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# OROMIA EDUCATION BUREAU

## GRADE 9 BIOLOGY

## UNIT THREE (3.3) TO UNIT SIX

- LESSON NOTES
- PRACTICE QUESTIONS WITH ANSWER KEY

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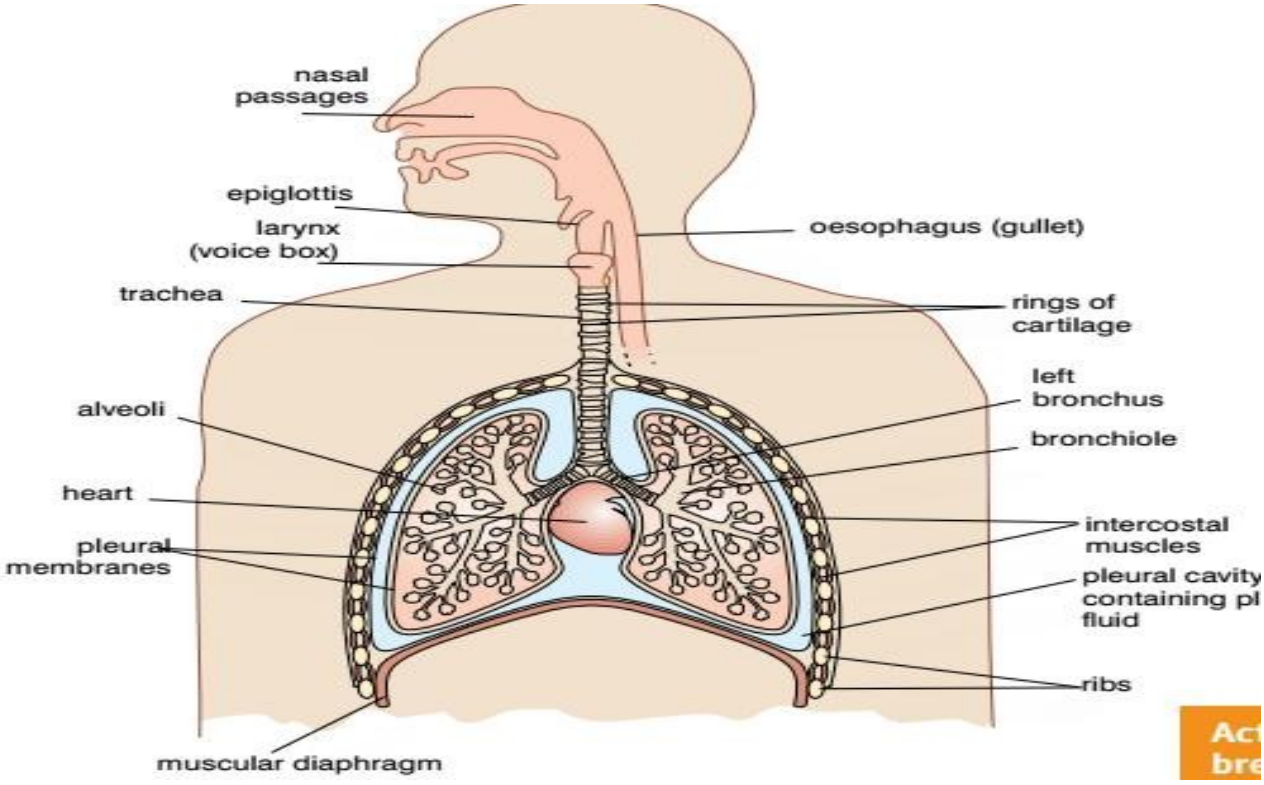
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# UNIT: 3 Human biology & health

## 3.3. The human respiratory system




### ㄱ Structure of human respiratory system

- The respiratory system is a vital in order to get oxygen to oxidize food and release energy for proper functioning of the body.

♣ The human respiratory system consisting of the following structures

- **Mouth:** is an organ through which the air enters into respiratory structures
- **Nose/nasal cavity:** is additional structure through which the air enter into respiratory tract.

Nose contains the nasal passages, which have:-

♣ a large surface area,

♣ a good blood supply,

♣ Lots of hairs and a lining that secretes mucus.

- The hairs and mucus filter out much of the dust and small particles that we breathe in, Whilst moist surfaces increase the humidity of the air we breathe into our bodies and The rich blood supply warms it
- This means that the air we take in is **warm**, **clean** and **moist** before it gets into the delicate tissue of our lungs.
  - **Pharynx:** is the structure that serves as a common passage for both food and air
  - **Larynx or voice box:** the upper part of trachea by directing air living the lungs over the vocal cords.
  - **Trachea:** is the wind pipe which is made from C-shaped cartilage that support it and hold it open.
- The lining of the trachea secretes mucus, which collects bacteria and dust particles.
- The cells that line the trachea are also covered in hair-like cilia that beat to move the mucus with any trapped micro-organisms and dirt away from the lungs and towards the mouth.
- The opening of trachea is called glottis
- The entrance of food and dust particles into the glottis is prevented by epiglottis.

- **Bronchi (singular bronchus)**: are the branches that arise from the trachea, one leading to each lung.

- **Bronchioles:** are small tubes branching from each bronchi in the lung
  - They are much smaller than bronchi.

◆ **Alveoli (singular alveolus):** are tiny air sacs which are used for exchange of gases between the lungs and the blood capillaries, they are called functional unit of the lung.

## ⇉ The lung

◆ Is the major breathing organ of human; it is surrounded by membranous structure called **pleural membrane.**

- The lung is spongy and elastic organ which is protected by ribs, vertebral column, diaphragm and intercostal muscle.
- **Diaphragm:** muscle separating the muscle from abdomen**.**
- **Intercostal muscle:** are muscle that are found between the ribs and used in breathing.
  There are two sets of intercostal muscle in normal quite breathing only external intercostal muscle is involved , however if we need to breath deliberately internal intercostal muscle is involved

### ⇉ How is air brought into the lungs?

◆ **The** process of breathing involves the process of inhalation and exhalation.

⇊ The breathing movements are brought about by two different sets of muscles that change the pressure in the chest cavity.

**The mechanism of breathing**

| | Inhalation (breathing in) | Exhalation (breathing out) |
|---|---|---|
| Diaphragm | Contract & flatten | Relax & become dome shaped |
| Intercostal muscle | Contract | Relax |
| Ribcage | Moves up & outwards | Moves down & inwards |
| Chest cavity | Looks bigger | Looks smaller |
| Pressure | Decreases | Increases |
| Lung | Inflated (filled with air) | Constricts(defleats) |
| The volume of thorax | Increases | Decreases |

### ⇉ The process of gaseous exchange

♣ Breathing in supplies us with the oxygen we need for cellular respiration
♣ when we breathe out waste carbon dioxide is removed from the body
♣ When the air is breathed into the lungs, **$O_2$** passes into the blood by diffusion along a concentration gradient.
♣ At the same time **$CO_2$** passes out of the blood into the air of the lungs, also by diffusion along a concentration gradient.
♣ This exchange of gases takes place in the **alveoli**, the tiny air sacs with a large surface area that make up much of the structure of the lungs.
♣ The movement of **$O_2$** into the blood and **$CO_2$** out of the blood takes place at exactly the same time
♣ There is a swap or exchange between the two and so this process is known as **gaseous exchange**
♣ The mechanism of gas exchange in the alveoli depends on:-
  ⇊ a large surface area
  ⇊ moist surfaces
  ⇊ short diffusion distances
  ⇊ a rich blood supply These maintain steep concentration gradient

◆ **Factor affect breathing rate**

The breathing rate is determined by the rate of breathing and depth of breathing

- The normal rate of breathing in adult human being is 12-14 times per breath
- **Depth of breathing**: is the amount of air per breath
- **Tidal volume**: is the amount of air that one can breathed in & out at normal resting situation
- **Vital capacity**: is the maximum amount of air that breathed in and out:

**The rate of breathing can be affected by the following major factors.** These are:

**A. Exercise**

- During exercise when muscular activity increases, the breathing rate and depth of breathing increases to supply more oxygen to release energy for the body.

**B. Anxiety**

- During anxiety the body reacts as it is in danger, extra oxygen needed to more energy in order to survive danger, therefore the rate & depth of breathing increases .

**C. Drugs**

- Stimulant drugs such as khat and cocaine can increases the rate and the depth of breathing.

**D. Altitude**

- At places of higher altitude; the level of oxygen becomes lower &lower. This makes breathing difficult thus the rate and depth of breathing becomes higher.

**E. Weight**

- Excess weight can also affect the breathing rate.
- It can be difficult to breathe deeply because of the fat around the abdominal organs, which makes it difficult for the diaphragm & other structures around the lungs to relax properly.

**F. Smoking**

- Smoking is a habit that directly affects your respiratory system as well as other areas of your body

## ◆ The effect of smoking on The health

The cigarette smoke consists of around 4000 chemicals that are inhaled into the lungs.**Some of these include:**

- **Nicotine:** is the addictive drug found in tobacco smoke**.**
- **Carbon monoxide:** is a very poisonous gas found in cigarette smoke .It takes up some of the oxygen carrying capacity of the blood.
- **Tar**: is a sticky black chemical in tobacco smoke and causes irritation of nose , throat & lung.
- **Carcinogenic substances**: are cancer causing substances; the most commonly carcinogenic are arsenic & benzeprene.

## ◆ Smoking-related diseases

- Smoker health may get affected in various ways :
- **Tar** is a **sticky** black chemical in tobacco smoke that is not absorbed into the bloodstream.
- It simply accumulates in the lungs, turning them from pink to grey.
- In a smoker, the cilia which move things away from the lungs are anaesthetized by each cigarette and stop working for a time, allowing dirt and bacteria down into the lungs.
- Tar makes smokers more likely to develop **bronchitis** –inflammation and infection of the bronchi.
- The build-up of tar in the delicate lung tissue can also lead to a breakdown in the alveolar structure.
- In these **chronic obstructive pulmonary diseases (COPD)** the structure of the alveoli break down and much larger air spaces develop.
- Cancers of lung, lips and throat can be caused due to carcinogenic substances
- Smoking also effects on heart & blood vessels which increases the risk of the heart attack and stroke.

- **Smoking and the family**

Smoking may have individual, family & the society ;some of its effects include:

- Economic crisis
- Psychological problems
- Increased risk of respiratory diseases
- Conflict in the family

- **Breathing hygiene**

There are mechanisms that can be used to keep the breathing system into a healthy state.

- Good oral hygiene
- Covering the mouth during cough &sneezing
- Consult a doctor for any problems related to respiratory organs

## 3.4 Cellular respiration

The digestive system, breathing and circulation systems all exist to provide the cells of the human body with what they need for respiration.

- **Respiration:** is the process in which energy is released from the breakdown of organic substances in the body.
- The energy that is used by the cells is stored in the form of a molecule known as **ATP**,
- Which stands for **adenosine triphosphate**. This is an adenosine molecule with three phosphate groups attached to it.
- When energy is needed for any chemical reaction in the cell, the third phosphate bond is broken in a hydrolysis reaction.

$$ATP + H_2O \rightarrow ADP + Pi$$

- **ATP** is formed by the bond between **adenosine diphosphate &** a free inorganic phosphate group (**Pi**) and the all-important energy needed in the cell.

$$ADP + Pi \rightarrow ATP + H_2O$$

**The importance of ATP to the body**

- To build up large molecules from smaller ones to make new cell material (**anabolism). And**
- Also break large molecules down into smaller molecules. ( **catabolism )**

**Anabolism + Catabolism = Metabolism**

- **To enable muscle contract and relax**
- Provide energy for the active transport of some substances across cell boundaries

- **Types of Respiration**

### I. Aerobic respiration

During the process of cellular respiration, glucose reacts with oxygen to release energy that can be used by the cell. Carbon dioxide and water are produced as waste products.

**The reaction can be summed up as follows:**

glucose + oxygen → carbon dioxide + water + energy (ATP)

Aerobic respiration takes place in the mitochondria in cells.

These are tiny rod-shaped bodies (organelles) that are found in almost all cells.

Cells that use a lot of energy contain lots of mitochondria

### II. Anaerobic respiration

- Breaking down of food to release energy without oxygen
- It is a type of respiration that **does not use oxygen.**
- Anaerobic respiration produces **far less ATP** than aerobic respiration.
- It also produces a different waste product called lactic acid.

- ♣ The body cannot get rid of lactic acid by breathing it out as it does **$CO_2$**, so when the exercise is over, lactic acid has to be broken down.
- ♣ This needs oxygen, and the amount of oxygen needed to break down the lactic acid is known as the **oxygen debt**

♣ After exercise, the lactic acid is oxidized by oxygen to produce carbon dioxide and water

- **Anaerobic respiration**:-Glucose → Lactic acid + Energy (ATP)
- **Oxygen debt repayment**:- Lactic acid + oxygen → carbon dioxide and water

### Anaerobic respiration in microorganisms

It is also used in other organisms particularly **yeast**

- **Yeast** is a single-celled fungus w/c is one of the micro-organisms that is most useful to people
- When yeast cells break down sugar in the absence of oxygen they produce **ethanol** and **$Co_2$**.

**Glucose → ethanol + $CO_2$ + energy (ATP)**

- The anaerobic respiration of yeast is referred to as **fermentation**
- Yeast cells reproduce asexually by budding. The new yeast cells break off to grow and bud

## 3.5. The circulatory system

- The transport system is required to supply the needs of the body cell & remove the waste products they produce.
- The human transport system is the **blood circulation system.** It has **three** elements

♣ the pipes (**blood vessels), the pump (the heart)** and the medium (the **blood)**

### A double circulation

Human circulatory system is called a double circulation.it consists:

i. One carrying blood from the heart to the lungs and back again to exchange oxygen and carbon dioxide with the air. This is called **pulmonary circulation**

ii. The other carrying blood all around the rest of the body from the heart and back again. This is called **systemic circulation**

## A. The blood vessels

- A very important element of any transport system is the pathways along which the transport takes place.
- In the human body there are three main types of blood vessels:-

**Arteries**, **Veins** & **Capillaries**

- **Arteries** :carry blood away from the heart

♣ it have thick walls that contain muscle and elastic fibres

♣ it have a **pulse:** the pulse is the surge of blood from the heart when it beats

♣ they have no valves

♣ most arteries carry oxygenated blood '**except'**

♣ **pulmonary artery** which carry the blood away from your heart to your lungs

♣ **umbilical artery** which carries blood away from a foetus into the placenta

- **Veins:** carry blood towards the heart.

▲ They have much **thinner** walls than arteries & less elastic wall\

▲ They do not have a pulse but they often have valves

▲ Most veins carry deoxygenated blood except:

▲ **Pulmonary vein**, which carry oxygenated blood back from lungs to the left-hand side of heart.

▲ **Umbilical vein**, which carries oxygenated blood from the placenta back to the developing foetus.

### Capillaries

- They are narrow , thin walled blood vessels
- It help to connect arteries with veins and take blood to the tissues & cells
- They have no valve
- They are site of the exchange of substances within the body.
- Blood from the arteries passes into the capillaries, which have thin walls & massive surface area.

## B. The Human heart

- The human heart is a bag of reddish-brown muscle that beats right from the early days of development until the end the life, sending blood around the body.
- It is made up of a unique type of muscle known as **cardiac muscle**
- The walls of the heart are almost entirely muscle.
- These muscular walls are supplied with blood by the **coronary arteries (**supply oxygenated blood to cardiac muscle).
- The deoxygenated blood is carried away in the coronary veins, which feed back into the right **atrium (atria).**
  - Human heart is divided into 4 chambers
    - The two upper chambers are the right & left atria
    - The two lower chambers are the right & left ventricles
  - The walls of the atria are relatively thin, so they can stretch to contain a lot of blood.
  - The walls of the **ventricles are much thicker,** as they have to pump the blood out through the major blood vessels.
  - The muscle walls of the left-hand side of the heart are thicker than on the right. This is because the left hand side of the heart has to pump blood around the whole body whilst the right-hand side pumps only to the lungs.

### The working of the heart

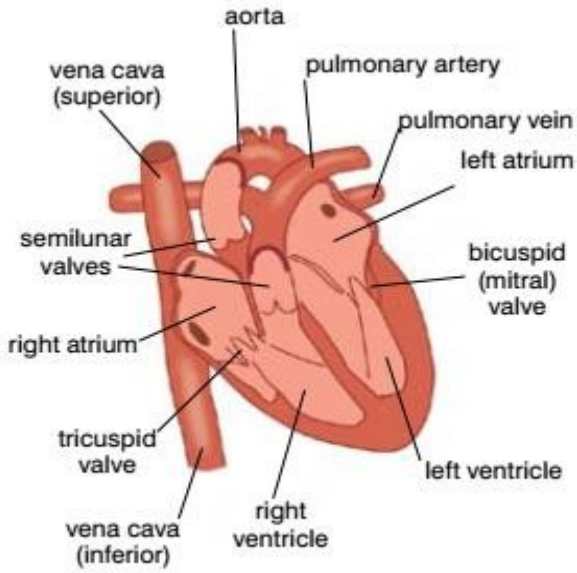
The two sides of the heart fill and empty at the same time to give a strong, coordinated beat

**Mechanism of blood circulation**

- Deoxygenated blood, which has supplied oxygen to the cells of the body and is loaded with carbon dioxide, comes into the right atrium of the heart from the veins of the body.
- The atrium contracts and forces blood into the right ventricle.
- The right ventricle contracts and forces blood out of the heart and into the lungs where it is oxygenated – it picks up oxygen.
- Oxygenated blood returns to the left-hand side of the heart from the lungs and the left atrium fills up.
- The left atrium contracts forcing blood into the left ventricle.
- The left ventricle contracts forcing oxygenated blood out of the heart and around the body



a) External view to show coronary arteries




b) Vertical section through the heart

### ⇉ Valves

**Valves:** mechanism in the veins that allows blood to flow in one direction only.

- ⇊ Inside the heart there are many different valves.
- ⇊ Their names describe their appearance;
- ⇊ **bicuspid (two parts**): are found between the left atrium & left ventricle
- ⇊ Tricuspid (three parts) are valves between the atrium & right ventricles.
- ⇊ semilunar (half-moon):
  - **Diastole** is when the heart muscles relax and it fills with blood**.**
  - **Systole** is when the heart muscles contract and force the blood out of the heart

The pressure at which the blood travels around our arteries varies as the heart beats.

- A normal blood pressure is about **120 mmHg/80 mmHg** –the nominator is systolic & the denominator is diastolic pressure.
- **Sphygmomanometer:** is an instrument that is used to measure blood pressure.

## C. The blood

- ⇉ Blood is a complex mixture of cells and liquid that carries a huge range of substances around the body
- ⇉ Blood consists of a liquid called the plasma.
- ⇉ **Plasma: -** is a **pale yellow** liquid that transports all the blood cells & also number of other things. **There are components of blood cells**. These are:

### ⇉ Red blood cells(Erythrocytes)

- ♣ They are more in number than other types of blood cells
- ♣ They are disc shaped & non nucleated cells.
- ♣ They are made in bone marrow, when they mature they lose their nucleus .
- ♣ The RBC only live 100-120days so they are constantly being replaced.
- ♣ They are used to carrying $O_2$ around our body. Because they are packed with a special **red** substance called **haemoglobin,** which picks up oxygen**.**
- ♣ **Haemoglobin** is a special red pigment, a large protein molecule folded around four iron atoms.
- ♣ In a high concentration of oxygen, such as in the lungs, the haemoglobin reacts with oxygen to form oxyhaemoglobin.This is bright, which is why most arterial blood is bright red.

- In areas where the concentration of oxygen is lower, such as the cells and organs of the body, the reaction reverses
- The **oxyhaemoglobin** splits to give purple-red haemoglobin **(**the colour of venous blood) and oxygen
- The oxygen then passes into the cells where it is needed by diffusion.

$$\text{haemoglobin} + \text{oxygen} \underset{\text{low oxygen concentration}}{\overset{\text{high oxygen concentration}}{\rightleftharpoons}} \text{oxyhaemoglobin}$$

### White blood cells (leukocytes)

- They are much bigger than the red cells but they are fewer of them.
- They have a nucleus and form part of the body's defence system against microbes
- They can be classified as:
  - **Lymphocytes**– form antibodies against microbes
  - **Phagocytes**-engulf invading microorganisms

### Platelets ( thrombocytes)

- They are small fragments of cells and very important in helping blood to clot at the site of a wound.
- Platelets have thread like protein fiber called fibrin for blood clotting to trap blood cells, platelets and fluid through a complex series of enzymes controlled rxns.
- The clotting of the blood prevents from bleeding to death from a simple cut
- It also protects the body from the entry of bacteria and other pathogens

### Human blood groups

- There are special proteins called **antigens** are found on the surface of all cells.
- They allow cells to recognize each other and also to recognize cells from different organisms
- If the cells of an immune system recognize a foreign antigen on a cell in the body, they will produce **antibodies &** it destroy the foreign cells.
- A number of different antigens are found specifically on the surface of the RBC, which gives different human blood groups.
- The blood grouping system is called **ABO** system.
- Based on presence and absence of these antigens , there are four types of blood groups
- There are two possible antigens : Antigen A & antigen B
- There are also two types of antibodies:- antibody A & antibody B
- The below table describe the compatibility of Different blood groups

| Blood group | Antigen on RBC | Antibody in the plasma | Donate to | Receive from |
|---|---|---|---|---|
| A | A | B | A & AB | A& O |
| B | B | A | B & AB | B & O |
| AB | AB | None | AB only | All groups |
| O | None | A and B | All groups | O only |

- Blood group 'O 'is called **universal Donor**, because it has no antigens so, it can be given to anyone.
- Blood group 'AB' is called universal recipient , which has no antibodies can receive any type of blood
- If the blood from different blood groups is mixed together, there may be a reaction b/n the antigen &the complementary antibody which makes the red blood cells stick together, this is called **agglutination.**

### Two common problems of the circulatory system

A. **Anemia:** it is caused when there are:
   - Too few red blood cells in the body, or too low levels of hemoglobin in the blood.
   - It is most commonly due to lack of **iron** in the diet so it is treated by iron rich diet.

**B. Hypertension (High Blood Pressure).**

- Is considered high if the systolic pressure is >140mmHg or the diastolic pressure is >90mmHg
- There are a number of factors that can increase the risk of hypertension.
- Many of these factors mean that blood vessels are likely to be getting narrower, or becoming more rigid
- These factors include: -
  - increasing age,
  - being overweight,
  - excessive salt intake,
  - excessive consumption of alcohol,
  - sedentary (inactive) lifestyle,
  - smoking,
  - kidney diseases, diabetes and
  - certain medicines such as steroids

- **Treatment of hypertension**
  - Losing weight
  - Life style adjustment
  - using medicines like
  - Lower salt level in diet & etc

- **Diuretics:** which increase frequency of urination to decrease the blood volume and
- **Beta blockers:-** these block the nerves w/c narrow the arteries

# Unit: 4 Microorganisms and diseases

## 4.1. Micro-organisms

- **Micro-organisms** are tiny living organisms that are usually too small to be seen with the naked eye, these includes bacteria, viruses, yeast and mould
- Many of microorganisms are very useful while other cause diseases.

### Bacteria

- Are single celled organisms
- They are much smaller than the smallest plant& animal cells.
- They contain cytoplasm surrounded by a membrane
- They have non cellulose cell wall
- Some bacteria have flagella to help to them move
- They also come in a variety of different shape and size

### Viruses

- are even smaller than bacteria
- They usually have regular geometric shapes, and
- They are made up of a protein coat surrounding genetic material containing relatively few genes.
- They do not carry out any of the functions of normal living organisms except reproduction
- They are obligate intracellular parasites
- They have either DNA or RNA as genetic material

### Fungi (Yeast and mould)

- **Yeast** are single –celled organisms
- Each yeast cell has a nucleus, cytoplasm and a membrane surrounded by a cell wall.
- They reproduce is by asexual budding – splitting to form new yeast cells.

### Moulds

- They are made up of, threadlike structures called **hyphae**.
- The hyphae are not made up of individual cells – they are tubes consisting of a cell wall containing cytoplasm and lots of nuclei.
- They reproduce asexually by spore formation.

## The germ theory of disease

- Germs are micro-organisms responsible for cause of some diseases
- The development of microscope Anton van Leeuwenhoek in 17th century helped different biologists to explain the relationship between infectious diseases & micro organisms
- The development of knowledge about micro-organisms is actually related to the theory of spontaneous generation.

### The theory of spontaneous generation

- States that living things could arise from non-living things spontaneously. This theory is opposed by many biologists & a French biologist Louis Pasteur disproved it finally by using an S- shaped flask that traps dust & microorganisms.
- Pasteur was convinced that any growths that appeared – for example, mould on food as it decayed – came from microscopic organisms already present in the air.
- First he showed that the theory of spontaneous generation was wrong. Then he showed that if he boiled broth and sealed the container, the broth would stay clear until he introduced material which had been exposed to the air.
- At this point micro-organisms grew and the broth turned cloudy
- Pasteur went on to identify the micro-organisms that caused a number of diseases including anthrax, rabies and diphtheria.

### The immune system

- **Immune system** the system in the body which protects the body against invading microorganisms and foreign proteins.
- Like all living cells, pathogens carry unique protein molecules called **antigens** on their cell surfaces. When a pathogen gets into the body the antigens on the surface stimulate a response by the immune system.
- White blood cells (lymphocytes) produce antibodies to disable the pathogen. Other white blood cells (the phagocytes) then engulf and digest the disabled pathogens.
- Once someone have had a disease, the immune system 'remembers' the antigen and the right antibody to deal with it.

### Control of microorganisms

**Sterilization** is the killing of all micro-organisms in a material or on the surface of an object, making it safe to handle. These include the use of:

**High temperatures or heat**

It is highly efficient means of sterilization

- **Autoclaving:** it involves the killing of microorganisms by boiling in water at 121 °C. under high pressure for 15–45 minutes of 'cooking' at these temperatures
- **Ultra high temperature (UHT)** is a way of treating food to kill all the micro-organisms on it. The temperatures used range from around 135 °C to 150 °C
- **Dry heat sterilization:** Dry heat, over a long time, kills all micro-organisms. Special ovens used in **microbiology** use temperatures of 171 °C for an hour, or 160 °C for 2hours,.

**Incineration** – burning substances at high temperatures in the air – also kills micro-organisms.

- **Pasteurization**: it involves boiling or heating of milk, beer and other foodstuffs at 71.6 °C for at least 15 seconds or 62.9 °C for 30 minutes.

### A chemical approach to controlling micro-organisms

- Possible pathogens can be attacked **chemically** in a number of ways .for e.g.
  - **A disinfectant** is a chemical or physical agent that is applied to an inanimate object to kill micro-organisms.

- Disinfection means reducing the number of living micro-organisms present in a sample
- This method discovered **by Joseph Lister**
- some of example of disinfectant include**:** house hold bleach, Dilute bleach and calcium hypochlorite
  - **Antiseptics:** are chemical agents that are applied to living tissue to kill micro-organisms – disinfectants for the skin.
  - It help to protect entrance of germs if the skin is cut or wounded.

**Growing of microorganisms**

- Micro-organisms can be grown in laboratories under controlled condition.
- It is important for various purposes; these include:
  - To know how to killed them
  - To develop vaccines
  - To identify their useful & harmful aspects

For growing microorganism's biologist need to fulfill the following precondition:

- Isolating type of microorganisms to be studied
- Developing suitable nutrient like agar and broth
- **Agar:** is a solid nutrient medium which is extracted from red algae
- **Broth:** is a liquid nutrient medium

### Antibiotics

- Drugs which kill bacteria but do not harm human cells
- Penicillin was the first antibiotic to be discovered

### Artificial immunity

- Our body has its own natural ability to protect itself against artificial disease, however if the immune system of the body fails to defend some dangerous disease it will be treated by artificial immunity.
- Artificial immunity is given in the form of vaccine/drugs.
- **Artificial active immunity:** involves introduction of weakened or dead pathogen in the body which stimulates the body to produce its own antibodies.
- It can be natural from mother to child (**natural passive**)until the child produces its own natural active immunity
- It has long-lasting effect on the body
- **Artificial passive immunity:** it involves giving specific antibodies in the form of infection
- It provides a high type of resistance but last only for short time.

### vaccination(immunization) :

- is the use of dead or weakened strains of pathogens to produce immunity to dangerous diseases
- the vaccination work through the following ways
  - a weak or dead form of the infecting organism is put into the body by injection or by mouth
  - once in the body, the white blood cells respond by producing antibodies
  - If the living micro-organism enters the body in the future, antibodies are produced very rapidly to destroy it and so the disease does not develop.

## 4.2. Diseases

- Disease is any form of disorder in or on the body distorts it's normal functioning
- Some of the most commonly known diseases which are caused by pathogenic organisms among them include:

### i. Tape worm(cestoda)

- Flat shaped worm that parasitizes the wall of intestine of humans
- They have no digestive system & but have cuticle to absorb nutrients
- The most common are beef tape worm(*Taenia saginata)* & the pork tapeworm(*Taenia solium)*
- They have complex life cycle which involves at least two different hosts.

**Transmission** :eating improperly cooked or raw meat

**Symptoms:** feeling weakness, weight loss, segments of tape worm in feaces

**Control & prevention:** avoid eating raw meat, use antiworm drug & proper disposal of feaces

**Life cycle of beef tape worm**

- Cows raised in unsanitary conditions may contain **cysticerci** 'bladder worms' embedded in their muscles.
- These consist of a capsule containing a **scolex**. When a bladderworm is ingested (e.g. in undercooked beef), The scolex turns inside out and attaches by suckers and hooks to the wall of intestine.
- It then begins to produce buds, called **proglottids**, which remain attached to each other for a time and, as they mature, each develops both male and female sex organs.
- The most mature proglottids eventually break loose and are passed out in the faeces. If conditions are such that cows get access to the human faeces, they take in the eggs and the whole cycle starts again.

### ii. Tuberculosis

- It is caused by a bacterium called *Mycobacterium tuberculosis*
- It can affect anyone of any age, but People with weakened immune systems (such as people suffering from HIV/AIDS) are at increased risk

**Transmission :**

- Droplet infection, but need prolonged exposure to someone with TB for infection to occur.
- work in overcrowded conditions

**Symptoms**

Some people may not have obvious symptoms (asymptomatic), however the symptoms of TB include:

- a low-grade fever,
- fatigue,
- a persistent cough
- night sweats,
- weight loss and

**Control and prevention**

- In social terms avoiding overcrowded conditions
- Covering the nose &mouth during coughing
- Good ventilation
- vaccination

**Treatment**

- people with active TB disease must complete antibiotic for four months or more

### The role of vectors in disease

- **A vector** is an organism that transmits disease-forming micro-organisms from one host to another
- well-known example is the *Anopheles* mosquito, which carries the malarial parasite

### iii. Mosquitoes and malaria

- **Malaria** is a disease where mosquitoes are the vector
- The mosquito vector is the female *Anopheles* mosquito
- The disease itself is caused by the single-celled parasite *Plasmodium*
- It spends part of its life cycle in a mosquito and part in the human body

**Life cycle**

- Female needs two meals of human blood to provide protein for her developing egg and this is when she passes on her load of malarial parasites.
- If the first feed the mosquito takes is from someone infected with malaria, the *Plasmodium* parasites called *Plasmodium falciparum* remain in her mouthparts
- the next time she feeds, the *Plasmodium* parasites pass into the blood of the victim along with the saliva – and someone else is infected with malaria

**symptoms :**These include fevers, chills and sweats

**Control and prevention:** Methods of controlling malaria must involve controlling the *Anopheles* mosquitoes. this can be done by: Using mosquito repellents

- Having screens on doors and windows
- insecticide-treated mosquito nets
- Proper disposal of sewage'
- Minimize any opportunities for the mosquitoes to breed

### iv. Gastroenteritis/acute watery diarrhoea (AWD)

- **Intestinal infection causing acute watery diarrhea**
- Some of the causative organisms include rotaviruses, the bacteria *Salmonella* and *Escherichia coli* (*E. coli*), or the protoctists *Giardia* and *Amoeba*.

**transmission**

- eating contaminated food or water
- prepares or handles food without washing their hands after going to the toilet
- poor sanitation
- poorly cooked and raw eggs if they are infected with bacteria such as *Salmonella*

**symptoms**

- violent abdominal cramps and pain
- feeling nauseous, vomiting or often both
- watery diarrhoea which does not usually have blood in it
- slight fever
- general muscle aches and headache

**Control and prevention**

- Good personal hygiene
- Avoid eating undercooked or raw food

### v. Cholera

- It is caused by bacteria called *Vibrio cholera &* it infects intestine
- **Transmission**: eating or drinking food or water contaminated by the faecal waste of an infected person
- **Symptoms** : include the pale, watery diarrhoea, vomiting and dehydration, muscle scramps
- **Treatment** : taking more fluid to replace the lost through diarrhoea &antibiotics, rehydration salt(ORS)
- **Control and prevention:** avoid consumption of uncooked food
  - Proper disposal of feaces , Taking cholera vaccine
  - Good personal hygiene and environmental sanitation

## vi. Typhoid (Typhoid fever)

- is a bacterial infection caused bacterium called *Salmonella typhi* – typhoid only affects humans
- **transmission** : Like other diarrhoea diseases they are spread by eating foods or drinking water contaminated by faeces from an infected individuals
- **symptoms:** it may include :A very high fever – 39–40 °C, A painful abdomen
  Sore throat and headache, an enlarged **spleen** and liver , Constipation or diarrhoea
- **Treatment:** antibiotics are used as a very effective treatment. plenty of fluids to replace the ones they lose
- **Control and prevention:** careful hand washing after toilet visits,
  - ♣ clean drinking water and good sewage disposal
  - ♣ good food hygiene in kitchens and care in eating raw or lightly cooked foods

## vii. Sexually transmitted diseases (STDs)

- **STDs** are Infectious diseases spread by sexual contact it is also known as **venereal diseases(VD)**
- are a growing problem in Ethiopia –partly because sexual activity often starts relatively young
- the most commonly known STDs are:

### A. Gonorrhea (gonococcal infection)

- Is caused by the bacterium *Neisseria gonorrhoeae*.
- Gonorrhea germs are found in the mucus areas of the body (the vagina, penis, throat and rectum).
- **Transmission** :It is spread through sexual contact, Having unprotected sex, having many sexual partner
- **Symptoms:** burning sensation while urinating and a yellowish-white discharge from the genital organ.
- If a pregnant woman has untreated gonorrhea, she can pass the infection on to her baby result in blindness
- **Treatment:** it can be treated effectively in the early stages using antibiotic
- **Prevention& control :**
  - Infected individual do not have sex until your course of treatment is completed.
  - Use a male or female condom
  - Be faithful to sexual partner.

### B. Syphilis

- Is bacterial infection, caused by the spiral-shaped *Treponema pallidum*
- Any sexually active person can be infected
- **Transmission** :like gonorrhea It is spread through sexual contact
- It is congenital syphilis, which is spread from mother to foetus. This can cause very serious problems for the baby when it is born.



**Structure of *Treponema pallidum***

- **Symptoms:** Syphilis progresses in distinct stages

The symptoms occur in stages called primary, secondary and tertiary (late)

- **Primary stage (the first six weeks)**: painless sores around reproductive organ, rectum & mouth.

- **Secondary stage (six weeks after)**: The most common symptom during this stage is a rash. Other symptoms can include:
  - Tiredness
  - sore throat
  - hoarseness
  - patchy hair loss
  - Fever
  - headaches
  - loss of appetite
  - swollen glands
- Untreated the disease then goes into a long quiet phase
- **Tertiary stage (late syphilis):**
- Involve illness in the skin, bones, central nervous system and heart.
  It causes severe and irreversible problems that cannot be treated successfully.
- If a pregnant woman has untreated syphilis she may transmit the disease to her unborn child. This may result in death or deformity of the child.
  - **treatment** t:is treated easily with antibiotics such as penicillin or tetracycline
  - Pregnant women can be treated with antibiotics to cure them and protect their baby
  - **Prevention& control:** similar with gonorrhea

## C. Chancroid

- It is a bacterial STD that is caused by the bacterium *Haemophilus ducreyi*
- It is more commonly seen in men than in women.
- **Transmission** : having sex with an infected person & increase risk of becoming HIV-positive

**Symptoms:**

- The first symptoms of chancroid are sore ulcerations on the genitals, particularly penis, it is soft and filled with pus.
- The second stage of the infection is that the lymph glands in the groin also become infected,
- Permanent loss of penis

**Treatment** : it can be treated easily with a dose of antibiotics

**Prevention & control:**

- be faithful sexual partner
- Use a male or female condom
- Good genital hygiene & male circumcision

## Using medicines correctly

- **Traditional medicines** are very &alternative form medicine in developing countries like Ethiopia
  - It is often holistic, based on treating the whole patient, but limiting their dose is very important.
  - It is based on extracts of plants including herbs and spices.
- **Modern medicines:** are responsible for cure various diseases &made in very carefully controlled doses
  - The most common include: antibiotic & vaccine
  - However care should be taken while using modern medicine: so the following precaution should be considered:
    - Do not take more than you are prescribed,
    - Do not take less than you are given
    - Make sure you finish taking all the medicine
    - Follow the instruction if not antibiotic-resistant bacteria may evolve which can be very serious indeed

## 4.3. HIV and AIDS

- **Acquired Immune Deficiency Syndrome (AIDS)** is the medical term for a combination of illnesses that result when the immune system is weakened or destroyed.
- It is caused by Human Immuno deficiency Virus (HIV), a virus that attacks the immune system.

- **Transmission:**
- sexual intercourse which is un protected
- It can pass from a mother to her baby in the womb, during birth or when she breastfeeds
- Infected blood on needles used for injecting illegal drugs, or knives used for female genital mutilation.
- **Symptoms**
- Patients often have few symptoms to begin with but eventually their weakened immune system means they get many diseases.
- **Treatment**

Antiretroviral drugs can slow down the progress of HIV/AIDS and protect unborn babies from infection.

The sooner people can start taking antiretroviral after infection, the longer they will stay healthy.

- **Prevention & control**
  - It can be controlled by **ABC** rule means that **:**
  - **A:**abstain from sex
  - **B:** be faithful to sexual partner
  - **C:** condom use

### HIV and the immune system

### How does HIV attack the immune system?

- There are two main types of white blood cells in the immune system. these are:
- **T-cells** actually bind to the antigens on the invading micro-organism and destroy it.
- **B-cells** make antibodies which bind to the antigen and destroy it.
- HIV attacks the T-cells of immune system. It gets inside them and so they can no longer work.
- As more T-cells are invaded by the virus, the immune system is less and less effective.
- This is why people with HIV/AIDS get so many other infections

### Stigma and discrimination

Stigma is a mark of disgrace on people with HIV, while discrimination is an act of neglecting some from the group or other.& are the most serious cases that affects people living with HIV/AIDS

### Care and support

- It is important for people living with HIV/AIDS since it helps them live longer & healthier.

# Unit 5: Classification

## 5.1. Principles of classification

- On Earth today there are many types of living things. This great variety of life is called **biodiversity.**
- **Classification: is** grouping of similar living things.
- **Taxonomy :** is study of classification of organisms(Greek, taxis-to arrange , nomos-law)

### Need for classification

Biologists classify living things for the following reasons:

- To simplify their study.
- To bring order out of chaos or confusion
- To try to understand how life originated.

### What is a species?

A group of organisms that can breed successfully with one another to produce fertile offspring.

### How are living things classified?

- Living things are classified according to how similar they are
- One example is animals that are put in a group together because their limbs are built on the same basic plan.
- The limbs of a bat, horse, bird, human and whale all have the same basic pattern though they are used in different ways these limbs are called **homologous** structures. (Similar structure with d/t function).
- Today there are more sophisticated ways of comparing organisms. The fundamental chemicals of life – such as DNA, RNA and proteins – are found in almost all organisms

### The classification system

- **Taxonomy** is The process of classifying living organisms
- **Taxa** category in classification
- The main taxonomic categories are kingdom, phylum (or for plants, division), class, order, family, genus and species.
  - The largest groups into which living organisms are divided are the kingdoms.
  - Kingdoms are subdivided into phyla,
  - Each phylum into classes, each class into orders,
  - Each order into families, each family into genera and each genus into species.
  - The species is the smallest unit of classification

### Naming living things

Different method of classification were introduced by different biologists at different times:

- **Aristotle:** Greece a philosopher .who tried to create a classification system for the living world, and grouped animals by: animals that live on land' and 'animals that live in water
- The modern classification method is introduced by Swedish botanist **Carl Linnaeus** in 18th century.
  - He developed the binomial system of nomenclature for organisms
  - He published in a book called ***The System of Nature***
  - **Binomial** means two names. The two names of an organism are in Latin

### Simple rules for writing scientific names

- The first name is the name of the genus name & it is starts with capital letter. e.g. *Homo sapiens*,
- The second name is the name of a species & it is written with a small letter.
- The two names are underlined when handwritten or in italics when printed.

**Table 5.1 Examples of scientific names of some common organisms**

| common name | Scientific name |
|---|---|
| Human beings | *Homo sapiens* |
| A dog | *Canis familiaris* |
| A housefly | *Musca domestica* |
| Domestic cat | *Felis domesticus* |
| Maize | *Zea mays* |
| Bean | *Phaseolus vulgaris* |
| Lion | *Panthera leo* |

### Living things are classified and named for the following main reasons.

- To create an internationally accepted way of referring to a particular living thing.
- To avoid confusion created by different languages.
- To help in simplifying classification and study of living things.

| | **Human** | **Honeybee** | **Teff** | **Mushroom** |
|---|---|---|---|---|
| Kingdom | Animalia | Animalia | Plantae | Fungi |
| Phylum | Chordata | Arthropoda | Angiospermophyta | Basidiomycot |
| Class | Mammalia | Insecta | Liliopsida | Basidiomycetes |
| Order | Primates | Hymenoptera | Cyperales | Agaricales |
| Family | Hominidae | Apidae | Poaceae | Agaricaceae |
| Genus | Homo | Apis | Eragrostis | Agaris |
| Species | sapiens | mellifera | teff | campestris |

**Table 5.2** Hierarchy of groups

## 5.2. The five kingdoms

- A kingdom is the largest taxon and consists of all the other taxa. In the modern classification, there are five kingdoms namely:
  - Monera (bacteria)
  - Protista
  - Fungi
  - Plantae
  - Animalia
- This system of classification is known as the **five-kingdom system**
- Viruses are not classified in any of the above kingdom. This is because viruses do not have all the seven characteristics of life, although most scientists now classify them as living organisms.

### 1. Kingdom Monera

- The representative groups are Eubacteria (**true bacteria**) & the blue-green algae **(Cyanobacteria**).
- They are unicellular & **prokaryotic (have** no distinctive nucleus).
- They are all microscopic and they reproduce by simply splitting in two(binary fission)
- They have either autotrophic or heterotrophic mode of nutrition
- Examples include *Mycobacterium tuberculosis* and *Haemophilus ducreyi* which are pathogenic while others are useful.

### 2. Kingdom Protista

- Consists usually unicellular & eukaryotic ( do have nucleus)
- they include plant-like organisms that can move around and animal-like organisms that cannot move
- Representative groups of this kingdom are subkingdom protozoa& subkingdom algae

**Subkingdom protozoa**

- They are microscopic & have no chloroplasts
- They live as parasite or free living
- Have locomotory structure. e.g. Amoeba: **pseudopodia** , Paramecium: **cilia**

**subkingdom algae**

- They are photosynthetic & eukaryotic
- They live either in aquatic habitat or on land
- They have undifferentiated body called thallus.
- E.g. **Dinoflagellates, red algae & green algae**

### 3. Kingdom Fungi

- Fungi are eukaryotic and usually multicellular.
- They are heterotrophic
- Many fungi are **saprotrophs**, which means they feed on dead material.
- They play a vital role within ecosystems as decomposers

- Examples of this type of fungus are *Rhizopus* ,*Mucor* and *Penicillium*
- They can be parasites, feeding on living organisms. Such as *Candida albicans* (thrush) and *Tinea pedis* (athlete's foot) affect people and other animals.
- Some fungi are **mutualists**. This means they live in close association with another organism and both benefit. Examples are **lichens,** which are a combination of a fungus and green algae
- **Mycorrhizae**, an association between a fungus and the roots of a plant.
- There are also single celled fungi like **yeast.**

## 4. Kingdom Plantae

- The plants – includes a great variety of organisms, which range from tiny mosses to giant trees & 80% of these are flowering plants
- The main characteristics of all plants include
  - They have eukaryotic cells.
  - They are multicellular organisms
  - They contain chlorophyll and carry out photosynthesis.
  - They are predominantly land dwelling.
  - Their cell wall composed of cellulose
  - Most have a waxy cuticle that helps to prevent drying out
- The kingdom is split into a number of divisions. Plant divisions are the same as animal phyla. The four most important divisions are:

### A. Division Bryophyta (mosses and liverworts)

- They are the simplest land plants.
- They do not have a true leave , stem & root system
- They are non-vascular (do not have xylem and phloem).
- The best examples of bryophytes are mosses like *Etodon concinnus*,and *Funaria* species.
  - **A moss plant has**
- A simple, slender stem.
- They also have thin simple leaves
- Also have simple root-like structures called **rhizoids** and attach the mosses to the soil & used for absorption of water.
- The other example is the liverworts, which only grow in very wet places.
- Bryophytes are commonly found in rainforests and at high altitudes on mountains



***Figure 5.8** Mosses like this can be found in damp places in Ethiopia.*

## B. Division Pteridophyta (Filicinopyta)-ferns

They have true leaves, stems and roots.

- Fern stems have **rhizomes**, which grow horizontally just below the surface of the soil.
- They have vascular tissue
- They have large prominent leaves called fronds
- Their spore produced in the fronds &dispersed by wind
- They reproduce by **alternation of generation(**the sporophyte is well developed their gametophyte stage is reduced)
- most ferns live in damp, shady places – they are very common in tropical rainforests
- However, some ferns – such as *Pteridium* spp (commonly known as bracken) can grow and do well in full sunlight.
- Another example of a pteridophyte is the fern *Dryopteris* spp.



***Ferns***

## C. Spermatophytes(seed-bearing plants )

- They are the most successful because of the following characteristic features that they possess:
  - They have well-developed roots, stem and leaves.
  - They have well-developed vascular tissues.
  - The male gametes are contained within pollen grains and female gamete is contained within the embryo sac.
  - The product of fertilisation in sexual reproduction is a seed that may or may not be enclosed in a fruit.
- The spermatophyta are divided into two divisions. these are:

### Division Gymnospermae(coniferopyta)- non-flowering plants

- These are more commonly known as the conifers or 'naked seed plants'. Pine trees, spruces and cedars

▲ The main characteristics of the gymnospermae are:

- Their seeds are not enclosed in fruits.
- They have small needle-shaped leaves with a thick waxy cuticle that reduces water loss and minimises damage by excess heat or cold.
- They are evergreen so they can photosynthesize all year long
- The reproductive structures are found in cones.

- They different types of cone. The male cone forms huge numbers of pollen grains that are blown by wind to a female cone.
- Fertilisation results in a small winged seed.
- The genus *Pinus* (for example, *Pinus sylvestris*, *Pinus resinosa*,) is a good example of a conifer



***Figure 5.10** Gymnosperms have very typical leaves and cones with naked, exposed seeds.*

### Division Angiospermae(flowering plants)

- They are the biggest group of land plants on the Earth.
  - **The main characteristics of the angiosperms are**
    - They have flowers as reproductive organs.
    - They have their seeds enclosed in a fruit.
    - They have well-developed **xylem** and **phloem** tissue
    - Angiosperms are subdivided into two main classes according to the number of cotyledons they have in their seeds. These are:

**I. Class Monocotyledons (monocots)**

- are a group of enormous importance because they are cereal plants that form the staple diet
  - The main characteristics of the monocotyledons are:
    - The embryo has a single seed leaf (cotyledon).
    - Leaves are generally long and thin with parallel veins.
    - The stem contains scattered vascular bundles.
    - They do not reach great sizes (palms are the exception to this).
    - They are often wind pollinated
    - Example grasses, orchids and maize. Maize& Teff

- **II.Class Dicotyledons (dicots)**

They make up most of the trees, as well as many vegetable plants .

- The main characteristics of the dicotyledons are
- The embryo has two seed leaves (cotyledons).
- The leaves are often relatively broad and have a network of veins.
- The stem contains a ring of vascular tissue.
- Some dicots reach great sizes.
- They are often insect pollinated.

- Some common examples of dicots include sunflowers, peas, roses and beans. Most trees, such as *Jacaranda*, *Eucalyptus*, *Cassia* and mangos are dicotyledons. Shrubs include *Hibiscus*, *Lantana camara*, *Bauhinia* and oranges

## 5. Kingdom Animalia

- This kingdom includes the animals. There are at least two million species of animals alive today.
- They are multicellular, eukaryotic and heterotrophic
- They exhibit locomotion, that is, can move their bodies from one place to another, and
- Their cells do not have cell walls.
- They have nervous systems so they are sensitive to their surroundings.
- They are either invertebrates (not have a backbone.) or the vertebrates( – all the animals which have a spinal cord enclosed in a backbone of vertebrae)
- There are33 animal phyla but the main ones are

### ㄱ Phylum Porifera (the sponges)

- ㅂ They are the simplest invertebrates. Most of them are hermaphroditic
- ㅂ They have hollow filter feeders, and the body cavity is connected to its external environment by pores.
- ㅂ There is little co-ordination or control.
- ㅂ They range in size from a few millimetres to two metres and are supported by a calcareous spicules.



***Figure 5.14*** *Sponges do not look much like animals, but that is what they are.*

### ㄱ Phylum Coelenterata(cnidaria)

- ㅂ They include some exceptionally beautiful creatures and also
- ㅂ Some very poisonous ones. Sea anemones, hydra, jelly fish and coral are among the members of this phylum.
- ㅂ They have soft bodies with a ring of tentacles for capturing prey.
- ㅂ They have stinging cells on their tentacles for poisoning or immobilising prey and predators.
- ㅂ They have two layers of cells in their bodies that surround a central cavity.
- ㅂ They have only one opening, the mouth, and their bodies have radial symmetry
- ㅂ Radial symmetry : is a body that can be divided into many halves.



**E.g. of coelenterate**

### Phylum Platyhelminthes – flatworms

- They show a relatively high level of organization
- They have flattened bodies with a mouth but no anus.
- They have no body cavity and rely on diffusion for everything.
- They are hermaphrodites
  - They live in other animals as parasites or are free-living in fresh water. Examples of Platyhelminthes include *Planaria* spp, which live in fresh water, tapeworms and liver flukes like *Fasciola hepatica*

### Phylum nematoda(round worm)

- They have narrow, thread-like bodies,
- Their bodies are not segmented and are round in cross-section.
- They don't have a circulatory system but they do have a complete digestive system.
- Bilaterally symmetrical. Body
- They contains many important parasites, such as *Ascaris*, which infects the guts of Both humans and pigs, and the family Filariidae -which cause elephantiasis



***Figure 5.17*** *Nematodes or*

### Phylum Annelida(segmented worm)

- They have segmented body.
- They have a closed blood circulatory system.
- They are hermaphrodites, with male and female reproductive organs and
- They have bristle like structures called **chaetae** to help them move.
- They are found in moist soil and water and most are free-living.
- The common earthworm, *Lumbricus terrestris*,& leech



**Earthworm**



**Snail (mollusc)**



**e.g. of Echinoderms**

### Phylum Mollusca

- The most intelligent of the invertebrate species.
- Octopi and squid have well developed brains.
- They may have shells or be shell-less, live in the sea, or in fresh water or on land.
- They have a soft muscular foot with a soft body
- Their bodies are divided into head, foot and visceral mass and they are not segmented.
- They breathe through gills. Examples of molluscs include slugs and snails.

### ¬ Phylum Echinodermata

- They are spiny skinned animals
- they have a mouth, a gut and an anus
- They are all marine animals, and move around using **tube feet**.
- The adults have five arms, but the larval stages do not.
- Examples include *Asteris*, the common starfsh, *Echinus*, the common sea urchin and *Paracucumana tricolor*, a brightly coloured sea cucumber known as a sea apple.

### ¬ Phylum Arthropoda

- This phylum gets its name from two Greek words, *arthron* – joint, and *podos* – foot.
- They have an external exoskeleton made of chitin that prevents excessive water loss.
- They are animals with segmented bodies and jointed limbs.
- They have a well-developed nervous system and a complete gut from the mouth to anus.
- They divided into a number of classes according to the number of limbs, presence and number of antennae and number of body parts.

### ¬ Class insecta

- They live almost everywhere although most are land-based.
- They have a body divided into three body parts; head, thorax and abdomen.
- They have three pairs of jointed legs on the thorax along with one or two pairs of wings.
- On their head they have a pair of antennae and one pair of compound eyes.
- Insects include flies, butterflies and moths, beetles, wasps and bees and many other common groups.

### ¬ Class crustacea

- They are mainly aquatic.
- They vary in size from very small, for example water fleas, to quite large, for e.g. lobsters and crabs.
- Their body is made up of two parts – a cephalothorax (head fused with thorax) and abdomen.
- The body is often protected by a tough covering called a carapace.
- They have more than four pairs of jointed legs, two pairs of antennae and simple eyes.
- They include *Daphnia*, crab, prawn, shrimp, barnacle, water flea, lobsters, woodlice and crayfish.

### ¬ Class chilopoda ( the centipedes )and the diplopoda (the millipedes)

They both have long bodies with many segments and lots of leg

| **Centipedes** | **Millipedes** |
|---|---|
| Have flattened bodies | Cylindrical bodies |
| Have brightly coloured bodies | Dull-coloured bodies |
| Have few or less segments | Have more segments |
| Have one pair of limbs per segment | Have two pairs of limbs per segment |
| Carnivorous (feed on other animals) | Herbivorous |
| Have poisonous claws for paralysing their prey | Have claws for biting and chewing plant material |

**Table 5.3 Differences between centipedes and millipedes**

### Class Arachnida (the spiders)

- They are mainly terrestrial although some are aquatic.
- They have two body parts – a cephalothorax and the abdomen – with no antennae.
- They have eight legs in four pairs.
- They have simple eyes
- Spiders spin silken webs. Examples of arachnids include spiders, ticks, scorpions and mites.

### Phylum Chordata

- The term Chordata is derived from the term notochord
- **Notochord** flexible rod like structure of cartilage running along the dorsal side of the body.

**They have the following three features in common:**

- They have a notochord at some stage of their lifecycle.
- They have a hollow nerve cord
- They have gill slits during early stages of development that are later replaced by lungs and gills.

### Vertebrates

6. The **chordates**, the best known of which are the **vertebrates (**animals with vertebral column/backbone)

**In addition, they also have the following features**:

- An internal skeleton (endoskeleton) made of bone or cartilage.
- A closed blood circulatory system consisting of blood vessels.
- A well-developed nervous system.
- Two pairs of limbs.
- Kidneys as excretory organs

- Phylum Chordata divided five classes

### i. Class pisces- fishes

- They are aquatic
- They have streamlined bodies with scales on their skin.
- They use gills for gaseous exchange and have fins for swimming

They are ectothermic – they rely on heat from their environment to regulate their body temperature.

***Table 5.5*** *Differences between bony fish and cartilaginous fish*

| **Bony fish (teleosts)** | **Cartilaginous fish(elesmobranches)** |
|---|---|
| Have bony skeleton | Have cartilaginous skeleton |
| Have round-shaped scales | Have scales that are not round shaped |
| Have opercula (gill covers) covering their gills | Have no opercula (gill covers) but have gill slits |
| Have homocercal tails (even size fins) | Have heterocercal tails (one part is larger than the other) |
| Are usually smaller in size | Are usually larger in size |
| e.g. *Tilapia*, Nile perch, mackerel and catfish | E.g. Sharks, skates and rays. |

### ii. Class Amphibia

- Spend part of their lives in water and part of it on land.
- They were the first vertebrates to colonise the land.
- They have simple sac-like lungs (which are not very efficient) and smooth, moist skin
- Their lifecycle includes metamorphosis, and they need water for successful reproduction as fertilisation is external and the larval form (tadpole) is aquatic.
- Gills are only present in the larval forms & they are ectothermic
- Example: frogs, toads, newts and salamanders

| Frog | Toad |
|---|---|
| Has a smooth skin | Has a rough skin |
| Has a moist skin | Has a dry skin |
| Has more webbed feet | Has less webbed feet |
| Has a brightly coloured body | Has a dull-coloured body |
| Has a more streamlined body | Has a less streamlined body |
| Has extra-long hind legs | Has hind legs that are not extra long |

**Table 5.6 Differences between a frog and a toad**

### iii. Class Reptilia

- The **reptiles** are mainly terrestrial animals
- They have bony skeleton
- They have dry skin with scales and their gas exchange takes place exclusively in the lungs
- They have developed internal fertilisation
- Some reptiles even keep the eggs within their body and give birth to fully developed young.
- They are poikilothermic (ectothermic) & have no external ears
- Examples , snakes, crocodiles
- Two pair of pentadactyl limbs usually present

### iv. Class Aves(birds)

- Have skin that bears feather & scales on legs.
- Have bony skeleton
- Two pairs of pentadactyl limbs, front pair forms wings
- They are homoeothermic (endothermic)
- Example: domestic fowl, the wattled ibis, white collared pigeon and the Ethiopian eagle owl.

### v. Class Mammalia

- They are the best known of all animals
- Their skin bears hair , the skin consists of glands like sebaceous& sweat
- They produce live young which have developed for a time within the body of the mother in a structure called the uterus
- They have bony skeleton & Have external ear
- Have two pairs of pentadactyl limbs
- They use lungs for gas exchange
- A true mammal produces milk for its young in mammary glands

#### Subdivisions of mammals

i. Mammals are classified according to the way their young are produced. There are three sub-classes of mammals:
   **Egg-laying mammals** – lay eggs, e.g. duck-billed platypus.
ii. **Marsupials** – produce immature young, which are nourished by milk in the pouch, e.g. kangaroo, koala bear, opossum.
iii. **Higher mammals** – produce fully developed young, which are nourished by milk from the mammary glands, e.g. cows, elephants, cats, monkeys and humans.

- There are even flying mammals, as bats have been adapted to fly through the air on their leathery wings!

# UNIT 6:ENVIRONMENT

## 6.1. Ecosystems

- **Ecosystem :** all the animals and plants that live in an area along with the things that affect them
- It is the home or **habitat** of the living organisms within it
- Habitats may be on land – when they are known as **terrestrial habitats** or
- They may be in water, when they are called **aquatic habitats**.

- there are two main types of aquatic habitat – the **marine habitat**, which is the salt water of the seas and oceans, and the **freshwater habitat** of lakes, ponds, rivers, and streams
- They are affected by both the **abiotic components** and the **biotic components** of the ecosystem

## A. Abiotic components

- Abiotic factors are the non-living elements of an ecosystem
- The **climate** and **weather** produce several important abiotic components. They include the amount of **sunlight**, and the amount of **rainfall**.
- **Temperature** is a factor which often affects whether animals and plants can survive in an ecosystem.
- Other abiotic factors include the type of soil and rocks, the drainage of the soil and the pH (acidity).

## B. Biotic components

- Are factor of the living organisms within an ecosystem which affect the ability of an organism to survive
- Each organism is the part of another organisms environment thus they interact in various ways: these are:

**I. Intraspecific factor** : occur between members of the same species, such as Competition for food, territory& finding mate.

**II. Interspecific factor**: which occur between members of different species. **This** include predator-prey relationship & symbiosis

- **Predator-prey relationship (predation):** in which predator animal like lion, tiger feed on other animal (**prey**) like buffalo, rabbit, etc.
- **Symbiosis:** is relationship between two organism of different species in which one or both get benefited from the relationship: this can classified as:
  - **Commensalism:** is the relationship in which one organism is benefited while the other is neither benefited nor harmed. E.g. The r/ship between big trees& epiphytes
  - **Mutualism :** is relationship in which get benefited & it's an obligatory relationship
    **For example: lichen** (algae & fungi).
  - **Parasitism:** is the relationship in which one organism is benefited (the parasite) & another organism is harmed (host). **e.g.** R/ship between human & parasite like tape worm.
  - **Protocooperation:** the relation which both organism are benefited but it is not an obligatory relationship. **e.g.** the r/ship between teeth cleaning bird & crocodile

# 6.2 Food relationships

**According to their mode of nutrition organism can be classified as:**

**A. Autotrophs**: organism that can synthesize their own food to release energy from the raw material in their surrounding environment. they can be classified as :

- **Phototrophs:** organisms that feed off light to synthesize their organic food .This group of organisms are called **producers. E.g**. green plants, algae& photosynthetic bacteria.
- **Chemotrophs:** organisms that get energy from the breakdown of inorganic chemical **E.g** . nitrifying bacteria
- **B. heterotrophs:** organisms that rely on eating other organisms. They cannot produce their own food so they are called **Consumer.** They can be grouped as:
  - **Herbivores:** animals that eat plants only. **E.g**. cow, buffalo, sheep, etc.
  - **Carnivores:** animals that feed on other animals only. e.g. tiger ,lion
  - **Omnivores:** animals whose diet includes both plants and animals. e.g., human

- **Decomposers**: organism that break down the remains of animals and plants and return the mineral nutrients to the soil **e.g. bacteria & fungi**

## Food chains

- **Food chain**: is simple & direct feeding interrelationship which involve transfer of energy & nutrients from one organism to another.
- In a food chain energy flow is unidirectional (from producer to consumer)
- Each organisms occupies particular tropic level within a food chain
- **Trophic levels:** levels in a food chain to which an organism belongs.
- **The main tropic levels are:**

i. **Producer (first tropic level):** are green plants & algae.
   - All organisms depend directly or indirectly on producer.
   - The sun is ultimate source of energy for all food chains.

ii. **Primary consumers (second trophic level):** includes herbivores & omnivores.

iii. **Secondary consumers (third tropic level):** are carnivores which mostly eat herbivores &omnivores.

iv. **Tertiary consumers (fourth tropic level ):** are carnivores (sometimes called **top carnivores**)which mostly eat other carnivores.

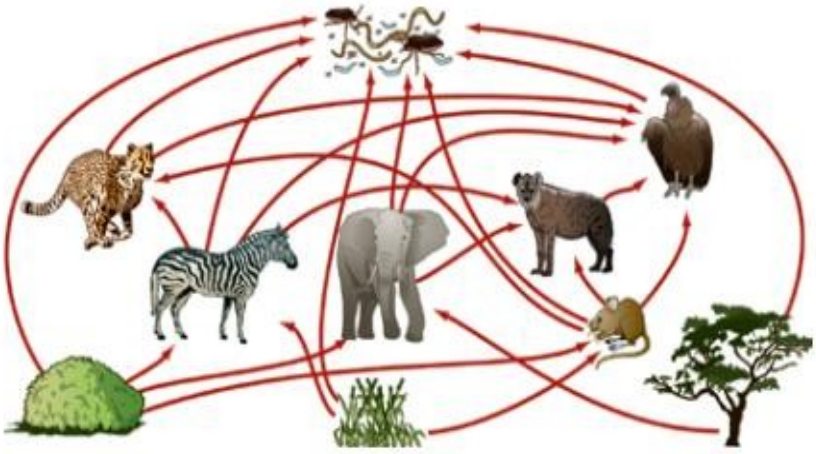
- **Decomposer are found at the of each food chain**
- Many aquatic food chains start with the microscopic photosynthetic organisms known as **phytoplankton** (**plant plankton**).
- These tiny organisms are eaten by the equally microscopic **zooplankton** (**animal plankton**) and these two groups of organisms underpin food chains which involve almost every animal in the water, from tiny shrimps to enormous whales.

**Examples food chain**

- Oak(**Leaves(** → grasshopper → rodent → leopard
  **Producer** **primary consumer** **2ndary consumer** **tertiary consumer**
- grass → zebra → lion
- phytoplankton → zooplankton →fish →man

## Food web

- Food web is network of food chains
- In a food web the interactions between many different food chains can be shown
- **Example of food web**



**Example of food web**

### ⇉ Pyramid of Biomass

- **Biomass:** Is a term that describes all the organic material produced by living organisms.
- It all comes originally from plants as they photosynthesize at the beginning of all food chains.
- This biomass is then passed on through a food chain or web into the animals which eat the plants and then on into the animals which eat other animals.
- The total amount of biomass in the living organisms stage of the food chain can be drawn to scale and shown as a pyramid of biomass
- The biomass supported at each trophic level decreases as it goes from one tropic level to the next.

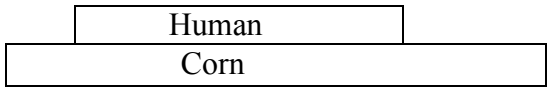



**Pyramid of biomass**

- **At each tropic level biomass is lost in various forms :**
  Heat from respiration, urine, feaces, to provide energy

### ⇉ Pyramid of numbers

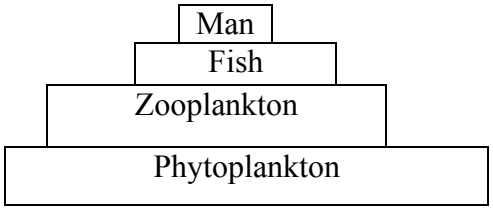
- The number of organism decreases it moves from one tropic level to the next.
- In most ecosystems producers contain large number of organisms than consumer, however sometimes this may not work
- **For e.g.** the breadfruit tree can grow to around 20 m tall, yet it can be attacked by mealybugs. They in turn are eaten by ladybirds. However, the pyramid of numbers for this food chain doesn't look like a pyramid at all.




**Pyramid of number**

### ⇉ Pyramid of energy

- In ecosystem there is always be transfer of energy from one tropic level to the next tropic level
- There is progressively less energy available for organisms further down a food chain.
- Energy is cannot be recycled in an ecosystem, it always flows in one directly.




**Pyramid of energy**

## 6.3 Recycling in nature

- Living things are constantly removing materials from the environment.
- The recycling of substances provide an important link between the biotic and abiotic component.
- The materials are returned to the environment from the waste products of animals and the dead bodies of plants and animals.
- Nutrient in organisms are back into the soil by action of group of organisms known as the decomposer.
- Decomposer(bacteria & fungi) play a huge role in recycling of nutrients :

### ⁼ Important of decomposers

- They are important in various way to the environment.
  - ⁼ Break & digest dead bodies of plants, animals & waste materials or dropping of animals & add them into the soil. This increases the fertility of the soil which is useful for plants.
  - ⁼ Removes unpleasant waste materials from an environment
  - ⁼ Used to make compost in garden
- Recycling of substances in an ecosystem includes chemical, physical &biological processes.

## i. The nitrogen cycle

- ▲ Nitrogen is a vital part of the structure of amino acids and proteins, DNA and RNA
- ▲ It involves the conversion of nitrogen gas by various processes into usable form by plants
- ▲ Green plants absorb nitrogen in the form of nitrates dissolved in the soil water.
- ▲ They use these nitrates to make proteins, and then this protein is passed along the food chain.
- ▲ The atmospheric nitrogen is fixed by microorganisms living in a symbiotic relationship certain plants, specially **legumes ,it includes pea,** beans and clover – have nodules on their roots which are full of nitrogen-fixing bacteria

**The nitrogen cycle involves the following bacteria**

A. **Nitrogen fixing bacteria-**convert free atmospheric nitrogen into nitrate
   **Note:** lightining has also a role in fixing atmospheric nitrogen
B. **Nitrifying bacteria** : convert ammonium to nitrite then to nitrate
   Ammonium ⟶ Nitrite
   Nitrite ⟶ Nitrate
C. **Putrefying (amonifying) bacteria: they** convert protein in the dead bodies & decay of plants into ammonium compounds.
D. **Denitrifying bacteria** –are bacteria that convert nitrates into free atmospheric nitrogen **.**

## ii. The carbon cycle

**Carbon cycle:** cycling of carbon compounds between the living and the nonliving world.

- The main molecules of life are based on carbon atoms.
- It mainly involves the conversion of the inorganic molecule carbon dioxide to form organic molecules which are formed within the tissues of organisms.
- Carbon dioxide is removed from the air by green plants in the process of photosynthesis.
- Then when the plants are eaten by animals the carbon is passed on and becomes part of the animal bodies
- when animals respire they release carbon dioxide as a waste product into the air
- Finally when both plants and animals die, their bodies are broken down by the action of decomposers
- Carbon dioxide is also released into the atmosphere in the process of combustion.
  - This build-up of carbon dioxide gas in the atmosphere is generally believed to contribute to the **greenhouse effect**, also referred to as **global warming**
  - Methane is another greenhouse gas which causes air pollution and the levels of this gas are rising too.

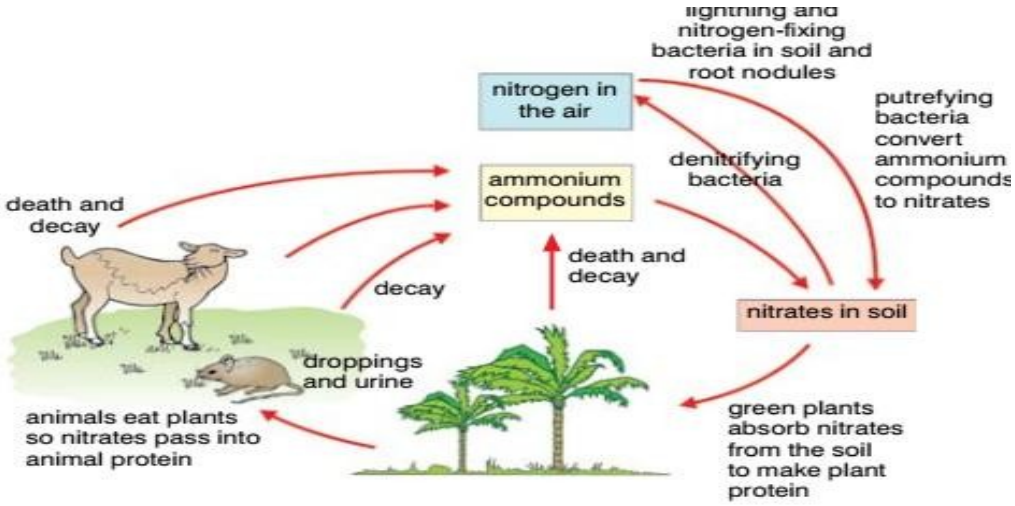



***Figure 6.16*** *The nitrogen cycle in nature*

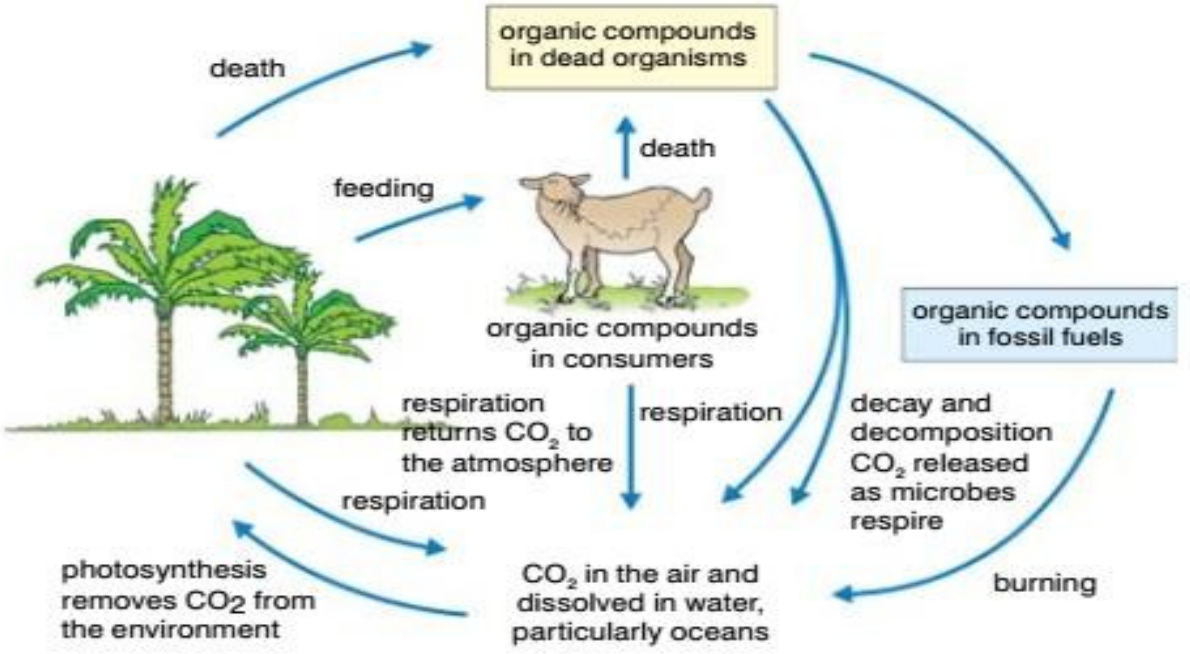



***Figure 6.17*** *The in nature*

## 6.4 Adaptation

- Features organisms develop which make it possible for them to survive in particular habitats.
- Organisms in different climatic condition have different adaptation mechanisms to survive in their ecosystem.

### I. Animals in cold climates

- Animals in very cold climates have other adaptation

- Thick layer of fat under the skin to keep to store more internal heat **&**a thick fur coat on the outside
- Reduced surface area to volume ratio
- Usually have Very small ears
- camouflageof an Arctic animal in summer would stand out against the snow in winter
- **E.g**. Arctic fox change the greys and browns of their summer coats for pure white in the winter.

### II. Adaptation in dry climates

- Many animals which live in hot or dry conditions have other adaptations for cooling down
- They are often most active in the early morning and late evening

- They often have large, thin ears as well to increase their surface area for losing heat
- They don't have much fur & relatively little body fat stored under the skin.

### III. Some adaptation of plants

- Plants take in water through their roots in the soil & lose water all the time through their leaves.
- There are small openings called **stomata** in the leaves of a plant. These open to allow gases in and out for photosynthesis and respiration.
- When it is hot and dry, photosynthesis and respiration take place fast
- most plants that live in dry conditions have reduced the surface area of their leaves so they lose less water e.g. cacti
- plants can cope with dry conditions to store water in their tissues
- Plants which store water in their fleshy leaves, stems or roots are known as **succulent**
- Animal dispersed plants have seeds which have hocks & spines

### IV. Some animal adaptation

- Carnivores animals have sharp & pointed canines to tear flesh.
- Porcupine(dhaddee) has skin surface which is covered with long stiff parts like needle called quills, which it can raise to protect itself when it is attacked by enemy

## 6.5 Tree-growing project

- Ecosystem our country has been changing dramatically because of deforestation. Now Only 3% of land is covered with forests.
- Trees produce oxygen and remove carbon dioxide from the air. They help to reduce the effects of air pollution and also reduce global warming.
- It hold the soil in place and without them our soil is becoming unstable and blowing away.
- it also help absorb water – they prevent soil erosion and help to prevent the formation of great areas of Desert

### tree planting procedure

- To plant a tree successfully;

I. The soil must be prepared,
II. a big hole must be dug and
III. Water must be put into the hole before the tree is planted.
IV. Once the sapling is in place, the soil must be pressed very frmly around it and
V. Often a stake is used to support the young tree as it starts to grow and get established.
VI. The young trees need to be cared.

## *Grade 9 biology Second semester practices questions*

### I. Choose the correct answer from the given alternatives

1. The substances that form a network over a cut surface and traps the blood cells is:
   A. Fibrinogen B. Calcium C. Fibrin D. Prothrombin
2. If you cut your finger , blood comes out and then stops flowing , this is due to clotting of blood by:
   A. Platelets B. White blood cells C. Antibodies D. Red blood cells
3. The tricuspid valve prevents the back flow of the blood from the:
   A. Left ventricle to left atrium
   B. Right ventricle to right atrium
   C. Pulmonary artery to right ventricle
   D. Right atrium to right ventricle
4. The chambers of the heart that pump the deoxygenated blood are the:
   A. Two upper chamber that are closer to the lungs
   B. The two right chambers
   C. Upper left and lower right chambers
   D. The two left chambers
5. Which one of the following statement is true about gaseous contents of the blood?
   A. Venous blood contains more or less the same amount of $O_2$ as does arterial blood.
   B. The $CO_2$ & $O_2$ contents of arterial and venous blood are similar.
   C. Arterial blood in general contains more $O_2$ and less $CO_2$ than does venous blood.
   D. Venous blood contains carbon dioxide but not oxygen.
6. Which of the following is true concerning blood circulation system?
   A. The right hand side of the heart always carry oxygenated blood
   B. The central cavity of the arteries is wider than that of veins
   C. The veins used as site of exchange of substance within the body
   D. The two side of the heart fill and empty simultaneously to give coordinated beat.
7. Based on the mechanism of blood circulation given below; which of the following alternative contains the correct sequence?
   I. Oxygenated blood returns to the left-hand side of the heart from the lungs and the left atrium fills up.
   II. The left ventricle contracts forcing oxygenated blood out of the heart and around the body.
   III. The right atrium contracts and forces blood into the right ventricle
   IV. The right ventricle contracts and forces blood out of the heart and into the lungs
   V. The left atrium contracts forcing blood into the left ventricle
   VI. Deoxygenated blood, which is loaded with carbon dioxide, comes into the right atrium of the heart from the veins of the body.
   A. VI,III,I,V,IV&II B. VI,III,IV,I,V&II C. VI,IV,III,I,V&II D. II,III,IV,I,V&VI
8. During the systolic phase of the cardiac cycle, the heart is _____.
   A. Relaxing
   B. contracting and relaxing
   C. filling with blood
   D. contracting
9. Which of the following is the method to decreases hypertension?
   A. Excessive salt intake
   B. Inactive lifestyle
   C. Excessive consumption of alcohol
   D. Losing weight
10. White blood cells differ from Mature red blood cells in that:-
    A. White blood cells have much longer span of life
    B. White blood cells have no nuclei
    C. White blood cells are larger in size
    D. All of the above
11. Which of the following statement is **not** true about veins?
    A. Their walls are thinner than that of arteries
    B. They contain valves but no pulse
    C. Most of them carry oxygenated blood
    D. They have wider lumen
12. Which of the following has thickest wall?
    A. Right ventricle B. Right atrium C. Left ventricle D. Left atrium
13. While oxygen is carried by the red blood cells , most of the carbon dioxide is carried by:
    A. Plasma B. Lymphocytes C. Platelets D. White blood cells
14. In which of the following mammalian veins do you find bright- red blood?
    A. Pulmonary vein
    B. Pulmonary artery
    C. Inferior venacava
    D. Coronary vein

15. The two side of the heart fill& empty at the same time to give strong coordinated beat. this means:
    A. The right atrium contract with right ventricle
    B. The left atrium contract with left ventricle
    C. The right atrium contract with left atrium
    D. The right ventricle contract with left atrium
16. The term double circulation more correctly refers to:
    A. Presence of inferior & superior venacava
    B. Presence of pulmonary & systemic circulation.
    C. Division of the heart into left and right halves.
    D. Presence of pulmonary vein & artery
17. The pain known as muscle cramps that one may experience after a heavy physical exercise results from the accumulation of:
    A. Alcohol in muscle cells
    B. Energy in muscle cells
    C. Carbon dioxide in muscle cells
    D. Lactic acid in muscle cells
18. If certain substance is injected into the blood in the right atrium of the mammalian heart, at which of the following parts would the substance detected last?
    A. Right ventricle B. Left atrium C. Left ventricle D. Right atrium
19. The exchange of substance between the blood &the tissues of the body takes place in the:
    A. Arteries B. Veins C. Capillaries D. Aorta
20. If you detected lots of mitochondria in the cells of a tissue from an animal , this suggests that the cells,
    A. Use lots of energy
    B. Respire anaerobically
    C. Has stopped active growth
    D. Are from portion of an organ with dead
21. Which of the following event is true during exhalation?
    A. Intercostal muscles contract
    B. The ribs move upward and outwards
    C. The diaphragm muscle relax
    D. The lung filled with air
22. One of the following structures is serves as a passage of both air and food?
    A. Larynx B. epiglottis C. Trachea D. Pharynx
23. Which of the following statement about the human respiratory system is false?
    A. When we breathe in, air travels from alveoli to trachea
    B. The bronchioles are larger and more branched than bronchi.
    C. Mucus in nasal passage used to trap dust and small particles
    D. Gas exchange between the lung and blood takes place in the trachea
24. Which is the correct order of airflow during inhalation?
    A. Nasal cavity→ trachea→ larynx →pharynx → bronchi→ bronchioles →alveoli
    B. Nasal cavity→ pharynx →larynx→ trachea→ bronchi →bronchioles →alveoli
    C. Nasal cavity→ pharynx →larynx→ trachea→ bronchioles→ bronchi →alveoli
    D. Nasal cavity→ pharynx →trachea→ larynx→ bronchi→ bronchioles→ alveoli
25. Which of the following reaction is indicating release of energy to the cells?
    A. ATP+ $H_2O$→ ADP + Pi
    B. ADP + Pi → ATP
    C. ADP + Pi → ATP+ Pi
    D. ATP+ $H_2O$→ ATP + Pi
26. Which of the following is true of aerobic respiration?
    A. It is involved without requirement of oxygen
    B. It takes place in cytoplasm of the cell
    C. It yields less energy than anaerobic respiration
    D. It release $CO_2$ as waste product
27. Which of the following reaction is true of oxygen debt repayment?
    A. Glucose → lactic acid+ energy
    B. Glucose +oxygen → $CO_2$ +$O_2$ + Energy
    C. Glucose → ethanol + $CO_2$ + energy
    D. Lactic acid + oxygen→ $CO_2$+ $H_2O$
28. Which of the following smoking related disease is result of breaking down of Alveolar structure?
    A. Bronchitis
    B. Chronic obstructive pulmonary disease
    C. Pulmonary TB
    D. Throat cancer
29. Which of the following is true of vital capacity?
    A. the maximum amount of air that breathed in and out
    B. The amount of air breathed in and out at normal resting situation
    C. The minimum amount of air per breath
    D. The number of breath per unit time
30. It is not true that:
    A. In normal quite breathing both internal and external intercostal muscles are involved.
    B. When air is breathed into the lungs oxygen passes into the blood by diffusion.
    C. The blood that the heart pumps to the lungs is low in oxygen.
    D. The volume the thorax increases when air is breathed in.

31. Which of the following chemical in cigarette smoke decreases the oxygen carrying capacity of the blood?
    A. Tar  B. Nicotine  C. Carbon monoxide  D. Arsenic
32. The role of the mucus on the epithelium of the trachea is:
    A. To move dirt and mucus down the trachea into the lung
    B. To trap microorganism & dust particles
    C. To prevent food getting into the lungs
    D. To move dirt and mucus away from the lungs
33. Fermentation of glucose by yeast yields
    A. $CO_2$, energy & lactic acid
    B. $CO_2$, $H_2O$ & ethyl alcohol
    C. $CO_2$, energy & ethanol
    D. $CO_2$, ethanol & lactic acid
34. Controlling of micro-organisms through heated to either 71.6 °C for at least 15 seconds or 62.9 °C for 30 minute is called?
    A. Pasteurization
    B. Autoclaving
    C. Dry heat sterilization
    D. Ultra high temperature
35. Immunity passed from mother to foetus by way of the placenta is described as:
    A. natural active  B. Artificial active  C. Natural passive  D. Artificial passive
36. Which of the following animal is the vector for malaria?
    A. *Aedes aegypti* mosquito
    B. housefly
    C. *Anopheles* mosquito
    D. *Plasmodium falciparum*
37. Which of the following statement is **not true of microorganisms?**
    A. All are harmful and cause disease
    B. Some of them have useful aspects in ecosystem
    C. All are parasites
    D. A&C are not true
38. All of the following are useful effects of growing of micro-organisms in laboratories. **Except:**
    A. To know how to killed them
    B. To develop biological weapon
    C. To identify their useful & harmful aspects
    D. To develop vaccines
39. Which of the following disease is only caused by bacteria?
    A. Malaria  B. Bilharzia  C. gastro enteritis  D. cholera
40. The chemical approach to controlling micro-organisms that are applied to living tissue to kill micro-organisms are:
    A. Antiseptics  B. Disinfectant  C. Autoclaving  D. Sterilization
41. A solid nutrient medium which is extracted from red algae & used for growing of microorganisms on Petridish is
    A. Agar  B. Broth  C. Crystal violet  D. Iodine
42. Artificial passive immunity**:**
    A. It involves giving specific antibodies in the form of infection
    B. It can be passes from mother to child though breast feeding
    C. It has long-lasting effect on the body
    D. It can damage all types of pathogenic antigen
43. Which of the following method is used prevent the disease which is caused by tape worm?
    A. Avoid work in overcrowded conditions
    B. Taking effective antibiotic
    C. Avoid eating improperly cooked or raw meat
    D. Use insecticide-treated mosquito nets
44. One of the following is not characteristics of viruses
    A. They are obligate intracellular parasites
    B. They have either DNA or RNA as genetic material
    C. They can reproduce without host cells
    D. They do not carry out of the functions of normal living organisms
45. Which of the following bacteria doesn't cause intestinal infection & result in diarrhea?
    A. Salmonella typhi
    B. Escheria coli
    C. Mycobacterium tuberculosis
    D. Vibrio cholerae
46. Controlling the *Anopheles* mosquitoes which are vector of causative agent of malaria can be done by the following. **Except** :
    A. Having screens on doors and windows
    B. Having Good ventilation
    C. insecticide-treated mosquito nets
    D. Minimize any opportunities for the mosquitoes to breed
47. Among the Sexually transmitted disease, which is not caused by bacteria?
    A. Syphilis  B. Gonorrhea  C. Chancroid  D. HIV/AIDS

48. At which stage of syphilis, symptoms of illness in the skin, bones, central nervous system and heart developed?
A. Primary stage B. Secondary stage C. Tertiary stage D. Quaternary stage
49. Which of the following sexually transmitted disease affects males than females?
A. Chancroid B. Syphilis C. Gonorrhea D. HIV/AIDS
50. Which of the following are the most serious cases that affects people living with HIV/AIDS?
A. Care & support C. Stigma and discrimination
B. Guidance and counseling D. Developing positive attitude
51. Which of the following cells of immunity are attacked by Human Immuno deficiency viruses?
A. T- cells B. Red blood cells C. B-cells D. Plasma cells
52. All of the following practice have to be applied while you using modern medicine. Except:
A. Stop using the medicines if you are in good health condition.
B. Follow the instruction given by physician.
C. Do not take more than you are prescribed. D. Do not take less than you are given.
53. Choose the alternative contains the disease caused by what is known as **droplet infection**?
A. Typhoid fever B. Cholera C. Malaria D. Tuberculosis
54. What is the mode of transmission of diseases such as gastroenteritis & cholera?
A. Blood to blood contact C. Eating contaminated food
B. Bites of animal vectors D. Sexual contact
55. All of the following are practices that increase risk of HIV/AIDS. **Except:**
A. Having sex with an infected person
B. Sharing knives for female genital mutilation
C. Receive infected blood
D. Having positive attitude with an infected individual
56. Which of the following of the following human body system does HIV attacks?
A. Circulatory system C. Digestive system
B. Immune system D. Breathing system
57. What is the huge role played by micro-organisms such as bacteria and fungi in the ecosystem?
A. Producing organic substances C. Recycling of nutrients
B. Antibiotic production D. Causing of diseases
58. Which of the following is true about antibodies:
A. Are substances that destroy the cells of sick person
B. Antibodies against one disease can be used for curing any other infection.
C. Antibodies function the same way as antibiotics
D. Antibodies will give protection to the person against reinfection
59. Different biologists used different criteria to classify living things into different categories. What is the need for the classification?
A. To simplify their study. C. To try to understand how life originated
B. To bring order out of chaos or confusion D. All are the reason for need of classification
60. Which of the following is not true of subkingdom algae
A. All are microscopic C. They live either in aquatic habitat or on land
B. They are photosynthetic & eukaryotic D. They have undifferentiated body called thallus
61. Liverwort is from which of the division of plant kingdom?
A. Bryophyta B. Pteridophyta C. Spermatophyta D. Seed bearing plant
62. The scientific name of dog is:
A. *Musca domestica* B. *Canis familiaris* C. *Felis domesticus* D. *Panthera leo*
63. Large prominent leaves of ferns are:
A. Fronds B. Rhizomes C. Spores D. Rhizoids
64. Monocotyledons are differ from dicotyledons .because monocotyledon possess:
A. The stem contains scattered vascular bundles. C. The stem contains a ring of vascular tissue.
B. The leaves are often relatively broad. D. The leaves contain have a network of veins

65. Which of the following is **not** feature of Phylum Porifera?
    A. They have hollow filter feeders
    B. They are the simplest invertebrates
    C. The body cavity is connected to its external environment by pores
    D. They have stinging cells on their tentacles for poisoning
66. Segmented body is the character of phylum:
    A. Annelida B. Mollusca C. Nematoda D. Platyhelminthes
67. Which of the following phylum of animal kingdom move using **tube feet?**
    A. Nematoda B. Platyhelminthes C. Echinodermata D. Annelida
68. Lobsters and crabs are member of class:
    A. Crustacea B. Arachnida C. Insecta D. Chilopoda
69. Which of the following character of Centipedes makes it different from millipedes?
    A. flattened bodies C. two pairs of limbs per segment
    B. Presence more segments D. presence of claws for biting plant material
70. All of the following are features of Bony fish (teleosts**). Except:**
    A. Presence of bony skeleton C. Homocercal tails
    B. Round-shaped scales D. Absence of opercula
71. Which of the following may have an external exoskeleton made of chitin that prevents excessive water loss?
    A. Ants ,earthworm & protozoa C. Echinoderms & molluscs
    B. Molluscs ,Echinodermata & Annelida D. Arthropods
72. A group of plants characterized by the possession of a mass of spore bearing structures on the underside of their leaves are:
    A. Algae B. Gymnosperms C. Ferns D. Angiosperms
73. In the scientific name *Podocarpus falcatus* ; the word *Podocarpus* stands for the:
    A. Genus name B. Species name C. Family name D. Order name
74. The following two are members of phylum Annelida
    A. Trematoda & Ascaris C. Plannaria & earth worm
    B. Leeches & earthworm D. Leeches & flukes
75. Which of the following phylum is mismatched with their appearance
    A. Annelida -round worms C. Echinodermata- spiny-skinned animals
    B. Mollusca -soft-bodied animals D. Arthropoda--joint-footed animals
76. Which of the following groups of animals has the largest number of species?
    A. Vertebrates B. Earthworm C. Arachnid D. Mollusca
77. The features of lichens include:
    A. Have no true root, stem & leaves C. Are non-photosynthetic
    B. Have very simple organization D. Are seed bearing plants

**The next four questions are based on the following groups of organisms.**

I. Molluscs III. Angiosperm V. Ferns VII. Arthropods
II. Birds IV. Fishes VI. Mosses VIII. gymnosperm

78. Which of the above groups belong to the animal kingdom?
    A. I,II,III& VII B. I,III,IV&VII C. I,II,IV&VIII D. I,II,IV&VII
79. The best category for classifying the monocotyledons is :
    A. Group VIII B. Group V C. Group III D. Group IV
80. The biological field that studies about the groups listed under III,V,VI&VIII is:
    A. Zoology B. Microbiology C. Botany D. Entomology
81. True roots, stem and leaves are found in :
    A. III,V&VI B. III, IV& VI C. III, V&VII D. III,V&VIII
82. Which of the following is **not** a member of phylum Arthropoda?
    A. Arachnida B. Coelenterata C. Insecta D. Crustacea
83. Which of the following are generally **not** true **vertebrates**
    A. They have endoskeleton made of bone or cartilage.
    B. They have closed blood circulatory system consisting of blood vessels.
    C. They have well-developed nervous system. D. They contain a pair of limb
84. The snail can be best classified in the group of
    A. Arthropoda B. Chordata C. Molluscs D. Echinoderms

85. Which of the following is **not** true about insects? they possess:
   A. Three segmented body parts
   B. A pair of antennae
   C. Two pairs of legs
   D. One or Two pairs of wings
86. Which class of the vertebrata has scaly skin on the legs, lays eggs and can regulate its own body temperature?
   A. Birds B. Fish C. Mammals D. Reptiles
87. **Mammals** are the best known of all animals, then which of the following is not feature of mammals make them different from other vertebrate groups?
   A. Produces milk for its young in mammary glands.
   B. They sweat to help control their body temperature**.**
   C. They have two pairs of pentadactyl limbs
   D. They are poikilothermic
88. Which major group of the plant kingdom is best characterized by having needle shaped leaves and production of seeds in structures called cones?
   A. Monocotyledons B. Ferns C. Angiosperms D. Conifers
89. Which one of the following is **not** closely related to the others?
   A. Frog B. Turtle C. Crocodile D. Snake
90. In which of the following features are eukaryotic cells differ from prokaryotic cells?
   A. They have cell membrane
   B. They have distinctive nucleus
   C. They have no ribosome
   D. They have cytoplasm
91. Which of the following is **not** true of protozoa?
   A. They represent both plants and animals
   B. They are microscopic organisms
   C. They have no chloroplast
   D. They are prokaryotes
92. In which kingdom of life are the unicellular prokaryotes grouped?
   A. Monera B. Fungi C. Protista D. Plantae
93. Which of the following has a unidirectional flow in an ecosystem?
   A. Carbon B. Energy C. Nitrogen D. Water
94. In a given ecosystem, members of which one of the following groups release nutrients that are locked up in organic substances?
   A. Herbivores B. Producers C. Decomposers D. Carnivores
95. The adult frog in a pond feeds on insects. What type of consumer is the frog?
   A. Primary consumer
   B. Primary producer
   C. Tertiary consumer
   D. Secondary consumer
96. Which of the following trophic level contains the least amount of total energy in an ecosystem?
   A. First trophic level
   B. Second trophic level
   C. Fourth trophic level
   D. Third trophic level
97. Which is the appropriate term that collectively refers to the fungi & bacteria that the dead organic matter to the small elemental units?
   A. Producers B. Decomposers C. Carnivores D. Omnivores
98. In a food chain: - grass →rodents →snakes →eagles .Which group contains the high amount of energy?
   A. Grass B. Snakes C. Eagles D. Rodents
99. Which of the following bacteria converts nitrate in the soil to atmospheric nitrogen?
   A. Denitrifying bacteria
   B. Nitrifying bacteria
   C. Amonifying bacteria
   D. Nitrogen fixing bacteria
100. The food web is differ from food chain because in the food web:
   A. There are many trophic level
   B. There is clear sign of recycling nutrients
   C. There are many interconnected food chain
   D. There are high number of organisms
101. Which of the following statement is true concerning matter & energy in the ecosystem?
   A. Both matter & energy are recycled
   B. Matter is recycled; energy is not recycled
   C. Matter is not recycled; energy is recycled
   D. Matter is recycled more than energy does
102. The biomass of ecosystem is refers to :
   A. The dead parts of organisms in the ecosystem
   B. The total mass of producer in the ecosystem
   C. The total mass of materials produced by living organisms.
   D. The total mass producer & consumer in the ecosystem
103. In an ecosystem, presence of which of the following group is essential in order for the other to be present?
   A. Autotrophs B. Herbivores C. Carnivores D. Decomposers

104. Which of the following groups has the highest efficiency of obtaining energy from grasses?
   A. Omnivorous
   B. Herbivores
   C. Primary carnivores
   D. Secondary carnivores
105. Which of the following is true about the cycle of energy in nature?
   A. Energy obtained from various kinds of food can be used 100%
   B. Energy can be converted from one from to another
   C. Light energy can be utilized by all organism to carry out basic life processes.
   D. Energy flow from producer to consumer in the same amount.
106. Which of the following factor that affect ecosystem is **biotic** component?
   A. Temperature  B. Rain fall  C. Diseases  D. Water
107. The process which release carbon dioxide to atmosphere is:
   A. Photosynthesis  B. Combustion  C. Respiration  D. B & C

**The next two question is based on the diagram of food chain given below**




108. Which of the following is true concerning birds and lizards? They are:
   A. Primary consumers
   B. Secondary consumers
   C. Primary producers
   D. Tertiary consumers
109. Which of the following is belongs to quaternary trophic level?
   A. Snails  B. Insects  C. Hawks  D. Lizard
110. It is **not** true that:
   A. Nitrifying bacteria converts ammonium to nitrite then to nitrate
   B. Energy is cannot be recycled in an ecosystem
   C. The number of organisms increases it moves from one tropic level to the next.
   D. Intraspecific competition occur between members of the same species.
111. Which of the following gases are contribute to the **greenhouse effect?**
   A. Methane & carbon dioxide
   B. Methane & oxygen
   C. Carbon dioxide & nitrogen dioxide
   D. Nitrogen oxide & methane
112. Which of the following adaptation of animal is important in hot climate?
   A. Having thick fur to reduce heat loss
   B. Having fatty insulated layer under skin to store heat.
   C. Increase their surface area for losing heat
   D. Usually have thick & Very small ears
113. The Golden back jackal chases, catches, kills & feeds up on small herbivorous gazelle. The ecological interaction between these two organisms can be best described as:
   A. Protocooperation
   B. Predator –prey interaction
   C. Parasite –host interaction
   D. Mutualistic relation
114. The importance of the valves of the mammalian heart is that they
   A. Control the amount of blood flow
   B. Prevent pathogenic microorganisms from heart
   C. Prevent the blood from flowing back ward
   D. Control the speed at which blood is flowing

## *Answer Key for G-9 Biology Practice questions*

| | | | | | |
|---|---|---|---|---|---|
| 1.C | 21.C | 41.A | 61.A | 81.D | 101.B |
| 2. A | 22.D | 42.A | 62.B | 82.B | 102.C |
| 3.B | 23.C | 43.C | 63.A | 83.D | 103.A |
| 4.B | 24.B | 44.C | 64.A | 84.C | 104.B |
| 5.C | 25.A | 45.C | 65.D | 85.C | 105.B |
| 6.D | 26.D | 46.B | 66.A | 86.A | 106.C |
| 7.B | 27.D | 47.D | 67.C | 87.D | 107.D |
| 8.D | 28.B | 48.C | 68.A | 88.D | 108.B |
| 9.D | 29.A | 49.A | 69.A | 89.A | 109.C |
| 10.C | 30.A | 50.C | 70.D | 90.B | 110.C |
| 11.C | 31.C | 51.A | 71.D | 91.D | 111.A |
| 12.C | 32.B | 52.A | 72.C | 92.A | 112.C |
| 13.A | 33.A | 53.D | 73.A | 93.B | 113.B |
| 14.A | 34.A | 54.C | 74.B | 94.C | 114.C |
| 15.C | 35.C | 55.D | 75.B | 95.D | |
| 16.B | 36.C | 56.B | 76.A | 96.C | |
| 17.D | 37.D | 57.C | 77.A | 97.B | |
| 18.C | 38.B | 58.D | 78.D | 98.A | |
| 19.C | 39.D | 59.D | 79.C | 99.A | |
| 20.A | 40.A | 60.A | 80.C | 100.C | |