which organisms are the first antibiotic used in medicine produced (2006 E.C.)?
A. Gram-negative bacteria C. Genetically modified protozoa
B. Members of the fungi D. Higher plants
1033. What is the difference between HIV and AIDS (2006 E.C.)?
A. AIDS is the virus and HIV is the diseases C. Both AIDS and HIV refer to the disease
B. AIDS is the disease and HIV is the virus D. Both AIDS and HIV refer to the virus
1034. Biotechnology can be applied in environmental remediation. To which of the major application areas of biotechnology is this most related (2006 E.C.)?
A. Medicine and nutrition C. Biodiversity and industry
B. Medicine and industry D. Agriculture and environment
1035. Which of the following is NOT a term used to describe organisms that have had foreign genes added to them (2006)?
A. Genetically modified organisms C. Genetically engineered organisms
B. Transgenic organisms D. Pathogenic organisms
1036. What color do Gram-positive bacteria stain with Gram stain (2007 E.C.)?
A. Red B. Pink C. Purple D. White
1037. Among the following organisms, which one belongs to the prokaryotes (2007 E.C.)?
A. Paramecium B. Streptococcus C. Spirogyra D. Tapeworm
1038. Which of the following features makes human T-lymphocyte cells more vulnerable to HIV attack (2007 E.C.)? Presence of; A. Cell membrane C. CD4 on the membrane surface
B, DNA on the chromosome D. Pores in the cell membrane
1039. Which one of the following is the smallest of all (2007 E.C.)?
A. A red blood cell B. A virus C. A bacterium D. An amoeba
1040. Which of the following organisms does not contain parasitic members (2007 E,C)?
A. Bacteria B. Algae C. Fungi D. Protozoa
1041. Which of the following steps in the life cycle of HIV is blocked if an anti-retroviral drug that inhibits the reverse transcription enzyme is given to AIDS patients (2004 E.C)?
A. Formation of DNA from RNA C. The entry of HIV into CD4 cells
B. The integration of HIV DNA into host chromosome
1042. To which of the following groups do those bacteriophages that integrate their DNA into the chromosome of their bacteria host belong (2005 E.C)?
A. Virulent viruses B. Lysogenic viruses C. Lytic viruses D. Non parasitic viruses
1043. Which stage in the life cycle of HIV is disrupted, if AIDS patients are treated with a drug that has a protease inhibiting activity (2007 E.C.)?
A. Entry of the virus into the host C. Conversion of viral RNA to DNA
B. Integration of viral DNA into host DNA D. Assembly of viral parts into whole virus

1044. Which one of the following is a routine method used by clinics to test people for HIV infection (2007 E.C.)?
   A. Microscopic examination for the virus
   B. Testing for human anti-HIV antibody
   C. Counting the number of white blood cells
   D. Measuring the amount of hemoglobin
1045. One of the following is true about bacteriophages that have lysogenic life cycle (2007 E.C.)?
   A. They are RNA viruses
   B. They integrate their nucleic acid into that of the host
   C. They multiply in the host immediately after infection
   D. Progeny viruses are released by chronic release method
1046. Who was the person that first observed living cells moving around when he examined drops of water under the microscope (2008 E.C)? A. Robert Brown C. Anton Van Leeuwenhoek
   B, Robert Hooke D. Theodor Schwann
1047. Which of the following of the cancer is known to mostly develop in AIDS (2007 E.C.)?
   A. Cervical cancer B. Stomach cancer C. Kaposi's sarcoma D. Breast cancer
1048. In which of the following groups of living organisms do the cells lack organized nuclei (2008 E.C.)?
   A. Fungi B. Protozoa C. Bacteria D. Algae
1049. Which of the following is the major mechanism by which AIDS is transmitted (2008 E.C.)?
   A. Mother to fetal transmission
   B. Heterosexual intercourse
   C. Homosexual intercourse
   D. Contaminated blood transfusion
1050. Which of the following diseases is correctly matched with its causative agent (2008 E.C.)?
   A. Malaria—fungus B. AIDS—virus C. Ringworm—protozoa D. Syphilis—worms
1051. Which step in the HIV life cycle is disrupted by an anti-retroviral drug that competitively inhibits the reverse transcriptase enzyme (2008 E.C.)?
   A. Entry into the host cell
   B. Formation of DNA from RNA
   C. Assembly of viral parts into a virus
   D. Interpretation of viral DNA
1052. In what way patients benefit from treatment with anti-retroviral drugs (2008 E.C.)?
   A. Reduction of HIV replication
   B. Provision of cure from AIDS
   C. Immunizing against HIV
   D. Killing of opportunistic infectious agents
1053. Which of the following is the best collective name for all bacteria with spherical shapes (2008 E.C.)?
   A. Spirochaetes B. Bacilli C. Cocci D. Streptococci
1054. Which aspect of biotechnology is considered strictly genetic engineering (2008 E.C.)?
   A. Providing gene therapy
   B. Production of new types of plants
   C. Monoclonal antibodies
   D. Mapping of the human genome
1055. Which of the following microorganisms are prokaryotic (2009 E.C.)?
   A. Bacteria B. Protozoa C. Yeast D. Algae
1056. From which of the following diseases can one be protected by sleeping under the cover of a mosquito net
   A. Sleeping sickness C. AIDS C. Malaria D. Athlete's foot
1057. Which of the following group of viruses copy their RNA to DNA
   A. Bacteriophages B. DNA viruses C. RNA viruses D. Retroviruses
1058. In which one of the following do we use genetically modified bacteria for purposes other than human health (2009)?
   A. Production of insulin
   B. Production of antibodies
   C. Production of herbicides
   D. Production of vaccines
1059. What do we call the place where organisms live in their ecosystem (2009 E.C.)?-
   A. Abiotic B. Biotic C. Habitat D. Niche
1060. Which one of the following concepts contains all the others (2005 E.C)?
   A. Species B. Genus C. Population D. Community
1061. Which of the following statement is true about matter and energy in the ecosystem?
   A. Energy is recycled more than matter does
   B. Both matter and energy are recycled
   C. Matter is not recycled; energy is recycled
   D. Matter is recycled; energy is not recycled
1062. Which factors are involved in the determination of climax vegetation?
   A. Preys and predators
   B. Radiation and reflection
   C. Temperature and precipitation
   D. Grazing and browsing

1063. Which of the following is NOT recycled in the ecosystem (2009 E.C.)?
A. Sulphur B. Energy C. Carbon D. Phosphorus
1064. Which of the following is the type of ecological succession that starts from a cleared forest area (2009 E.C.)? A. Hydrosere B. Primary C. Secondary D. Pioneer
1065. In which one of the following ways the Tundra biome differs from desert biome (2006E.C)?
A. It has little biodiversity C. It receives little precipitation
B. It has permanently frozen sub-soil D. It is a treeless biome
1066. Which of the following can be given as a good reason for finding large number of plant and animal species in Ethiopia today? A. Presence of many biomes and habitats C. Lack of ecological disturbance
B, Good ecological and biodiversity management D. Environment free from predators
1067. Which of the following is the major role played by bacteria and fungi in the ecosystem (2009 E.C.)?
A. Causing diseases B. Fixing carbon dioxide C. Nutrient recycling D. Producing antibiotics
1068. Which of the following processes is most important to release nutrients from dead organic matter into the soil (2009)? A. Fixation B. Decomposition C. Excretion D. Respiration
1069. In which one of the following aspects is the tropical rain forest biome poor?
A. Annual precipitation B. Soil fertility C. Amount of sun light D. Species diversity
1070. Which of the following biomes supports the highest diversity of plant and animal life (2009 E.C.)?
A. Tropical rainforest B. Grass land C. Deciduous forest D. African savannah
1071. Which of the following demographic factors can increase the size of the world population (2009 E.C.)?
A. Natality B. Migration C. Emigration D. Immigration
1072. Among the following, which one is held more responsible for the present fast depletion of the world biodiversity (2009 E.C.)?
A. Herbivores B. Hybrid infertility C. Ecological isolation D. Habitat isolation
1073. Which of the following can be given as a good reason for finding large number of plant and mammal species in Ethiopia today? A. Environment free from predators B. Presence of many biomes and habitats
B, Good ecological and biodiversity management D. Lack of ecological disturbance
1074. The total amount of living tissue within a given trophic level is called (2009 E.C.)
A. Organic mass B. energy mass C. Trophic mass D. Biomass
1075. Biomes where trees predominate are called (2009 E.C.)?
A. Polar biomes B. Forest biomes C. Desert biomes D. Grassland biomes
1076. Which group of animals has the highest number of total and endemic species in Ethiopia (2007 E. C)?
A. Amphibians B. Birds C. Mammals D. Reptiles
1077. The goals of biodiversity conservation include all of the following EXCEPT
A. Protecting individual species
B. Preserving habitats and ecosystems
C. Introducing exotic species into new environments
D. Making sure that local people benefit from conservation effect
1078. What could be the main reason behind the observed slow or stable rate of population growth in the industrialized countries?
A. Increasing death rate B. poor health condition C. Good family planning Poor health condition
1079. What could be the main reason behind the observed slow or stable rate of population growth in the industrialized countries?
A. Increasing death rate C. High rate of child death
B. Poor health conditions D. Good family planning
1080. The maximum population growth rate characteristic of a species is called (2009 E.C.)?
A. Limiting factor B. Carrying capacity C. Immunology D. Exponential growth pattern
1081. Among the following which one is held more responsible for the present fast depletion of world biodiversity (2009)?
A. Herbivores B. Carnivores C. Grazers D. Humans
1082. Which of the following is true about a population growth whose size is maintained at the caring capacity of its environment? A. It overshoots the environment resistance C. It grows at its biotic potential
B, Its growth rate eventually declines D. It maintains a dynamic equilibrium with the environment
1083. What mode of feeding does soil organisms that release nutrients from dead organic matter into the soil have (2009 E.C.)?
A. Photoautotrophic B. Chemoautotrophic C. Saprophytic D. Parasitic

1084. If the number of young population is greater than the old population in a given country, its human population tends to
A. Grow steadily B. Decrease C. Increase D. Perish

1085. When farmers are using fewer and fewer number of crop varieties, what would happen to the genetic diversity of our crop plants (2009 E.C.)?
A. It would get eroded C. It would be more diverse
B. It would be more conserved D. Nothing would happen to it

1086. Which of the following is the most UNLIKELY action that would be expected from Ethiopians who have been given adequate biodiversity (2009 E.C.)?
A. Engagement in activities resulting in biodiversity loss
B. Supporting activities concerned with food security
C. Awareness about climate change and its problems
D. Engagement in biological resource conservation

1087. Which term better captures the concept of variety of organisms present in a whole continent as well as all the genes found in them? A. Biome B. Niche C. Biodiversity D. Ecosystem

1088. Which group of bacteria reduces nitrates to nitrogen gas in the nitrogen cycle (2009 E.C.)?
A. Nitrogen fixing bacteria C. Denitrifying bacteria
B. Ammonium ion forming bacteria D. Photosynthetic bacteria

1089. Which of the following contains members of a single species only?
A. Ecosystem B. Community C. Population D. Biosphere

1090. If the number of female population is greater than the male population in a given county, its human population tends to
A. Increase B. Decrease C. Remain constant D. Disappear

1091. The part of the earth that contains life is known as
A. Hydrosphere B. Biosphere C. Atmosphere D. Lithosphere

1092. The role (the general activities) of an organism in an ecosystem is
A. Niche B. Habitat C. Food chain D. Food web

1093. Organisms that live and feed on dead organic matter such as decaying wood are known as
A. Parasites B. Herbivores C. Saprotrophs D. Predators

1094. The major producers in aquatic environment are
A. Phytoplankton B. Blue green algae C. Bacteria D. Protozoan

1095. Each stage of the food chain is called
A. Consumer level B. Trophic level C. Grazer level D. Producer level

1096. The best description of climax community is
A. Complex and changing C. Complex and stable
B. Simple and stable D. Constantly changing

1097. The succession on a very dry rock or sand dune is called
A. Zerosere B. Xerophyte C. Hydrophyte D. Hydrosere

1098. The self-sustaining dynamic community of living things is
A. Biome B. Ecosystem C. Niche D. Habitat

1099. According to the exponential population growth curve
A. The immigration rate falls with increasing population size
B. Population growth increases and decreases
C. Population growth continues indefinitely
D. Population growth stops at the carrying capacity

1100. The conversion of atmospheric nitrogen to a usable form is
A. Nitrogen fixation B. Nitrification C. Denitrification D. Ammonification

1101. The beginning of soil formation from bare rock involves
A. Trees B. Lichens C. Shrubs D. Grasses

1102. The main factors that determine the types of terrestrial biomes in a certain geographic area (2009 E.C.)?
A. Soil and vegetation formation C. Soil and biological diversity
B. Complexity in ecological succession D. Precipitation and temperature

1103. The highest productivity in a given ecosystem is expected from
A. Producers B. Herbivores C. Consumers D. Predators

1104. Among the following choices, identify the ones that have identical DNA fingerprints (2003 E.C)?
A. Parents and children B. Fraternal twins C. Non-twin sibs D. Monozygotic twins

1105. Which group of organisms has a system of protein synthesis in which transcription and translation take place at separate times (2004 E.C)? A. In all eukaryotic organisms C. Only in prokaryotic organisms B, In multicellular animals only D. In both eukaryotic and prokaryotic organisms
1106. When an enzyme is denatured by heat or extreme pH, which one of the following does it lose (2004 E.C.)?
A. The peptide bond B. Secondary structure C. Primary structure D. Tertiary structure
1107. At which level of structural organization do proteins have the alpha helix shape (2007 E.C.)?
A. Primary structure B. Tertiary structure C, Secondary structure D. Quaternary structure
1108. Which characteristic of RNA makes it suitable for moving out of the molecule (2008E.C)?
A. Inability to replicate B. Its unstable nature C. Absence of thymine D. Smallness of its size
1109. How many daughter cells are produced from a single mitotic division (2003 E.C.)?
A. Two B. Four C. Six D. Eight
1110. Which one of the following refers to a change in a gene (2003 E.C.)?
A. Mutation B. Replication C. Protein synthesis D. Transcription
1111. In plant hybridization experiment, which one of the following is the best way to prevent self-pollination (2003 E.C.)?
A. To remove the stamens C. To cross flowers with bags
B. To cross pollinate flowers D. To make reciprocal crosses
1112. Suppose in a monohybrid cross 80 F2 plants were produced, what is the number of plants that are expected to have the dominant and the recessive phenotype (2003 E.C.)?
A. 70 dominant + 10 recessive C. 50 dominant + 30 recessive
B. 60 dominant + 20 recessive D. 40 dominant + 40 recessive
1113. In spite of their ability to form hybrids when mated, which one of the following factors is more important to keep horse and donkey as separate species (2003 E.C.)?
A. Their hybrid is not viable C. They cannot form hybrid zygotes
B. Their hybrid is sterile D. They are ecologically isolated
1114. Which of the following contains phosphate group in its molecule (2003 E.C.)?
A. Nucleotide B. Protein C. Cellulose D. Single sugar
1115. Choose the breeding method used by humans to produce new and improved varieties of plants and animals (2003 E.C.)?
A. Crossing over B. Artificial selection C. Natural selection D. Independent assortment
1116. Which one is the correct direction of transfer of genetic information in most living things (2003 E.C.)?
A. Protein------DNA----------mRNA C. Protein --------RNA-------DNA
B. DNA--------Protein---------tRNA D. DNA-------RNA-------Protein
1117. Which of the following is true about both DNA and RNA (2003 E.C)?
A. Both are single stranded C. Both have a five carbon sugar
B. Both are polymers of amino acids D. Both contain the same four nitrogenous bases
1118. If it is known that the total amount of DNA in a cell contains 300 nucleotides and adenine constitutes to 80 of these, how many nucleotides go to guanine (2003 E.C.)? A. 35 B. 70 C. 80 D. 140
1119. What proportion of the number of chromosomes found in a normal cell an angiosperm plant is expected in its endosperm tissue (2003 E.C.)? A. Half B. Some C. Two times D. Three times
1120. Which of the following phases of mitosis if blocked would produce a cell with twice as many chromosomes as the mother cell (2003 E.C.)? A. Interphase B. Prophase C. Anaphase D. Telophase
1121. Which of the following is the mode of reproduction in bacteria (2003 E.C.)?
A. Meiosis B. Binary fission C. Conjugation D. Lysogenation
1122. Which one of the following types of mutations is responsible for sickle cell anaemia (2003 E.C.)?
A. Addition of a base pair C. Deletion of a base pair
B. Substitution of a base pair D. Shift in the reading frame of the genetic code
1123. If, due to incomplete dominance, the F1 plants from a cross of red flowered x white flowered parents are pink, which of the following ratios are expected in F2 generation (2003 E.C.)?
A. 1 red : 2 pink : 1 white C. 1 red : 1 pink : 1 white
B. 2 red : 1 pink : 1 white D. 3 red : 1 pink : 1 white
1124. From which of the following sources did Charles Darwin get the idea that selection can change living organisms (2003 E.C.)? From:
A. The work of plant and animal breeders C. His observation of the Galapagos birds
B, The evolution theory of Lamarck D. The book Malthus

1125. Why is it that the typical diploid chromosome number of many organisms including human beings is an even number (2003 E.C.)?
A, Both parents contribute equal number of chromosomes C. It is only a coincidence
B, Meiosis reduces chromosome number D. C. Chromosomes duplicate before cell division

1126. If it is known the total number of the purine bases account for 50% of a DNA molecule and if each of the remaining bases are known to have the same proportion, what proportion is accounted for by thymine alone in the same molecule (2003 E.C.)? A. 25% B. 50% C. 75% 100%
1127. As was shown by Gregor Mendel in garden pea, what percentage of F2 generation of a monohybrid cross has the recessive phenotype (2004 E.C)? A. 75% B. 50% C. 25% D. 12.5%
1128. Which of the following parts of a flower did Mendel remove from young flowers to prevent self-pollination (2009 E.C.)? A. Stamens B. Sepals C. Petals D. Ovaries
1129. Which of the following is the sex cell constitution of human males (2009 E.C.)?
A. XX B. XY C. ZZ D.ZW
1130. Which of the following bases is NOT found in RNA (2009 E.C.)?
A. Adenine B. Guanine C. Cytosine D. Thymine
1131. What type of cross performed to determine whether the father was homozygous or heterozygous (2009 E.C.)? A. Monohybrid cross B. Dihybrid cross C. Back cross D. Double cross
1132. If a heterozygous tall pea plant (Tt) is crossed with a short pea plant (tt), what percentage of the progeny is expected to be short (2009 E.C A. 100% B. 75% C.50% D. 25%
1133. When Mendel crossed a tall pea plant with a short plant, the F1 progeny were all tall. What F1 did he obtain when he made the reciprocal cross (2009 E.C.)?
A. Short plants B. Extra-tall plants C. Tall plants D. Plants of average height
1134. Among the following ABO blood group genotypes, which one produces two types of antigens (2009 E.C.)?
A. I^AI^O B. I^BI^O C. I^AI^B DI^BI^B
1135. Which of the following methods do animal breeders use to produce domestic animals with hybrid vigor (2009 E.C.)?
A. Feeding with nutritive food C. Mating together related animals
B. Giving proper veterinary care D. Cross breeding their animals
1136. At which of the following generations of crosses between dominant and recessive homozygote parents are all the progeny heterozygous (2009 E.C.)?
A. P_1 generation B. F_1 generation C. F_2 generation D. F_3 generation
1137. Which of the following nitrogenous bases of nucleic acids is a purine base (2009 E.C.)?
A. Adenine B. Cytosine C. Thymine D. Uracil
1138. Which of the plants with the following genotypes is heterozygous (2009 E.C.)?
A. BBYY B. BbYy C. bbyy D. YYBB
1139. If in a DNA molecule consisting of 1000 base pairs, there are 300 adenine bases, how many guanine bases will be present (2009 E.C.)? A. 200 B. 400 C. 600 D.700
1140. Which one of the following is NOT a mutation (2004 E.C)?
A. DNA replication to form two daughter cells C. Gain of an extra chromosome by a cell
B. Deletion of a base pair from DNA D. Loss of a chromosome by a cell
1141. Mutation may be described as (2009 E.C.):
A. Phenotypic change C. Continuous variation
B. Change in gene structure D. Change due to hybridization
1142. What do geneticists call the genotype in which the two alleles of a pair are identical (2004 E. C.)?
A. Dominant B. Recessive C. Homozygous D. Heterozygous
1143. Which form of mutation is responsible for the disease known as leukemia (2009 E.C.)?
A. Duplication B. Insertion C. Inversion D. Deletion
1144. Which groups of organisms has a system of protein synthesis in which transcription and translation take place at separate times (2004 E.C.)?
A. In all eukaryotic organisms C. In multicellular animals only
B. Only in prokaryotic organisms D. In both eukaryotic and prokaryotic organisms
1145. Which one of the following is referred to as the First Law of Mendel (2004 E.C)?
A. The occurrence of alleles in pairs C. The dominance of one allele over the other

B. The equal contribution of alleles by both parents D. The separation of alleles during gamete formation

1146. Which of the following is the best way to check whether an individual having a dominant phenotype is homozygous or heterozygous for the trait (2004 E.C.)
   A. To cross it to a homozygous dominant individual
   B. To cross it to a homozygous dominant individual
   C. To cross it to homozygous recessive individual D. To self the individual

1147. Which of the following ideas is NOT a part of Darwin's theory of evolution (2004 E.C)?
   A. Over reproduction C. Existence of heritable variation
   B. Use-and-disuse of body parts D. Competitive for scarce resources

1148. In the process of amino acid condensation, which one of the following happens (2004E.C)?
   A. Oxygen is used up C. Water is released as a byproduct
   B. Carbon dioxide is released D. Protein is broken down into amino acids

1149. A genetic cross between two F1 hybrid pea plants having a yellow seeds (dominant) will yield what percent green-seeded (recessive) plants in the F2 generation (2004 E.C.)?
   A. 0% B.25% C. 50% D. &5%

1150. Among the following couples whose ABO blood genotypes are shown, which one can produce children, A,B,AB and O blood types (2004 E.C)?
   A) OO and AB B) BO and AA C) BO and AO D) BB and AO

1151. Which of the following pairs of molecules can give information about how much two species are evolutionary related to one another (2004)?
   A. DNA and proteins C. Starch and cellulose
   B. Lipids and carbohydrates D. Carbohydrates and proteins

1152. What would most likely result if mitosis fails to be accomplished by cytoplasmic division (2004 E.C.)?
   A. Two cells without nuclei C. Two cells each with one nucleus
   B. One cell without a nucleus D. One cell with two identical nuclei

1153. Which part of the angiosperm flower, are both essential for the success of hybridization experiments (2004 E.C)?
   A. Sepal and petal B. Gynoecium and androecium C. stamen and petal D. Pollen and filament

1154. In which of its contents RNA differs from DNA (2005)?
   A. Deoxyribose and guanine C. Ribose and uracil
   B. Ribose and thymine D. Phosphate and adenine

1155. Which of the following human diseases can be prevented by taking proper diet (2005 E.C.)?
   A. Degenerative diseases B. Social diseases C. Genetic diseases D. deficiency diseases

1156. Before making crosses which part of the flower did Mendel remove to avoid self- pollination (2005 E.C)?
   A. Stigma B. Ovule C. Ovary D. Stamens

1157. Which of the following is correct F2 phenotypic ratio of a monohybrid cross (2005 E.C)?
   A. 1:2 B. 1:1 C. 3:1 C. 2:2

1158. How many chromosomes do humans inherit from each of their parents (2005 E.C)?
   A. 23 chromosomes C. 46 chromosomes
   B. 23 pairs of chromosomes D. 46 Pairs of chromosomes

1159. Which of the following is true about the gene called sex (2005 E.C.)
   A. It is found on the Y chromosome C. It determines maleness
   B. Testes develop in its presence D. Females have two copies of these gene

1160. The four nucleotides that are used as building blocks of DNA differ from each other in their
   A. Organic base molecules C. Sugar molecules
   B. Phosphate molecules D. Fatty acids and glycerol

1161. The sheep "dolly" is an example of which biotechnological manipulation of animals by human (2005 E,C)?
   A. Transgenic animal C. Genetically engineered animal
   B. Cloned animal D. Hybrid animal

1162. Choose the one that is different from all the others (2005E.C)/
   A. Genetically modified organisms C. Pathogenic organisms
   B. Genetically engineered organisms D. Transgenic organisms

1163. In a cross between heterozygotes what proportion is expected to be homozygote recessive (2005E.C)?
   A. 25% B. 50% C. 75% D. 100%

1164. Gene silencing is the function of the following molecules (2005 E.C.)?

A. dsRNA B. mRNA C. SiRNA D. tRNA

1165. Which process is held responsible for chronic myelogenous leukemia (2005E.C)?
A. Translocation B. Translation C. Transcription D. Duplication

1166. Two parents of genotype Aa are cross bred. The alleles show complete dominance what proportion of the offspring will phenotypically look like their parents (2005 E.C)? A) 0 B. 1/4 C. 1/2 D. 3/4

1167. Among the following mating, the ABO blood genotypes of the parents are shown, identifying the mating in which all the children will have the same blood type (2005 E. C)?
A. AO x BO B. AA x OO C. AB x BO D. BB x AO

1168. If a new mutant allele arises in a certain population, which of the following factors determines if the allele is going to be adaptive or non-adaptive (2005 E.C)?
A. The environment in which the population in which the population lives
B. The rate at which the gene mutates
C. The population in which the gene is found
D. The use and disuse of the gene by population

1169. Suppose the amino acid coding region in a mRNA is 1200 nucleotides long, how long is the protein in terms of amino acid number (2005 E.C)?
A. 1200 amino acids B. 400 amino acids C. 600 amino acids D. 300 amino acids

1170. Which one of the following choices shows the end products of a mitotic cell division (2005 E.C)?
A. Gametes and ordinary cells C. Two genetically different cells
B, Four genetically different cells D. Two genetically identical cells

1171. What exactly happens during a substitution mutation (2005E.C)?
A. One base is replaced by different base
B. An extra base is added during DNA replication
C. A base is missed out during DNA replication
D. Changes occur in the arrangement of structure of a chromosome

1172. In a DNA molecule the "up-rights" of the ladder are made of
A. Sugar and phosphate B. Organic bases C. Sugar and organic bases D. Phosphate group and bases

1173. Which molecule in the cell is the constituent of the gene (2006E.C)?
A. Nucleic acid B. Protein C. Lipid D. Carbohydrate

1174. Which of the following is the distinguishing feature of amino acids that is not found in carbohydrates (2005E.C)? A. Carbon B. Oxygen C. Hydrogen D. Nitrogen

1175. In which of their structural parts do different molecules of amino acids differ from one another?
A. In their alpha-carbon chain C, In their amino group
B. In their R-group D. In their carboxyl group

1176. In a cross between round green pea of RRyy genotype and wrinkled yellow pea of rrYY genotype, what is the expected genotype of the F1 (2005 E.C)? A. RRyy B. rrYY C. Rryy D. RyYy

1177. Which of the following groups of animals have males with zz and females with zw sex chromosome constitution (2005E.C)? A. Grass hopper B. Mammals C. Birds D. Honey bees

1178. Which one of the following is the mechanism by which two genes located on the same chromosome are separated (2005E.C)?
A. Independent assortment B. Linkage C. Segregation D. Crossing over

1179. During protein synthesis, where in the cell does transcription take place (2005 E.C)?
A. Ribosome B. Nucleus C. Endoplasmic reticulum D. Golgi apparatus

1180. In some crosses of maize, the progeny produces better yield than the parents. What is this phenomenon known as (2006 E.C)? A. Hybrid vigour B. Heterozygosity C. Dominance D. Codominance

1181. Which molecules carry the instructions for protein synthesis (2006E,C)?
A. Carbohydrates and lipids B. DNA and RNA C. Amino acids D, Enzymes

1182. In protein synthesis what is produced during transcription (2006E.C)?
A. Protein B. DNA C. mRNA D. Polypeptide

1183. What is a perfect flower (2006 E.C)?
A. A flower with petal C. A flower with stamen and sepal
B. A flower with stamen and pistil D. A flower with sepal and petal

1184. Which of the following type of chromosome mutations gives rise to an extra chromosome (2006 E.C)?
A. Inversion B. Translocation C. Duplication D. Deletion

1185. Which of the following pairs of individuals have identical DNA finger prints (2006E.C)?

A. Father and son C. Brother and sister
B. Mother and daughter D. Monozygotic twins

1186. Which of the following mating process children all having the same ABO blood phenotypes (2006 E.C)?
A. AO x AB B. BB x OO C. AO x BO D. AA x BO
1187. If a DNA contains, 10% thymine what is the percentage of cytosine in the DNA (2006E.C)?
A. 10% B. 30% C.40% D.90%
1188. Which one of the following are the two major constituents of eukaryotic chromosomes (2007E.C)?
A. DNA and RNA B. RNA and lipid C. DNA and protein D. DNA and carbohydrate
1189. Which of the following is true about mutations that occur in normal body cells (2007E.C)?
A. They never lead to cancerous cells
B. They never pass to the next generation
C. They never damage the affected cells
D. There is no way that they kill the affected cells
1190. In which of the following ways do retroviruses differ from other RNA viruses (2007 E.C)?
A. Their genetic material is DNA C. Their genetic material is RNA
B. They copy RNA to DNA molecule B. They copy RNA from DNA molecule
1191. To what purpose molecular biologists use the technology known as a polymerase chain reaction or PCR (2007 E.C)?
A. To insert DNA into plasmid C. To insert plasmid into bacteria
B. To multiply copies of DNA molecules D. To produce DNA from RNA
1192. Which element is found in nucleic acids (2007 E.C)?
A. Calcium B. Iron C. Magnesium D. Phosphorus
1193. What do you call a group of genetically identical plants produced by vegetative reproduction (2007 E.C)?
A. Hybrid B. Family C. Clone D. Genus
1194. What is the base found in RNA in place of thymine of DNA (2007E.C)?
A. Cytosine B. Guanine C. Thymine D. Uracil
1195. What does a restriction enzyme do (2007E.C)?
A. Restricts transcription C. Prevents the DNA from replicating
B. Cuts DNA at specific sites D. Hydrolyses the DNA molecule
1196. A cow was found to yield much higher milk than any of the breeds of the parental cattle. What could be the most probable reason for this (2007 E. C)?
A. Dominant genes B. Recessive genes C. Hybrid vigor D. Co-dominant genes
1197. Which of the following expression is more related to the phrase "survival of the fittest" (2007 E.C)?
A. Natural selection C. Gene mutation
B. Mendelian inheritance D. Inheritance of acquired characteristics
1198. Which two nitrogenous bases belong to purines (2007E.C)?
A. Adenine and thymine B. Guanine and cytosine C. Adenine and guanine D. Thymine and uracil
1199. Which one of the following is true (2007 E.C)?
A. Recessive alleles are only expressed in the homozygote
B. Dominant alleles are expressed only in the heterozygote
C. Recessive alleles are expressed in the heterozygote
D. Genetically modified organisms are never used to manufacture vaccine
1200. Which hormone promotes human sleepfulness in darkness and controls the sleep-wake cycle (2007 E,C)?
A. Insulin B. Melatonin C. Adrenalin D. Thyroxin
1201. Which process produces mRNA during protein synthesis (2007 E.C)?
A. Translation B. Replication C. Mutation D. Transcription
1202. Which of the following is true about gene mutation (2008 E.C)?
A. Altering the DNA sequence of the gene C. Change in the position a block of genes
B. Addition of genes to a chromosome D. Loss of genes from a chromosome
1203. Suppose in a monohybrid cross 80 F2 plants were produced, what is the number of the plants that are expected to have the dominant and the recessive phenotypes?
A. 60 dominant: 20 recessive C. 70 dominant:10 recessive
B. 40 dominant: 40 recessive D. 50 dominant: 30 recessive
1204. In cell division, what is the phase that comes following the metaphase called (2007 E.C)?
A. Prophase B. Interphase C. Anaphase D. Telophase

1205. What is the use of enzymes circumstance that causes the health condition known as sickle cell anemia (2007 E. C.)?
   A. DNA denaturation C. Haemoglobin mutation
   B. RNA mutation and decay D. Phosphate mutagenesis
1206. Which of the following is the correct constitution of the sex chromosome of a normal woman (2008 E.C)?
   A. XY B. XX C. XO D. XXY
1207. Which of the following sequences represents the correct change in number of chromosomes during fertilization (2007 E.C)? A) $n + n \longrightarrow 2n$ B)$2n \longrightarrow 2n$ C) $n \longrightarrow n$ D) $2n \longrightarrow n+n$
1208. Why is it that the typical diploid chromosome number of many organisms including human beings is an even number?
   A. Both parents contribute equal number of chromosomes
   B. Meiosis deduces chromosome number
   C. Chromosomes duplicate before cell division
   D. Meiosis deduces chromosome number D. It is only coincidence
1209. Which of the following is made up of globular proteins (2007 E.C)?
   A. Enzymes B. Keratin C. Collagen D. Glycogen
1210. Which of the following is true about sex determination in birds (2008E.C)?
   A. They have the heterozygotic X and Y chromosomes
   B. Males have heterozygotic W and Z chromosomes
   C. Females have the homozygotic WW chromosomes
   D. They have the heterozygotic W and Z chromosomes
1211. How many amino acids are there in all known proteins (2008 E.C)?
   A. About 10 B.About 20 C. About 35 D. About 46
1212. Which of the following crosses will produce progeny with phenotypic ratio of 3:1 (2008 E.C)?
   A. Crossing the F1 to the dominant parent C. Crossing two homozygote individuals
   B. Crossing the F1 to the recessive parent D. Crossing two heterozygote individuals
1213. Which of the following molecule is capable of mutation?
   A. Proteins B. Nucleic acids C. Carbohydrates D. Lipids
1214. What percentage of F2 progeny of a monohybrid cross is expected to have the recessive phenotype (2008 E.C)? A. 100% B. 75% C. 25% D. 50%
1215. Deficiency of which of the following nutrients in human diet is likely to result in a deficiency of some co-enzymes like FAD (2008 E. C.)? A. Essential amino acids C. Carbohydrates C. Vitamins D. Saturated fatty acids
1216. Which of these could be a gamete? A. GgRr B. GRr C. Gr D. Gg
1217. In a codon on the mRNA is UUU, what is the complementary anticodon on the tRNA (2008E.C)?
   A. UUU B. GGG C. CCC D. AAA
1218. If a clone is produced by transferring a nucleus of animal A to an enucleated egg of animal B and the egg then implanted in the uterus of animal C, which animal would the clone resemble most (2008 E.C)?
   A. Animal C B. Anima B C. Animal A D. Other animals
1219. How many years have passed since Darwins book on the theory of evolution was published (2008E. C)?
   A. About 50 years B. About 120 years C. About 160 years D. About 100 Years
1220. Which of the following techniques is used to separate DNA fragments according to their size on a gel?
   A. Radioactive labeling C. Electrophoresis
   B. Southern blotting D. Digestion by restriction enzyme
1221. Which of the following can be understood about living things from the study of how breeders improved domesticated plants and animals (2008 E. C.)?
   A. Living things tend to over-reproduce C. Natural resources are of limited supply
   B. Living things can be improved through selection D. Individuals compete for resources
1222. Linked genes do not assort
   A. when dominant B. if crossed over C. when recessive D. independently
1223. Suppose two heterozygous round yellow (RrYy x RrYy) pea plants were crossed and seeds were produced, how many of the seeds are expected to the heterozygous round yellow (2008 E.C.)?
   A. 4 B. 16 C. 9 D. 3
1224. Why is it that mutations are considered as one of the raw materials of evolution (2007 E.C)?
   A. They contribute to new variations in organisms
   B. They are usually related to environment in which they appear

C. They are mostly beneficial to the environment in which they appear
D. They usually become the causes for species extinction

1225. Which one of the following is consistent with understanding of human evolution (2007E.C)?
A. Bipedalism was never important in human evolution
B. Larger brain size had no contribution to evolution of human species
C. Human ancestry has no relation whatsoever with that of the chimpanzees
D. Fossils of Lucy and Ardi provided evidence for human origin

1226. What is the branch of biology that that studies about the origin of and gradual changes of living things (2006E.C)? A. Microbiology B. Evolution C. Mutation D. Genetics

1227. Which of the following groups are believed to be the first photosynthetic organisms to evolve on Earth (2009 E.C.)? A. Green plants B. Green algae C. Blue green algae D. Lichens

1228. Which of the following factors brings about changes both during evolution and breeding of plants and animals (2009 E.C.)?
A. Limited resources B. Selection C. Production of excess progeny D. Competition

1229. Which of the following reproductive isolating mechanisms keeps the horse and the donkey as two independent species (2009 E.C.)?
A. Hybrid inviability C. Ecological isolation C. Hybrid infertility D. Habitat isolation

1230. Among the following four processes, identify the one that probably evolved before the other three (2009 E.C.)? A. Aerobic respiration C. an Anaerobic respiration
B. Oxidizing atmosphere D. Photosynthesis

1231. Which of the following is the most possible mode of evolution by which many species of Darwin's finches evolved in the Galapagos islands (2009 E.C.)?
A. Phyletic evolution C. Divergent evolution
B. B. Convergent evolution . D. Sympatric evolution

1232. Which of the following characteristics can show the evolutionary relationships among organisms (2009 E.C.)?
A. Structure having similar functions C. Presence of homologous structures
B. Presence of analogous structures D. Structures having different origins

1233. Which of the following species isolating processes could lead to the evolution of a new species by the mechanisms known as sympatric speciation (2009 E.C.)?
A. A river that changed its course of many years
B. A new mountain range that was created many years ago
C. Populations of species having different breeding seasons
D. A land mass that separated two water bodies for many years

1234. For which of the following can divergent evolution be taken as an alternative name (2009 E.C.)?
A. Allopatric evolution B. Sympatric speciation C, Adaptive radiation D. Disruptive selection

1235. Which one of the following is the result of the similarity observed between the wings of a bird and a pterodactyl (extinct flying reptiles) (2009 E.C.)?
A. Convergent evolution C. Directional selection
B. stabilizing selection D. Divergent evolution

1236. Which one of the following modes of natural selection was responsible for the fast increase in the number of the black form of moth in Europe during industrial revolution
A. Stabilizing selection B. Normalizing selection C. Disruptive selection D. Directional selection

1237. Which of the following played an important role in the evolution of human being (2009 E.C.)?
A. Emergence of wings in addition to limbs C. Development of even toes in the forearms
B. Development of feathers and hollow bones D. Development of opposable thumb to grasp

1238. Which group of organisms is found at a lower level of evolution according to the modern principles of biology (2003 E.C)? A. Protista B. Fungi C. Animals D. Plants

1239. Which of the following is NOT true about the nature of the first form of organism on earth (2007 E.C)? They were A. Prokaryotic B. Aerobic C. Unicellular D. anaerobic

1240. Which of the following came first in the course of organic evolution (2007 E.C)?
A. Photosynthetic organisms C. Land plants
B. Free oxygen in the atmosphere D. Multicellular organisms

1241. Animals without close evolutionary relations are sometimes seen to have similar structures adapted for the same function. Which evolutionary principle is illustrated by this observation (2003 E.C)?

A. Converging evolution B. Sympatric evolution C. Diverging evolution D. Allopatric evolution

1242. Which one of the following is most important for speciation to occur (2003 E.C)?
A. Hybridization among populations C. Isolation of one gene pool
B. Migration between populations D. Free flow of genes between populations

1243. Which of the following fossils is the nearest to the common ancestor of the hominids and the apes (2004 E.C)? A. *Homo hablis* B. *Ardipithecus animals* C. *Homo erectus* D. *Australopithecus afarensis*

1244. Which of the following ideas was NOT a part of Darwin's theory of evolution (2004E.C)?
A. Over-reproduction C. Existence of heritable variation
B. Use-and-disuse of body parts D. Competition for scarce resources

1245. To which genus of human-like organisms does Lucy belong (2004 E.C)?
A. The genus Homo C. The genus Sahelathropus
B. The genus Ardipithechus D. The genus Australopithecus

1246. Why fossils of soft-bodied organisms are usually relatively rare in the environment (2004 E.C)?
A. They all lived in environments where sedimentation did not occur
B. They were never common in environments in which they lived
C. They are generally small in size D. Their bodies decompose readily

1247. Carbon 14 has a half-life of about 5730 years. Suppose a fossil contain only 12% of the amount of carbon 14 normally present in living organisms, how old is the fossil (2004 E. C.)?
A. 5730 years B. 11460years C. 17190 years D. 22920 years

1248. If a radioactive substance that weighs one kilogram has a half-life of 100 years what would be the percentage of the substance left after 300 years (2006 E.C) A. 50 B. 30 C. 25 D. 12.5

1249. The half- life of carbon 14 is about 5730years. If a fossil is 17 years old, about what percent of this original carbon 14is present in the fossil (2006 E.C)? A. 75% B50% C. 25% D. 12.5%

1250. If a substance that weighs 2000 grams and has a half-life of 100 years is left with only 250 grams, for how long has the radioactive decaying activity been undergoing (2007 E.C)?
A. 200 years B.250years C. 300 years D. 500 years

1251. According to Lamarck's theory of evolution, what is the mechanism by which evolving organisms acquire new structures (2006E.C.)? A. Mutation C. Use-and-disuse of parts of the body
B, Heredity variation D. Recombination of ancestral genes

1252. "Rats can be produced by keeping rags and grains at the corner of a room". Which of the following line of thinking supports this statement (2008 E.C)?
A. Darwinian evolution
B. Alternation of generation C. Spontaneous generation D. Sexual reproduction

1253. What is the specific name of biological scientists who do research that tries to find evidence of life on other planets in the solar system (2008 E.C)? A. Neurobiologists B. Astrobiologists C. Paleontologists D. Biogeographers

1254. What are the most likely causes of variations within species (2005 E.C)?
A. Mitosis and a sexual reproduction C. Over population and over production
B. Vegetative propagation and cloning D. Mutation and sexual reproduction

1255. In which hominid species did scientist find the smallest brain size (cranial activity) (2005 E.C)?
A. *Homo sapiens* B. *Homo erectus* C, *Homo habilis* D. *Homo neanderthalis*

Brain capacity of *Homo sapiens* is 1400cm^2 in size Brain capacity of *Homo erectus* is 800cm^2 in size Brain capacity of *Homo habilis* is 700cm^2 in size Brain capacity of *Homo neanderthalensis* is 1200cm^2 in size

1256. When two species are compared which of the following sources of evidence in least informative about the degree of relationships between species (2005 E.C)?
A. Nucleotide sequence of DNAs C. Amino acid sequence of proteins
B. Glucose sequence of polysaccharides D. DNA –DNA hybridization

1257. What is the reproductive isolating mechanism called if two species of frogs do not interbreed because they cannot understand the mating time of one another (2005 E.C)?
A. Temporal isolation B. Isolation by place C. Seasonal isolation D. Isolation by distance

1258. What is the reproductive isolating mechanism called if two species of frogs do not interbreed because they cannot understand the mating calls (2005 E.C)? A. Seasonal isolation C. Temperature isolation
B, Behavioral isolation D. Isolation by distance

1259. Which of the following characteristics can show the evolutionary relationships among organisms (2005 E.C)?
   A. Structures having similar functions C. Structures having the same size
   B. Structures having common origin D. Structures having different origin
1260. What do you call structures that have the same evolutionary but now are different in structure or have different functions (2006 E.C)?
   A. Indigenous B. Endemic C. Homologous D. Analogous
1261. Which of the following pairs are analogous structures (2006E.C)?
   A. Wing of a bird and wing of a butterfly C. Front leg of a horse and a human arm
   B. Wing of a bird and wing of a bat D. Front leg of a frog and wing of a bat
1262. What do you call structures that have the same evolutionary origin even though they may now have different structural make up or function (2008 E.C)?
   A. Endemic B. Analogous C. Homologous D. Indigenous
1263. Which of the following conclusions can be drawn from the structural similarities observed between the flippers of whales and arms of human (2006 E.C)?
   A. The human species began life in the ocean
   B. Whales are older than the human species
   C. The human species and whales share a common ancestry
   D. Whales have evolved from early humans that went back to the ocean
1264. Among the following fossil hominid species, which one is the oldest of all (2006 E.C)?
   A. *Homo erectus* C. *Ardipithecus ramidus*
   B. *Australopithecus afarensis* D. *Australopithecus africans*
1265. In the process of the evolution of life on earth, which of the following four processes evolved last (2005 E. C)? A/ Photosynthesis B. Chemosynthesis C. Aerobic respiration D. Photo auto-tropism
1266. Which one of the following is NOT important for evolutionary change of a population (2005 E.C)?
   A. Over reproduction C. Existence of heritable variation
   B, Insufficient natural resource D. Survival of all that are born
1267. Among the following which one is the best criterion to show that the populations belong to the same species (2005 E.C)?
   A. Morphological similarity C. Physiological similarity
   B. Inhabiting the same geographical area D. Production of fertile offspring
1268. What is the reason that Louis Pasteur used a swan-necked flask instead of straight necked one in his experiment designed to disprove the theory of spontaneous generation (2004 E.C)?
   A. To allow free passage of air to the broth inside the flask
   B. To prevent scape of any micro-organisms from the flask
   C. To keep the broth in the flask hot to kill micro-organisms
   D. To trap particles from the air that might enter the flask before reaching the broth
1269. Which of the following pairs of molecules can give information about how much two species are evolutionary related to one another (2004 E. C)?
   A. DNA and proteins C. Lipids and carbohydrates
   B. Starch and cellulose D. Carbohydrates and proteins
1270. If two species are known to belong to the same order, they must also belong to which taxonomic category (2008E.C)? A. Class B. Family C. Species D. Genus
1271. What kind of natural selection is at work in a situation where individuals at both extreme ends of the range get better survival advantages than those around the middle (2005 E.C)?
   A. Stabilizing B. Disruptive selection C. Directional D. Selection that removes the extremes
1272. In which of geologic period does the fossil record show more diverse and relatively higher forms of organisms (2005E.C)? A. Devonian B. Cretaceous C. Jurassic D. Permian
1273. Which one of the following is an evolutionary requirement for two sub-populations of species to evolve into independent species (2007E.C)? A. Free exchange of genes C. Geographic isolation
   B, Free migration between populations D. Absence of natural selection
1274. Based on similarity in number of amino acids found in haemoglobin, which one of the following animals has closer phylogenetic relation to human beings (2008E.C)? A. Chicken B. Horse C. Frog D. Gibbon

1275. Which of the following did the early heterotrophs do that probably assisted the origin of autotrophs (2006 E.C)?
   A. The added oxygen and chlorophyll to the environment
   B. The added carbon dioxide to the environment
   C. They stored energy in the bonds of inorganic compounds
   D. They manufactured food from carbon dioxide and oxygen

1276. Which of the following can be taken as an evidence for evolution from the field of plant and animal breeding (2006)?
   A. Artificial breeding always creates new species
   B. Artificial breeding only produces new organisms with higher yield
   C. Artificial breeding shows that natural selection can produce variations
   D. Artificial breeding can produce new variations in organisms

1277. According to theory of evolution as proposed by Charles Darwin, which one of the following is the most important driving force of evolution (2004 E.C)?
   A. Mutation B. Genetic recombination C. Over-reproduction D. Natural selection

1278. What does an etiologist study (2007E.C)?
   A. Insect diet B. Soil type C. Fossil fuel D. Animal behavior

1279. Which one of the following behavioral biologists is known for his study about imprinting behavior in animals (2007 E.C)?
   A). W. Kohler B). B.F. Skinner C). Ivan Pavlov D). Konrad Lorenz

1280. Baby ostriches tend to follow the first moving object that they see as they hatch out of the eggs. What kind of animal behavior does this demonstrate (2007 E.C)?
   A. Positive taxis B. Positive kinesis C. Innate behavior D. Learned behavior

1281. Behavior that is repeated on a daily basis is referred to as
   A. Lunar B. Imprinting C. Circadian D. Seasonal

1282. An experimental animal stopped responding to a stimulus that has been repeated to many times. What type of learned behavior is this (2006 E.C)?
   A. Latent learning B. Imprinting C. Habituation D. Operant conditioning

1283. Choose the one that had the LEAST contribution to human evolution (2008 E.C)?
   A. Development of bipedalism C. Attaining opposable thumb
   B. Adaptation to flight D. Increasing brain size

1284. Which of the following involves trial and error learning (2008 E.C)?
   A. Operant conditioning B. Sensitization C. Habituation D. Classical conditioning

1285. Which of the following is a learned behavior (2008E.C)?
   A. Suckling of the new born at mothers breast
   B. Withdrawal of hands suddenly from hot objects
   C. Salivation by conditioned dogs at the sound of a bell
   D. Blinking the eyes when something gets into them

1286. Which of the following is an example of an orientational innate behavior
   A. Kinesis in woodlice C. Sudden withdrawal of limbs from hot object
   B. Blinking of the eyes D. Nest Building by weaver birds

1287. In Pavlov's experiment on the classical conditioning of dogs, what does the reaction of to the sound of the bell represent (2007E.C)?
   A. The conditioned stimulus C. The unconditioned stimulus
   B, The conditioned response D. The unconditioned response

1288. Suppose when you first enter a room you notice an unpleasant smell which you eventually forget about its presence, what is this behavior called (2007 E.C)?
   A. Latent B. Insight learning C. Habituation D. Operant conditioning

1289. Which of the following is true about an innate behavior (2003 E. C)?
   A. It is non-adaptive behavior C. It is learned behavior
   B. Members of a species behave similarly D. It is environmentally determined

1290. Which of the following is more true about the male of the honey bee (2006 E,C)?
   A. It has no father B. It is diploid C. It is sterile D. It regulates the colony

1291. In which of the activities of the honey bee colony are worker bees involved (2006 E.C)?
   A. Laying eggs C. Reproductive functions C. Serving as queens D. Taking care of the larva

1292. Which one of the following do bees use to inform other bees about the location and distance of new nectar discover (2005E.C)?
A. Pheromones B. Buzzing noise C. Waggle dance D. Vibration of wings

1293. Which of the following is NOT classified as a learned behavior (2005 E.C)?
A. Insight B. Latent C. Innate D. Conditioned

1294. What do we call the learned behavior in a mouse that had just escaped from the mouth of a cat jumped violently at a sight touch by a trivial object (2005 E.C)?
A. Latent learning B. Conditioning C. Sensitization D. Imprinting

1295. To what kind of animal behavior can a spinning of a web by spider be classified (2005 E.C)?
A. Learned behavior C. Experimental behavior
B. Instinctive behavior D. Accidental behavior

1296. In the classical conditioning experiment performed by Pavlov on dogs, which of the following alternatives is the unconditioned stimulus (2004E.C)?
A. The sound of the bell C. The salivation at the sound of the bell
B. The smell of the food D. The salivation at the smell of food

1297. Which of the following types of movements in response to a stimulus has no specific direction (2004E.C)?
A. Taxis B. Kinesis C. Gravitropism D. Phototropism

1298. What is the role of the worker honey bee just after it emerges (2003 E.C)?
A. Forage for nectar, pollen and water C. Guard the hive
B. Clean out dirt honeycomb D. Build the honey comb

Role of the worker bees	
1st week after emergence	Clean out dirty honeycomb, feed larvae
2nd week after emergence	Build honeycomb, receive food from incoming forager
3rd week after emergence	Guard the hive, remove corpse
4th week and afterwards	Forage for nectar, pollen and water. But they die at 5-7 weeks

1299. During seasons of reproduction, the males of some species of birds produce colorful feathers to attract females. What do etiologists call this method of communication in animals (2004 E.C)?
A. Visual B. Chemical C. Auditory D. Touch

1300. Why is it that the wood lice are typically found under logs, stones, bark and amongst leaf litters (2004E.C)?
A. To be sheltered in a dry windy environment
B. To run away from the area where the air is humid
C. To make sure that they are in the hottest place all the time
D. To reduce the rate at which water is lost from their bodies

1301. Wood lice increase their movement in different directions in response to increased light intensity. This is an example of which of the following (2003E.C)?
A. Positive taxis B. Kinesis C. Negative taxis D. Phototropism

1302. It is said that a goat mother accepts and nurses as her own kid any young that she smells at a certain critical period, and rejects all others. This is an example of (2003E.C) ;
A. Habituation B. Insight learning C. Imprinting D. Sensitization

1303. Fixed action patterns are: A. Innate B. regular C. unvarying D. all of the above

1304. Among the following, which one is learned behavior (2005 E.C)?
A, Reflex action B. Imprinting C. Habituation D. Fixed action pattern

1305. In Pavlov's classical conditioning experiment on dogs, which one of the following is the unconditioned response (2003)?
A. The sound of the bell before presenting food C. The site of food from far away
B. The salivation of the dog at the site of food D. The salivation of the dog at the sound of the bell

1306. Which type of animal behavior happens without learning (2009 E.C.)?
A. Innate B. Insight C. Latent D. Conditioned

1307. Which of the following activities of an organism do we call a behavior (2009 E.C.)?
A. Reception of external stimuli C. Responding to stimulus
B. Reception of internal stimuli D. Lack of receptors to receive stimuli

1308. Which of the following is necessary for learning to occur?
A. Punishment B. Reward C. Motivation D. All of the above

1309. A reflex action that involves internal organs such as the heart is referred to as (2009 E.C.)?
A. Somatic reflex B. External reflex C. Spinal cord reflex D. Autonomic reflex

1310. All of the following statements about territoriality are true EXCEPT:
A. It is adaptive in that it tends to reduce conflict, and control population growth
B. It ensures the efficient use of environmental resources
C. It is not related to the animals reproductive success D. All are true statements

1311. Which of the following organs serve as a coordinating system in the reflex action (2009 E.C.)?
A. Spinal cord B. Sense organs C. Nerve cells D. Muscle

1312. To which category of behavior does the human behavior that involves the strengthening of existing responses or the formation of new responses to existing stimuli that occur because of practice or repetition belong (2009 E.C.)?
A. Learned behavior B. Innate behavior C. Instinctive behavior D. Inborn behavior

1313. Which of the following is NOT grouped under genetically pre-programmed pattern of behavior (2009 E.C.)?
A. Reflex action in humans C. Orientational behavior
B. Conditioned behavior D. Instinctive behavior

1314. Courtship behavior
A. Enables members of species to recognize and mate with a member of the same species
B. is reflex C. is learned D. Both A and C are correct

1315. Behavior: A. is a pattern of activities of an organism in reacting to stimuli C. may occur without stimuli
B, involves responses to external stimuli only D. is basically the same in all organisms

1316. A reflex involves
A. Changing of behavior C. Learning
B. Fixed pathways of nervous system D. Trial and error

1317. The behavior known as ritual fighting is mostly associated with:
A. Territorial behavior C. Orientational behavior
B. Courtship behavior D. Social behavior

1318. The larvae of most insects move away from light. What kind of behavior is this?
A. Kinesis B. Taxis C. Tropism D. Imprinting

1319. The coordinated response of an organism to external and internal stimuli is called:
A. Fixed action B. Entropy C. Aggression D. Behavior

1320. The biological clock of mammals is located in:
A. Prostate gland B. Hypothalamus C. Cerebrum D. Cerebellum

1321. Worker bees are: A. fertile female B. sterile females C. sterile males D. fertile males

1322. Which of the following is NOT an example of innate behavior?
A. Operant conditioning B. Orientational behavior C. Reflex action D. Instinctive behavior

1323. In the classical conditioning experiments on dogs made by Ivan Pavlov, which of the following was the conditioned response? A. Salivation of dog for bell ringing C. Presentation of meat by Pavlov
B, Ringing of bell by Ivan Pavlov D. Salivation of dog for meat

1324. Which of the following statement is not correct?
A. Knee jerk reflex is a somatic reflex
B. Reflex actions are protective
C. Heat rate is controlled by autonomic reflexes
D. Peripheral nervous system comprises of brain and spinal cord

1325. In one of the following learned behaviors, a naturally occurring stimulus is associated with a conditioned stimulus. A/ Insight learning B. Sensitization C. Classical conditioning D. Habituation

1326. Sneezing and shivering is an example of:
A. Imprinting B. Innate behaviors C. Reflexes D. Instinct behavior

1327. On average, social behavior:
A. Decreases group survival C. Increases the number of deaths
B. Increases individual fitness D. Increases agonistic behavior

1328. The way an organism reacts to stimuli in its environment is
A. Behavior B. learning C. conditioning D. imprinting

1329. A decrease in response to the stimulus that neither rewards nor harms an animal is called
A. Instinct B. operant conditioning C. habituation D. classical conditioning
1330. Insight learning is common among:
A. Dogs B. primates C. birds and insects D. birds only

1331. Animal behaviors can evolve through natural selection because
A. what animal learns is incorporated into its genes
B. all behavior is completely the result of genes
C. all behavior is completely the result of environmental influences
D. genes that influence behavior that increases an individual's fitness can be passed on to the next generation
1332. A behavior that appears in its fully functional form the first time the animal performs it is
A. Learned B. habituated C. imprinted D. innate
1333. A threatening behavior with which an animal exerts dominance over another is
A. Migration B. courtship C. habituation D. aggression
1334. Each year, a bird called the American redstart travels from its winter home in South America to its nesting area in New York. This behavior is called:
A. Migration B. competition C. imprinting D. courtship
1335. Which of the following is NOT a type of social behavior?
A. Operant conditioning B. territoriality C. hunting in a park D. courtship
1336. A system of communication that uses meaningful sounds, symbols, or gestures according to specific rules is called: A. Behavior B. language C. competition D. a signature
1337. A rat that learns to press a button to get food is exhibiting
A. Insight learning B. classical conditioning C. operant conditioning D. habituation
1338. A dog that always salivates at the ringing of a bell is exhibiting
A. Insight learning B. classical conditioning C. operant conditioning D. habituation
1339. A chimpanzee that stacks boxes in order to reach a banana hanging from a ceiling is showing
A. Insight learning B. classical conditioning C. operant conditioning D. habituation
1340. A bird that stops responding to a repeated warning call when the call is not followed by an attack is showing:
A. Insight learning B. classical conditioning C. operant conditioning D. habituation
1341. Which kind of behavior does NOT evolve learning?
A. Habituation B. Trial and error C. Imprinting D. Instinct
1342. A male three-spined stickleback fish will attack male red-belled sticklebacks and models of fishes that have a red underside. It will not attack males or models lacking the red underside. What can you conclude from the three-spined stickleback's behavior?
A. The stimulus for an attack is a red underside
B. The stimulus for an attack is aggression
C. The stimulus for an attack is the presence of a fish with red fins
D. The stimulus for an attack is the presence of model
1343. Which of the following is NOT an innate behavior?
A. A dog looking for its food dish C. A spider spinning a web
B, A baby mammal sucking a milk D. A worm moving away from bright light
1344. Any change, rather than an injury, that disrupts the normal functions of a person's body system is a: A. Disease B. pathogen C. toxin D. vector
1345. Disease causing agents such as viruses, bacteria, and fungi are known as
A. Antibodies B antigens C. pathogens D. toxins
1346. The bodies most widespread nonspecific defense against pathogens is (are)
A. Tears B. mucus C. saliva D. skin
1347. A nonspecific defense reaction to tissue damage cause by injury or infection known as
A. the inflammatory response C. active immunity
B. cell-mediated immunity D. passive immunity
1348. Injecting antibodies from an animal to help prevent a disease from occurring in a human is called
A. active immunity B. passive immunity C. antibiotic therapy D. vaccination

1349. The main target cells of HIV are

A. T-lymphocytes C. B-lymphocytes
B. cells in the liver D. insulin producing cells in the pancreas

1350. All of the following prevent pathogens from entering the human body EXCEPT
A. Red blood cells B. tears C. mucus D. skin

1351. Which of the following lymphocyte produces antibodies that are released into the blood stream?
A. Cytotoxic T cells B. Helper T cells C. Phagocytes D. Plasma cell

1352. Which of the following is NOT a white blood cell?
A. Interferon B. Macrophage C. Cytotoxic T cell D. Lymphocyte

1353. Stabilizing selection:
A. selects those individuals with a phenotype near the mean
B. Operates to reduce the population's variability
C. Is common in an environment that has been stable for an extended period of time. D. All of the above

1354. Which of the following is man's distinctive biological feature?
A. Bipedal, gait, learning and intelligence C. rapid development of cerebral cortex
B. Mechanical skills D. Making and using tools, E. All of the above

1355. Which of the following is prevented from taking place if populations are separated by geographic barrier? A. Gene flow B. Evolution C. Natural selection D. Mutation.

ANSWER FOR THE QUESTIONS

1	B	51	A	101	B	151	C	201	C	251	A	301	C	351	D	401	D	451	B	501	A	551	B
2	B	52	C	102	B	152	A	202	D	252	B	302	C	352	A	402	C	452	E	502	B	552	C
3	B	53	D	103	C	153	C	203	B	253	A	303	B	353	C	403	D	453	D	503	A	553	D
4	C	54	B	104	D	154	C	204	A	254	B	304	A	354	D	404	C	454	B	504	D	554	B
5	B	55	B	105	B	155	D	205	B	255	D	305	C	355	B	405	B	455	A	505	A	555	A
6	B	56	C	106	A	156	A	206	D	256	C	306	D	356	A	406	A	456	D	506	B	556	C
7	D	57	B	107	B	157	B	207	B	257	C	307	C	357	D	407	D	457	A	507	C	557	D
8	A	58	B	108	A	158	D	208	A	258	B	308	C	358	F	408	E	458	A	508	A	558	A
9	C	59	A	109	C	159	C	209	D	259	C	309	B	359	A	409	D	459	D	509	A	559	C
10	A	60	B	110	B	160	A	210	A	260	B	310	B	360	D	410	E	460	D	510	D	560	B
11	C	61	D	111	C	161	D	211	A	261	D	311	C	361	D	411	D	461	D	511	A	561	A
12	C	62	A	112	A	162	C	212	B	262	D	312	A	362	D	412	E	462	E	512	D	562	A
13	A	63	B	113	A	163	D	213	A	263	A	313	B	363	B	413	D	463	A	513	D	563	C
14	C	64	C	114	C	164	C	214	B	264	C	314	D	364	D	414	B	464	B	514	E	564	D
15	D	65	A	115	D	165	D	215	D	265	C	315	C	365	D	415	B	465	A	515	A	565	C
16	C	66	D	116	C	166	B	216	A	266	D	316	C	366	D	416	B	466	D	516	C	566	A
17	B	67	B	117	C	167	D	217	D	267	A	317	D	367	E	417	A	467	B	517	C	567	B
18	B	68	C	118	D	168	C	218	C	268	A	318	B	368	C	418	D	468	A	518	B	568	B
19	A	69	C	119	B	169	C	219	C	269	C	319	B	369	B	419	C	469	E	519	D	569	D
20	D	70	D	120	B	170	B	220	B	270	C	320	B	370	C	420	C	470	C	520	C	570	B
21	C	71	C	121	B	171	A	221	A	271	B	321	A	371	A	421	D	471	D	521	B	571	A
22	C	72	B	122	C	172	C	222	A	272	D	322	A	372	D	422	C	472	D	522	A	572	D
23	C	73	B	123	C	173	C	223	D	273	C	323	C	373	B	423	D	473	A	523	A	573	C
24	B	74	B	124	B	174	D	224	C	274	A	324	D	374	B	424	A	474	A	524	D	574	A
25	A	75	B	125	A	175	B	225	A	275	A	325	B	375	D	425	D	475	D	525	A	575	B
26	C	76	B	126	B	176	C	226	B	276	D	326	C	376	C	426	A	476	B	526	D	576	D
27	C	77	C	127	D	177	C	227	C	277	B	327	A	377	C	427	A	477	C	527	E	577	B
28	C	78	C	128	A	178	A	228	A	278	C	328	B	378	B	428	A	478	A	528	A	578	C
29	B	79	C	129	C	179	B	229	D	279	B	329	A	379	C	429	A	479	C	529	A	579	C
30	C	80	A	130	C	180	C	230	B	280	B	330	D	380	D	430	D	480	A	530	C	580	D
31	A	81	B	131	D	181	A	231	B	281	C	331	D	381	D	431	B	481	D	531	D	581	B

32	B	82	B	132	D	182	B	232	D	282	C	332	C	382	D	432	D	482	C	532	C	582	A
33	A	83	A	133	A	183	B	233	BC	283	D	333	C	383	D	433	D	483	E	533	C	583	A
34	D	84	C	134	D	184	B	234	A	284	D	334	A	384	C	434	C	484	A	534	D	584	D
35	A	85	B	135	A	185	C	235	A	285	B	335	A	385	A	435	A	485	A	535	C	585	B
36	D	86	C	136	B	186	A	236	A	286	D	336	D	386	H	436	D	486	D	536	C	586	A
37	A	87	B	137	C	187	B	237	D	287	B	337	A	387	A	437	C	487	D	537	A	587	C
38	D	88	A	138	C	188	C	238	C	288	A	338	D	388	A	438	A	488	D	538	C	588	D
39	A	89	D	139	B	189	B	239	A	289	C	339	B	389	D	439	A	489	D	539	C	589	B
40	B	90	B	140	A	190	A	240	A	290	C	340	E	390	B	440	E	490	A	540	D	590	A
41	A	91	C	141	B	191	B	241	D	291	A	341	A	391	E	441	B	491	A	541	B	591	C
42	D	92	A	142	A	192	A	242	B	292	C	342	D	392	D	442	C	492	A	542	A	592	D
43	D	93	B	143	D	193	A	243	A	293	D	343	C	393	E	443	B	493	D	543	B	593	B
44	D	94	A	144	B	194	C	244	C	294	D	344	B	394	B	444	E	494	C	544	D	594	D
45	A	95	C	145	B	195	C	245	A	295	A	345	A	395	F	445	A	495	C	545	D	595	B
46	D	96	D	146	B	196	C	246	A	296	C	346	A	396	E	446	C	496	E	546	D	596	A
47	B	97	B	147	A	197	A	247	B	297	A	347	A	397	C	447	E	497	D	547	D	597	C
48	B	98	D	148	B	198	B	248	B	298	A	348	D	398	D	448	D	498	A	548	B	598	D
49	B	99	A	149	A	199	D	249	A	299	B	349	D	399	E	449	B	499	A	549	D	599	D
50	B	100	B	150	C	200	C	250	D	300	C	350	D	400	D	450	B	500	A	550	D	600	A

Cont……

601	A	651	B	701	A	751	D	801	B	851	A	901	D	951	A	1001	B	1051	B	1101	B	1151	A
602	A	652	A	702	D	752	B	802	B	852	A	902	B	952	B	1002	A	1052	A	1102	D	1152	D
603	D	653	D	703	D	753	D	803	D	853	D	903	A	953	B	1003	C	1053	C	1103	A	1153	B
604	A	654	D	704	A	754	D	804	B	854	D	904	A	954	A	1004	B	1054	B	1104	D	1154	C
605	A	655	C	705	B	755	D	805	C	855	C	905	B	955	C	1005	C	1055	A	1105	A	1155	D
606	D	656	B	706	B	756	B	806	C	856	A	906	C	956	C	1006	A	1056	C	1106	D	1156	D
607	D	657	B	707	D	757	C	807	B	857	D	907	A	957	B	1007	B	1057	D	1107	C	1157	C
608	A	658	C	708	B	758	A	808	B	858	A	908	D	958	A	1008	B	1058	A	1108	D	1158	A
609	A	659	B	709	B	759	B	809	B	859	D	909	D	959	B	1009	D	1059	C	1109	A	1159	D
610	A	660	D	710	B	760	B	810	C	860	B	910	A	960	D	1010	B	1060	D	1110	A	1160	A
611	D	661	B	711	B	761	B	811	C	861	C	911	D	961	B	1011	B	1061	D	1111	A	1161	B
612	A	662	A	712	C	762	B	812	B	862	D	912	A	962	B	1012	C	1062	D	1112	B	1162	C
613	D	663	C	713	B	763	A	813	A	863	C	913	C	963	C	1013	A	1063	C	1113	B	1163	A
614	C	664	A	714	C	764	C	814	A	864	D	914	D	964	A	1014	B	1064	D	1114	A	1164	C
615	A	665	D	715	A	765	C	815	D	865	C	915	B	965	D	1015	B	1065	B	1115	B	1165	A
616	D	666	A	716	D	766	B	816	C	866	D	916	B	966	B	1016	D	1066	A	1116	D	1166	D
617	A	667	C	717	B	767	C	817	C	867	B	917	A	967	A	1017	B	1067	C	1117	C	1167	A
618	D	668	A	718	D	768	B	818	B	868	D	918	D	968	D	1018	B	1068	B	1118	B	1168	B
619	D	669	B	719	A	769	C	819	B	869	D	919	A	969	B	1019	C	1069	B	1119	D	1169	B
620	E	670	B	720	B	770	B	820	B	870	D	920	D	970	D	1020	B	1070	A	1120	C	1170	D
621	B	671	C	721	C	771	D	821	A	871	C	921	C	971	C	102I	D	1071	A	1121	B	1171	A
622	D	672	D	722	C	772	A	822	B	872	D	922	C	972	C	1022	D	1072	D	1122	B	1172	B
623	C	673	C	723	A	773	C	823	B	873	B	923	C	973	C	1023	A	1073	B	1123	A	1173	A
624	D	674	B	724	C	774	C	824	A	874	A	924	B	974	A	1024	D	1074	D	1124	D	1174	D
625	D	675	C	725	D	775	C	825	A	875	D	925	C	975	A	1025	D	1075	B	1125	A	1175	B
626	B	676	C	726	D	776	B	826	A	876	C	926	B	976	D	1026	D	1076	B	1126	A	1176	D
627	A	677	C	727	A	777	C	827	B	877	A	927	C	977	C	1027	C	1077	B	1127	C	1177	C
628	C	678	B	728	B	778	D	828	A	878	B	928	B	978	C	1028	C	1078	C	1128	A	1178	D
629	D	679	D	729	A	779	C	829	D	879	C	929	C	979	D	1029	D	1079	D	1129	B	1179	B
630	A	680	B	730	A	780	B	830	D	880	C	930	D	980	C	1030	B	1080	B	1130	D	1180	A
631	C	681	B	731	B	781	C	831	A	881	A	931	E	981	B	1031	C	1081	D	1131`	C	1181	B

632	A	682	B	732	D	782	C	832	C	882	A	932	D	982	C	1032	B	1082	D	1132	C	1182	C
633	A	683	A	733	B	783	A	833	C	883	B	933	D	983	A	1033	B	1083	C	1133	C	1183	B
634	C	684	D	734	C	784	A	834	D	884	C	934	D	984	C	1034	B	1084	C	1134	C	1184	C
635	C	685	B	735	A	785	C	835	A	885	C	935	A	985	A	1035	D	1085	A	1135	D	1185	D
636	D	686	C	736	D	786	C	836	A	886	D	936	C	986	A	1036	C	1086	A	1136	B	1186	C
637	E	687	E	737	C	787	B	837	A	887	A	937	A	987	D	1037	B	1087	C	1137	A	1187	C
638	B	688	C	738	A	788	D	838	C	888	C	938	D	988	C	1038	C	1088	C	1138	B	1188	C
639	A	689	D	739	D	789	C	839	B	889	B	939	B	989	B	1039	B	1089	C	1139	A	1189	B
640	C	690	E	740	B	790	B	840	D	890	D	940	D	990	D	1040	B	1090	A	1140	A	1190	B
641	A	691	A	741	C	791	C	841	D	891	C	941	A	991	B	1041	A	1091	B	1141	B	1191	B
642	C	692	C	742	D	792	C	842	A	892	D	942	B	992	D	1042	B	1092	A	1142	C	1192	D
643	B	693	C	743	B	793	D	843	B	893	C	943	D	993	D	1043	D	1093	C	1143	A	1193	C
644	D	694	C	744	D	794	D	844	A	884	A	944	A	994	D	1044	B	1094	A	1144	A	1194	D
645	A	695	D	745	D	795	C	845	C	895	A	945	A	995	A	1045	B	1095	B	1145	D	1195	C
646	B	696	A	746	A	796	B	846	B	896	B	946	D	996	A	1046	C	1096	C	1146	C	1196	C
647	D	697	A	747	B	797	A	847	A	897	A	947	D	997	A	1047	C	1097	A	1147	B	1197	A
648	C	698	B	748	C	798	D	848	D	898	C	948	D	998	A	1048	C	1098	B	1148	C	1198	C
649	C	699	**D**	749	D	799	A	849	D	899	B	949	D	999	B	1049	B	1099	C	1149	B	1199	A
650	A	700	B	750	D	800	B	850	C	900	D	950	B	1000	B	1050	B	1100	A	1150	C	1200	B

1201	D	1216	C	1231	C	1246	D	1261	A	1276	C	1291	D	1306	A	1321	B	1336	B	1351	B
1202	A	1217	D	1232	C	1247	C	1262	C	1277	D	1292	C	1307	C	1322	A	1337	C	1352	A
1203	A	1218	C	1233	C	1248	D	1263	C	1278	D	1293	C	1308	D	1323	A	1338	B	1353	D
1204	C	1219	A	1234	C	1249	D	1264	C	1279	D	1294	C	1309	D	1324	D	1339	A	1354	E
1205	C	1220	C	1235	A	1250	C	1265	C	1280	C	1295	B	1310	C	1325	C	1340	D	1355	A
1206	B	1221	B	1236	D	1251	C	1266	D	1281	C	1296	A	1311	A	1326	C	1341	D		
1207	D	1222	D	1237	D	1252	C	1267	D	1282	C	1297	B	1312	A	1327	B	1342	A		
1208	A	1223	C	1238	A	1253	B	1268	D	1283	B	1298	B	1313	B	1328	A	1343	A		
1209	A	1224	A	1239	D	1254	D	1269	A	1284	A	1299	A	1314	A	1329	C	1344	A		
1210	B	1225	D	1240	A	1255	C	1270	D	1285	C	1300	D	1315	A	1330	B	1345	C		
1211	B	1226	B	1241	A	1256	B	1271	B	1286	A	1301	B	1316	B	1331	D	1346	D		
1212	D	1227	C	1242	C	1257	C	1272	B	1287	B	1302	C	1317	A	1332	C	1347	A		
1213	B	1228	B	1243	B	1258	B	1273	C	1288	C	1303	D	1318	B	1333	D	1348	D		
1214	C	1229	C	1244	B	1259	B	1274	D	1289	B	1304	C	1319	D	1334	A	1349	A		
1215	C	1230	C	1245	D	1260	C	1275	A	1290	A	1305	B	1320	B	1335	A	1350	A		

THE END

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Say True or False

1356. Existing scientific truth is relative and must be continually tested, evaluated and reconstructed.
1357. In a single scientific activity observations can be carried only when identifying the problem for investigation.
1358. In any scientific study the information gathered could be either quantitative or qualitative.
1359. Inductive reasoning begins with pieces of observation, whereas deductive reasoning begins with general facts (hypotheses, theories).
1360. One of the weaknesses of inductive method of reasoning is that conclusions contain more information than the reported facts on which they are based.
1361. When released from support, apples, oranges, rocks and trees fall to the ground, therefore, force acting on these objects attracts them to the ground (i.e. the force of gravity). This statement is an example of deductive reasoning.
1362. It is in the construction of hypotheses and the ability to discern relationships among seemingly disparate events that scientists differ most.
1363. It is by mere accumulation of facts and mere postulations of hypotheses that science advances.
1364. A good theory relates facts that previously appeared to the unrelated and that could not be explained on common ground.
1365. When scientists investigate a certain natural phenomena, they usually publish their results for scrutiny by their peers.
1366. The speed of an exothermic reaction does not depend on how much the energy the reaction releases but rather on the amount of activation energy that is required for the reaction to begin.
1367. Reactions that need larger activation energies tend to proceed very fast.
1368. The presence of enzymes alters the nature or properties of the end products of the reaction.
1369. Enzymes are effective in large amounts.
1370. Neither an apoenzyme nor a cofactor alone has catalytic activity.
1371. Like prosthetic groups, coenzymes remain attached to the enzyme between reactions.
1372. Coenzyme A helps in the transformation of pyruvate to acetate.
1373. When there is a highly concentration of ATP in cells, the ATP itself inhibits one of the enzymes of glycolysis allosterically.
1374. In competitive reversible reaction the competing substance and the normal substrate of the enzyme are different structurally.
1375. In living cells exergonic reactions usually involve the breakdown of ATP.
1376. Glycolysis does not require oxygen and can proceed under aerobic or anaerobic conditions.
1377. In fermentation the final electron acceptor from NADH is oxygen.
1378. The inefficiency of anaerobic respiration (metabolism) necessitates a large supply of fuels.
1379. Pyruvate is the only molecule that can enter the citric acid cycle.
1380. In the TCA cycle more hydrogen is generated than entered the cycle with the fuel molecule.
1381. Since two pyruvate molecules are produced from each glucose molecule, the cycle must turn four times to process each glucose.
1382. In an electron transport system cytochrome molecules accept only the electrons from hydrogen, not the entire atom.
1383. The inner mitochondrial membrane is permeable to the passage of protons.
1384. Rapidly growing cells use a large fraction of their total energy output to biosynthetic processes.
1385. During glycolysis, the phosphate needed to generate 1, 3-diphosphoglycerate comes from inorganic phosphate (Pi) dissolved in the cells cytoplasm, and not from ATP.
1386. In cyclic photophosphorylation only photosynthesis I is involved.

1387. For every two electrons that enter the pathway of cyclic photophosphorylation of photosynthesis, there is an energy yield of one ATP molecule and two NADPH molecules.
1388. When electrons are missed from the chlorophyll molecule of the reaction center of photosystem II (P_{680}) they will be replaced by photolysis of water.
1389. The Calvin cycle uses ribulose phosphate as its starting material.
1390. Plants with the C_4 pathway appear first in geographical areas with high temperatures, high light intensities, and limited amount of water.
1391. If photorespiration could be reduced, food supplies could be increased.
1392. In plant cells photorespiration occurs on bright, hot, dry days when they close their stomata.
1393. Members of a linkage group can assort independently of one another.
1394. Genes on linked chromosomes do not always remain linked sometimes they cross-over.
1395. As garden pea (*Pisum sativum*) is to Gregor Mendel, fruit fly (Drosophila melanogaster) is to T.H. Morgan.
1396. Human males are homogametic while human females are heterogametic.
1397. Codominance is a situation where two alleles are expressed independently of one another in heterozygote condition.
1398. The only factor that differentiates various species is the number of chromosome they possess.
1399. Allelic genes always contain the same genetic information, and hence govern the same characteristic of the organism.
1400. Meiosis I is an equational while meiosis II is a reductional one.
1401. The greater the distance between two genes, the greater the chance of crossing over between them.
1402. Sex-limited traits are expressed in either of the two sexes.
1403. Natural selection results in the increase of "favorable" genes and the decrease of "unfavorable" genes within a population.
1404. Fossil refers to only the parts of an animal's body that may survive.
1405. The formation and preservation of a fossil require that an organism be under conditions that will speed up the process of decay.
1406. The existence of analogous structures is very crucial because they show how unrelated organisms may adapt to common problems as their evolution leads to their structural and functional convergence in similar habitats.
1407. The resemblance between embryos of different animals is closer than the resemblance between their adults.
1408. The evolutionary relationships of organisms inferred from biochemical studies parallel the relationships inferred on the basis of structural similarities.
1409. A greater proportion of the sequence of nucleotides in DNA is identical in distantly related organisms.
1410. Since apes and humans share a number of features collectively we call them hominids.
1411. *Australopithecines* were ancestors *Homo hablis.*
1412. *Homo erectus* was smaller than *Homo hablis,* quadrupedal, and fully erect.
1413. The first modern Homo sapiens developed in Africa during the early part of the late Pleistocene.
1414. Two of the most significant advances in cultural evolution were the development of agriculture and the Industrial revolution.
1415. Cultural evolution is made possible by an evolutionary increase in brain size in humans.
1416. Divergent evolution can take place over a period of time because of geographical isolation, or it can happen very rapidly, especially in plants when meiosis is in complete.
1417. Since donkey and horses are different species, they are reproductively isolated. T
1418. In convergent evolution, species look alike and have adapted to similar environmental conditions but are unrelated.
1419. The constancy in behavior does not mean that it is genetically programmed.
1420. The completeness of a new behavior demonstrates that learning was unimportant.
1421. The involvement of learning in the shaping of behavior is an indication that the behavior has no genetic basis.
1422. As innate behaviors are not purely genetic, learning behaviors are not entirely environmental.
1423. Once an animal initiates a fixed action pattern (FAP), it usually carries an action pattern to completion even if, for some reason, the activity is interrupted or becomes inappropriate.

1424. The response by which tendrils curl around and cling to stems or other objects is an example of thigmotropism.
1425. In honeybees the workers guard the hive entrance and serve as a forager for the first 3 days.
1426. In reflexes there is a delay between giving a stimulus and seeing its effect.
1427. If you have puzzled over a problem for several days and suddenly the answer flashes into your mind, the type of learning you have experienced is sensitization.
1428. The molecular bases of heredity is encodes in the linear sequence of nucleotides in the DNA molecule
1429. A nucleotide=pentose sugar + phosphate group + nitrogen base
1430. During DNA replication the original strand serves as a template for the synthesis of the daughter strand
1431. Adenine bonds with thymine forming two hydrogen bonds
1432. RNA is found only in the nucleus
1433. tRNA molecules have an anticodon portion and a region where a specific amino acid is attached.
1434. Protein synthesis always proceeds from the amino terminal to the carboxyl terminal end of the growing peptide chain.
1435. Translation of the mRNA always proceeds in a 5^1 to 3^1 direction.
1436. There are three hydrogen bonds between complementary adenine and thymine bases.
1437. One complete coil of the DNA helix is 10 bases long.
1438. The two helical strands of DNA are held together by covalent bonds.
1439. DNA polymerase is involved in the formation of mRNA.
1440. Translation of the genetic code takes place on the ribosome.
1441. tRNA is double—stranded throughout its length.
1442. Messenger RNA is longer than transfer RNA.
1443. DNA is more stable than RNA.
1444. The pyrimidines are larger than the purines.
1445. Deoxyribose sugar weighs more than ribose sugar.
1446. In prokaryotic mRNA post transcriptional process occurs.
1447. In eukaryotes only exons are transcribed into mRNA.

Match Column A with Column B

	Column A	Column B
1448.	mRNA	A. Is semiconservative and bi-directional
1449.	Translation	B. The nucleoprotein complex of which chromosomes are made\
1450.	Codon	C. Adenine and guanine
1451.	Anticodon	D. Thymine and cytosine
1452.	siRNA	E. Three bases in the mRNA
1453.	Purine bases	F. Three bases in the tRNA
1454.	Double helix	G. Copied from DNA by transcription
1455.	DNA replication	H. Gene silencing
1456.	Chromatin	I. Transferring of the genetic code to sequence amino acids in a protein
1457.	Clones	J. Two polypeptide chains of DNA arranged in coil
1458.	Restriction enzymes	K. Identical copies L. Cleave DNA

Part lll MATCHING

	Column A	Column B
1459.	441. Histone	A. Hidden traits in F_1
1460.	442. Dihybrid crosses	B. Mendel's factors
1461.	443. Locus	C. Alternative forms of a gene
1462.	444. Alleles	D. Organism with two identical alleles
1463.	445. Homozygote	E. Crosses involving two genes
1464.	446. Trait	F. 3:1
1465.	447. Monohybrid F_2 phenotypic ratio	G. 1: 2: 1
1466.	448. Monohybrid F_2 genotypic ratio	H. a feature of an organism
1467.	449. Genes	I. the core of chromosome around which DNA wrapped
1468.	450. Recessive traits	J. the position of the a particular gene on a chromosome

Match Column A with Column B

	Column A	Column B
1469.	Sign stimulus	A. Classical conditioning
1470.	Gravitropism	B. Does not require learning
1471.	Eurosociality	C. Triggers Fixed Action Pattern
1472.	Instinct behavior	D. Response top gravity
1473.	Ivan Pavlov	E. Animals live and work together
1474.	Extinction	F. Primer pheromone
1475.	Imprinting	G. Konrad Lorenz
1476.	Latent learning	H. There is no reward
1477.	Circadian rhythm	I. Loss of the response
1478.	Queen substance	J. A physiological cycle with a frequency of about 24 hour