NATIONAL EDUCATIONAL ASSESSMENT AND EXAMINATIONS AGENCY (NEAEA)
ETHIOPIAN UNIVERSITY ENTERANCE EXAMINATION (EUEE)
CHEMISTRY, MEGABIT 2012/13/MARCH 2020/21

TIME ALLOWED: $2\frac{1}{2}$ HOURS

BOOKLET CODE: 38 **SUBJECT CODE:05**

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1. Which of the following physical properties of a solvent are affected by the formation of a solution?
   A. Vapour pressure elevation, boiling point lowering, freezing point lowering, osmotic pressure
   B. Vapour pressure lowering and boiling point lowering
   C. Vapour pressure lowering, boiling point elevation, freezing point lowering, osmotic pressure
   D. Vapour pressure lowering, boiling point lowering, freezing point lowering, osmotic pressure

2. A solution is made by dissolving 3.75g of pure non-volatile solute in 95g of acetone. The BP of pure acetone was observed to be 55.95°c and that of the solution was 56.50 °c. Which of the following is correct based on the given evidence? If the dissolved solute is electrolyte. The boiling point of the solution
   A. will be slightly lower than 56.50 °c.
   B. will be slightly higher than 55.95 °c.
   C. remains to be 56.50 °c.
   D. will be slightly higher than 56.50 °c.

3. In the following reaction, which is a Brønsted-Lowry base?
   $HC_2O_4^-(aq) + H_2O(l) \longrightarrow H_3O^+(aq) + C_2O_4^{2-}(aq)$
   A. H_2O
   B. $C_2O_4^{2-}$
   C. $HC_2O_4^-$
   D. H_3O^+

4. In the auto ionization of water
   A. one water molecule acts as a Lewis base and the other water molecule acts as a Lewis acid.
   B. there is no transfer of hydrogen ion from the acid or the base.
   C. an electron is transferred from one water molecule to another.
   D. a proton is transferred from one water molecule to another.

5. In the structural arrangement of cell membrane, the organic molecules which serve as the structural backbone and prevent uncontrolled movement of water soluble materials are
A. cholesterols.
B. peripheral proteins.
C. lipid bilayers.
D. carbohydrates.

6. What is the chemical composition of bacterial cell wall?
A. Cellulose
B. Peptidoglycan
C. Starch
D. Capsule

7. In his biology practical section, a biology student applied a Gram stain to two groups of bacteria named X and Y. At the end, he observed that bacteria X stained purple while bacteria Y stained pink. Which of the following could be the correct conclusion of his experiment? Bacteria
A. X are Gram positive and Y are Gram negative.
B. Y are Gram positive and X are Gram negative.
C. Y and X are both Gram positive.
D. X and Y are both Gram negative.

. As compared to infectious diseases, functional diseases
A. are caused by pathogenic micro-organisms.
B. can result from malfunction of organs.
C. can spread through the bites of insects.
D. are passed from person to person through reservoirs.

Which one of the following products does **NOT** need the role of bacteria?
A. Insulin
B. Enzymes
C. Vaccine
D. Ethanol

Bacteria are used in the production of vinegar to
A. produce alcohol in beer.
B. dilute ethanoic acid into vinegar.
C. oxidise alcohol to ethanoic acid.
D. supply oxygen for the fermenter.

11. By which levels of precipitation, temperature and type of plants is the Taiga biome characterized, respectively?
    A. Humid, always warm and ferns
    B. Dry, cold and lichens
    C. Almost none, cold and succulents
    D. Adequate, cool year round and conifers

12. In which biome are epiphytes common?
    A. Temperate forest
    B. Thorn forest
    C. Tundra forest
    D. Tropical rainforest

13. What makes Ethiopia rich in biodiversity which deserves a global attention?
    A. Variation in topography and vegetation
    B. Narrow range in altitude and climate
    C. Uniformity of high lands and low lands
    D. Similar terrestrial and aquatic biomes

14. Why maintaining habitats is the key and fundamental aspect to conserve biodiversity? Because
    A. disturbance of habitats makes the population well adapted.
    B. destruction of habitats is the leading cause of extinction.
    C. preserving habitats leads to decreased species richness and abundance
    D. replacing natural habitats by artificial ones increases food security..

15. Which of the following products are formed in anaerobic respiration of one glucose molecule in animal cells?
    A. 2lactate, $2CO_2$, 2ATP
    B. 2ethanol, $2CO_2$, 2ATP
    C. 2ethanol, $2NAD^+$, 2ATP
    D. 2lactate, $2NAD^+$, 2ATP

16. Which stage of cellular respiration is correctly paired with its site?
    A. Glycolysis - cristae
    B. Pyruvate oxidation - cytoplasm
    C. Chemiosmosis - outer membrane
    D. Krebs cycle - matrix

17. The table below compares the two types of competition.

No	Intra-specific competition	Inter-specific competition
1	Competition between different species	Competition between members of the same species
2	Occurs between individuals with different adaptation	Occurs between individuals with similar adaptation
3	Occurs for all types of requirements	Occurs for specific requirement
4	Directly affects the population size	Either both or one species can be suppressed

In the above table, which rows contain **WRONGLY** stated statements with respect to the types of competition?

A. Row 2 and 4
B. Row 1 and 3
C. Row 1 and 2
D. Row 2 and 3

18. What happens during the process of electron transport chain? Protons
A. diffuse against concentration gradient through ATP synthase.
B. build up in the matrix than the inter-membrane space.
C. diffuse down concentration gradient to reduce NAD.
D. build up in the inter-membrane space than the matrix.

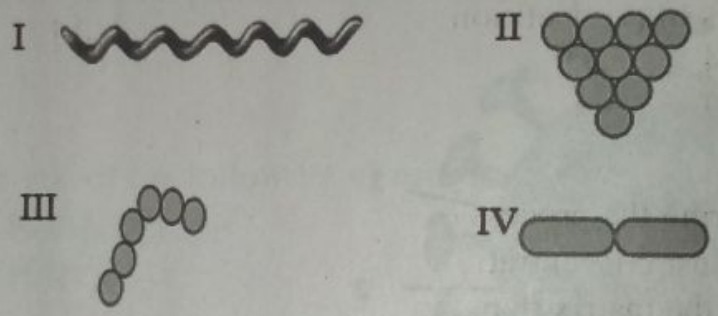
19. Identify the correct statement about the role of NAD and FAD during aerobic respiration. They
A. are the terminal electron acceptors of electron transport chain.
B. carry hydrogen atoms that will be split into protons and electrons.
C. oxidize intermediate products of cellular respiration.
D. are electron carriers that pump protons into inter-membrane space.

20. Which one of the following options represents the correct catabolic pathway of the given respiratory substrates?
A. Lipids → fatty acids → acetyl-CoA →TCA
B. Polysaccharides → glucose → acetyl-CoA → pyruvate → TCA
C. Nucleic acids → amino acids → nucleotides → acetyl-CoA →TCA
D. Proteins → ammonia → amino acid → pyruvate →TCA

21. The chromosomal mutation that results Down's syndrome is
A. inversion.
B. duplication.
C. chromosome non-disjunction.
D. chromosome translocation.

22. When a piece of one chromosome is transferred to another non-homologous chromosome, such kind of mutation is called
A. inversion.
B. translocation.
C. duplication.
D. insertion.

23. Consider the following diagram of the shapes of bacteria.



Which of the following shapes of bacteria belongs to spirochaetes?

A. I
B. III
C. II
D. IV

24. Which of the following diseases have water as their reservoir?
A. Pneumonia and tuberculosis
B. Amoeba and cholera
C. Trachoma and diphtheria
D. Salmonella and malaria

25. A geographical area with specific climate, soil type, plants and animals with similar adaptations is _____.
A. ecosystem
B. habitat
C. biome
D. niche

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5. Given the following acid-base reaction
$Ag^+ + NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$, the Lewis base is
A. Ag^+ and NH_3
B. $[Ag(NH_3)_2]^+$
C. NH_3
D. Ag^+

6. How much energy would be released as an electron is moved from the n = 4 to the n = 3 energy level?
(RH= 2.18x10^{-18}J)
A. 2.043×10^{-18} J
B. 3.981×10^{-18} J
C. 1.050×10^{-19} J
D. 1.938×10^{-19} J

7. Which set of quantum numbers uniquely defines one of the electrons in an atomic orbital with n = 2 and l = 0?
A. n =2, l = 0, m_l = 1, m_s =+1
B. n =2, l = 0, m_l = 1, m_s =+½
C. n =2, l = 0, m_l = 0, m_s =+1
D. n =2, l = 0, m_l = 0, m_s =+½

8. What is Pauli Exclusion Principle? The Pauli Exclusion Principle states that
A. two electrons in an atom can have the same set of the four quantum numbers.
B. an orbital can hold a maximum of two electrons with the same quantum number m_s.
C. all electrons in an atom are in the same energy state.
D. no two electrons in an atom can have the same set of the four quantum numbers.

9. Which of the following is the correct relationship between the given parameter and the property of an EMR?
A. The higher the value of the wave length of an EMR, the greater is its energy.
B. The lower the frequency of an EMR, the higher is its wave length.
C. The higher the value of the wave length of an EMR, the greater is its frequency.
D. The lower the value of the frequency of an EMR, the higher is the energy of an EMR.

10. When equal amounts of sodium chloride and lead iodide are dissolved in water, which of the following statements is true regarding the electrical conductivity of the dissolved ionic solutions?
    A. Both solutions will have the same electrical conductivity.
    B. The electrical conductivity depends on the type of electrodes.
    C. The sodium chloride solution will have a higher electrical conductivity.
    D. The lead iodide solution will have a higher electrical conductivity.

11. Which of the following represents a net ionic equation?
    A. $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$
    B. $CaCO_3\,(s) \rightarrow CaO(s) + CO_2(g)$
    C. $Na^+(aq) + OH^-(aq) + H^+(aq) + Cl^-(aq) \rightarrow NaCl(aq) + H_2O$
    D. $AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3\,(aq)$

12. Which of the following statement is correct about the solution process?
    A. Adding solute to a stock solution gives less concentrated solution.
    B. A dilution process is carried out by adding a solute.
    C. A dilution process gives a concentrated solution.
    D. Adding solvent to a stock solution to get less concentrated solution.

13. The number of equivalent per liter of solution is known as
    A. molality.
    B. mole fraction.
    C. molarity.
    D. normality.

14. When silver nitrate solution is mixed with sodium chloride solution it gives an insoluble silver chloride. Which of the following is correct?
    A. Sodium ion is a spectator ion while nitrate is a reacting ion.
    B. Silver and chloride ions are reacting species.
    C. Nitrate and sodium ions are reacting species.
    D. Silver and chloride ions are spectator ions.

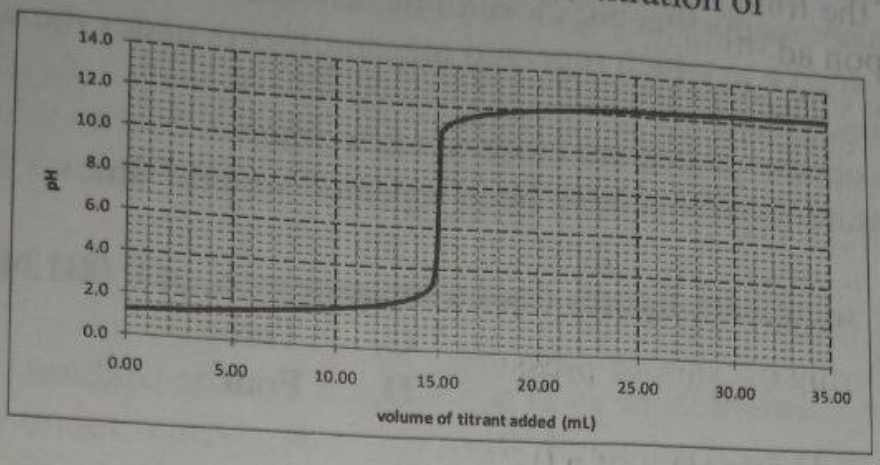
15. Which of the following explains the change of colligative properties of a solvent upon addition of a non-volatile solute?
    A. The solvent shows weak intermolecular interactions.
    B. The nature of the solute determines the volatility of the solvent.
    C. Lower amount of a non-volatile solute results in a higher vapor pressure change.
    D. The solute covers the surface of the solvent and results in lowering of vapour pressure.

16. What is the pH and $[H^+]$ of a 0.2 M solution of HCN? ($K_a = 4.9 \times 10^{-10}$)
    A. pH= 5; $[H^+ = 9.9 \times 10^{-6}$
    B. pH= 5; $[H^+ = 4.9 \times 10^{-10}$
    C. pH= 3; $[H^+ = 4.9 \times 10^{-6}$
    D. pH= 3; $[H^+ = 4.9 \times 10^{-10}$

17. A common ion effect in a certain weak acid will make the solution less acidic. This is because the presence of a common ion
    A. suppresses the ionization salt of weak acid.
    B. enhances the ionization of salt of weak acid.
    C. suppresses the ionization of the weak acid.
    D. enhances the ionization of the weak acid.

18. A salt is formed from the weak acid (HCN) whose $Ka = 4.9 \times 10^{-10}$ and a weak base whose $Kb = 1.8 \times 10^{-5}$. What do you expect about the solution of the salt formed from HCN and NH_3?
    A. The solution will be neutral, because the concentration of OH^- equals that of H^+.
    B. The solution can be either acidic or basic at the same time.
    C. The solution will be basic, because the concentration of OH^- is greater than that of H^+.
    D. The solution will be basic, because the concentration of OH^- is less than that of H^+.

19. The titration curve shown below shows the titration of



A. a weak base with a strong acid.
B. a weak acid with a strong base.
C. a strong base with a strong acid.
D. a weak acid with a weak base.

20. What is the difference between equivalence point and end point in an acid base titration?

A. At the endpoint, the pH is always 7 and at the equivalence point there is a color change.
B. At the equivalence point, the pH is always 7 and at the end point there is a color change.
C. Equivalence point is where an observable physical change occurs in a titration and endpoint is where stoichiometrically equivalent amounts of the analyte and titrant react.
D. Equivalence point is where stoichiometrically equivalent amounts of the analyte and titrant react and endpoint is where an observable physical change occurs in a titration.

21. The major fields of chemistry that study all the elements and their compounds with the exception of carbon and its compounds are known as

A. inorganic.
B. analytical.
C. organic.
D. physical.

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22. Which of the following correctly defines accuracy of a measurements?
    A. Measurements that are close to the known value.
    B. The degree to which repeated measurements under the same conditions are unchanged.
    C. Measurements that are close to each other.
    D. Measurements that have been repeated several times.

23. How many significant figures does a measurement of 0.00134 m^3 have?
    A. Five
    B. Six
    C. Three
    D. Four

24. What is a scientific method? It is a method of
    A. investigation involving experimentation and observation to acquire new knowledge, solve problems, and answer questions.
    B. quantitative observations and experiments.
    C. gaining knowledge through theory modified as needed.
    D. searching for information based only on past scientific research.

25. A hypothesis step in the scientific method is
    A. an explanation of the general principles of certain phenomena.
    B. the step at which data are collected by observations and experiments.
    C. a verbal statement or a mathematical equation that summarizes the observations.
    D. a possible explanation for an observation.

26. Which one of the following does a closed system allow to happen?
    A. Only matter to cross a system boundary
    B. Neither matter nor energy to cross a system boundary
    C. Matter and energy to cross a system boundary
    D. Only energy to cross a system boundary

27. The standard enthalpies of formation of HBr(g) and $Br_2(g)$ are -36 and +31 kJ mol^{-1} (at 298 K), respectively. What is the enthalpy change, DH for the following reaction?

$H_2(g) + Br_2(g) \longrightarrow 2HBr(g)$

A. +103 kJ mol^{-1}
B. -103 kJ mol^{-1}
C. + 67 kJ mol^{-1}
D. -67 kJ mol^{-1}

28. Which of the following statements about the standard state of a substance is correct?

A. The standard state of a substance is its most thermodynamically stable state under a pressure of 1.00 $x10^5$ Pa and at a specified temperature, T
B. The standard state of a substance is its most kinetically stable state under a pressure of 1.00 $x10^5$ Pa and at a specified temperature, T
C. The standard state of a substance is its most kinetically stable state under a pressure of 1.00 $x10^5$ kPa and at a specified temperature, T
D. The standard state of a substance is its most thermodynamically stable state under a pressure of 1.00 $x10^5$ kPa and at a specified temperature, T

29. Which of the following statements best describes the Second Law of Thermodynamics?

A. Energy can neither be created nor destroyed.
B. The internal energy of the universe is constant.
C. At absolute zero, the entropy of a perfect crystal is considered to be zero.
D. When an isolated system undergoes a spontaneous change, the entropy of the system will increase.

30. Colligative property is defined as a property that depends on

A. the nature of pure liquid.
B. the amount of solute present in the solution.
C. the nature of solute present in the solution.
D. the amount of pure liquid.

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31. Given a general reaction at equilibrium:
$aA + bB \leftrightarrows mM + nN$
The equilibrium constant (K_c) expression is
A. $K_c = [A]^a[B]^b - [M]^m[N]^n$
B. $K_c = \frac{[M]^m[N]^n}{[A]^a[B]^b}$
C. $K_c = \frac{[A]^a[B]^b}{[M]^m[N]^n}$
D. $K_c = [M]^m[N]^n - [A]^a[B]^b$

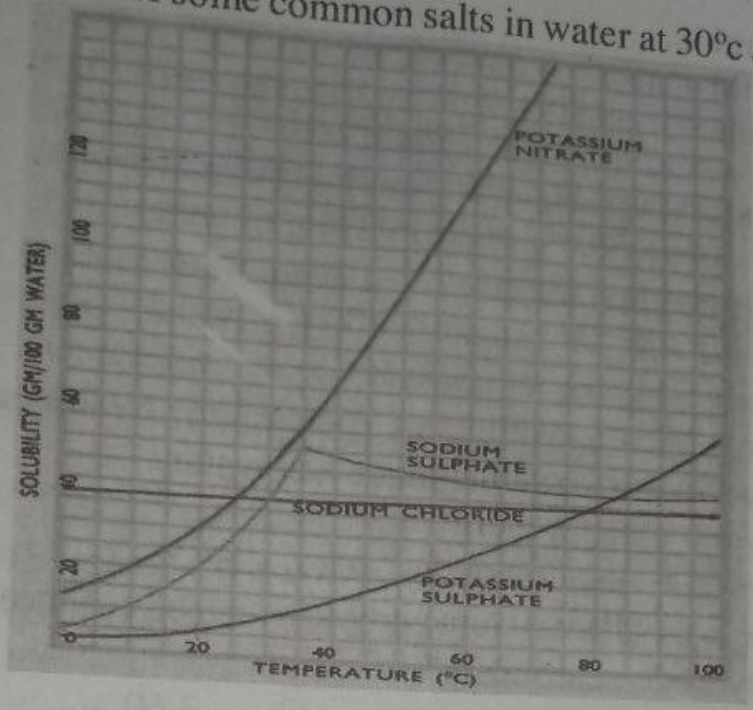
32. The first law of thermodynamics states that
A. the total amount of energy in the universe is constant.
B. energy can be created or destroyed.
C. the entropy of the universe increases in a spontaneous process.
D. in absolute zero the entropy of a perfect crystal is considered to be zero.

33. Given the production of ammonia:
$H_2\,(g) + I_2\,(g) \leftrightarrows 2HI\,(g)$
The equilibrium constant (K_p) expression is
A. $K_p = (P_{H2})(P_{I2})$
B. $K_p = \frac{(P_{H2})(P_{I2})}{(P_{HI})^2}$
C. $K_p = \frac{(P_{HI})^2}{(P_{H2})(P_{I2})}$
D. $K_p = \frac{1}{(P_{H2})(P_{I2})}$

34. Which of the follow is a homogeneous reaction?
A. $N_2(g) + 3H_2(g) \leftrightarrows NH_3(g)$
B. $Fe^{3+}(aq) + 3OH^-(aq) \leftrightarrows Fe(OH)_3(s)$
C. $NH_4Cl(s) \leftrightarrows NH_3(g) + HCl(g)$
D. $CaCO_3(s) \leftrightarrows CaO(s) + CO_2(g)$

35. Which of the following procedures indicates a system which **CANNOT** exchange both energy and matter with the surroundings?
A. Cooking *shiro-wet* in a closed pan
B. Baking *injera*
C. Water boiling in an open beaker
D. Keeping hot water in a thermostat

36. The solubility curves of some common salts in water at 30°c are shown below:



When 30 grams of sodium sulfate, Na_2SO_4, is dissolved in 100 grams of water at 20 °C, the solution can be correctly described as

A. supersaturated.
B. diluted.
C. unsaturated.
D. saturated.

37. What is mole fraction? Mole fraction is

A. moles of solute divided by kilogram of solvent.
B. mass of solute divided by mass of solution.
C. number of moles of a component divided by the total number of moles of all components.
D. mass of a component divided by the total mass of all components.

38. A 5 g sample of groundwater was found to contain 10.5 µg of Pb^{2+}. What is the concentration of Pb^{2+} in ppm?

A. 2.1
B. 3.4
C. 0.48
D. 1.7

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39. How can you prepare a 0.53 molal solution that contains 8.6% glucose $C_6H_{12}O_6$(w/w) in water?
(Molar mass of glucose =180g/mol)
A. By dissolving 8.6 g sugar in 91.4 g of water
B. By dissolving 8.6 g sugar in 914 g of water
C. By dissolving 8.6 g sugar in 100 ml water
D. By dissolving 86 g sugar in 100 g of water

40. The thermal decomposition of potassium hydrogen carbonate yields potassium carbonate, carbon dioxide and water.

$$2KHCO_3 \longrightarrow K_2CO_3 + CO_2 + H_2O$$

How many moles of potassium carbonate can be produced from 550 grams of potassium hydrogen carbonate?
A. 2.78
B. 27.8
C. 3.60
D. 0.36

41. If 3.423 grams of sucrose is dissolved in 200.0 g of water, what is the molality of the sucrose solution? (molar mass of sucrose = 342.3 g/mol)
A. 0.5 m
B. 0.01 m
C. 0.05 m
D. 0.1 m

42. What is the Arrhenius concept of a base?
A. A base furnishes a pair of electrons.
B. A substance that releases hydrogen ion in water is a base.
C. A base is a proton acceptor.
D. A substance that increases hydroxide ion in water is a base.

43. The Brønsted-Lowry concept defines an acid as a substance that
A. gives hydrogen ion in water.
B. furnishes proton to a molecule.
C. produces hydroxide ion in water.
D. accepts proton from a molecule.

44. Which of the following explains the cleaning action of soap?
A. Oily dirt is absorbed into both hydrophilic and hydrophobic parts but not washed away.
B. Cleaning action is not related to hydrophilic and hydrophobic nature of soap.
C. Oily dirt is absorbed into the hydrophobic part of soap and washed away.
D. Oily dirt is absorbed into the hydrophilic part of soap and washed away.

45. Which of the following statements is **WRONG** about entropy and change of entropy (ΔS)?
A. Entropy is a measure of randomness.
B. ΔS decreases with randomness.
C. $\Delta S > 0$ indicates an increase in randomness.
D. $\Delta S_{rxn} = \sum mS_{reactant} - \sum nS_{product}$

46. What is dynamic chemical equilibrium?
A. Dynamic chemical equilibrium is the state of equal opposite rates with equal concentrations of reactants and products.
B. Dynamic chemical equilibrium is the state where the forward and backward reaction rates are equal to zero.
C. Dynamic chemical equilibrium is the state where all reactants and products in the reaction are at rest.
D. At dynamic chemical equilibrium, reactants are converted to products and products are converted to reactants at an equal and constant rate.

47. The Reaction Quotient (Q)is
   A. the ratio of the concentrations of the products to the concentrations of reactants to the power of their respective coefficients at any stage after the start of the reaction.
   B. the ratio of the concentrations of the products to the concentrations of reactants to the power of their respective coefficients under equilibrium conditions.
   C. a measurement of the relative quantities of product reactants present in a reaction mixture.
   D. a quantity that does not change as a reaction system approaches equilibrium.

48. What factors affect chemical equilibrium in a chemical reaction?
   A. Change in reactant or product concentrations, volume and pressure changes, temperature, presence of catalyst
   B. Change in reactant or product concentrations, pressure change, temperature, presence of catalyst
   C. Change in reactant or product concentrations, volume and pressure changes, temperature
   D. Change in reactant(s) concentration(s), volume changes, temperature, presence of catalyst

49. Which of the following are equal for a chemical system at equilibrium?
   A. The time that a particular atom or molecule stays as a reactant or product
   B. The rate of the forward and reverse reaction
   C. The concentrations of reactant and products
   D. The rate constants for the forward and reverse reactions

50. The equilibrium constant for the formation of calcium carbonate from the ions in solution is 2.2×10^8 according to the reaction:

$Ca^{2+}(aq) + CO_3^{2-}(aq) \rightleftharpoons Ca(CO_3(s)$ $K = 2.2 \times 10^8$

What is the value of the equilibrium constant for the reverse of this reaction?

$Ca(CO_3(s) \rightleftharpoons Ca^{2+}(aq) + CO_3^{2-}(aq)$

A. 4.55×10^{-9}
B. 2.2×10^8
C. 2.2×10^{-8}
D. 4.4×10^{-8}

51. Which of the following states the law of definite proportions?
A. The mass of the products in a chemical reaction must be equal to the mass of the reactants.
B. Chemical compounds are formed when atoms combine in whole number ratios.
C. Every compound always contains the same elements in the same proportions by weight.
D. The total mass in the universe is always constant.

52. What did J. J. Thomson contribute with his experiments in cathode- ray tubes in understanding the atomic structure of the atom?
A. The electric charge deposited was negative.
B. Cathode rays and electric charge were separate entities, and not combined together.
C. Cathode rays and electric charge were combined together, and not separate entities.
D. Cathode rays were actually electrons.

53. An element X has two naturally occurring isotopes. X (10.013 amu) and X (11.01 amu). The first accounts for 19.9% of the total and the second accounts for remaining 80.1%. What is the average atomic mass of the element X?
A. 10.512
B. 10.125
C. 10.812
D. 10.211

54. What are isotopes? Isotopes are atoms with the same number of protons but different number of

A. ions.
B. neutrons.
C. electrons.
D. protons.

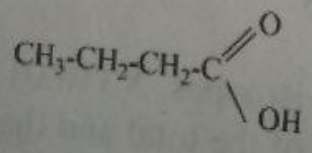
55. Which statement is correct for the emission spectrum of the hydrogen atom?

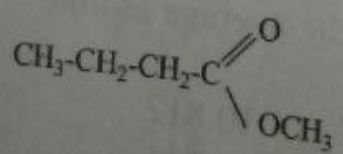
A. The lines are produced when electrons move from lower to higher energy levels.
B. The line corresponding to the greatest emission of energy is in the ultraviolet region.
C. The lines are produced when electrons move from second to fourth.
D. The lines in the visible region involve electron transitions into the energy level closest to the nucleus.

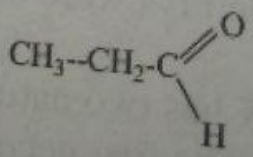
56. Which of the following explanation is correct about vapor pressure and its relation with phase changes?

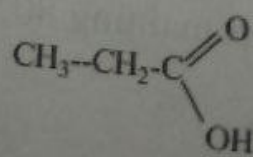
A. Rate of condensation increases as lower number of molecules go into the vapor phase.
B. Rate of evaporation increases as higher number of molecules go in to the vapor phase.
C. As the temperature is increased; more molecules go from liquid phase to the vapor phase.
D. As the temperature is decreased more molecules go from liquid phase to the vapor phase.

57. Which of the following structural formula represents propanoic acid?

A. 

B. 

C. 

D. 

58. Acetic acid is manufactured industrially by the fermentation of
A. ethanal.
B. methanal.
C. methanol.
D. ethanol.

59. Which of the following **DOES NOT** represent an ester with the molecular formula of $C_5O_2H_{10}$?
A. Buthyl methanoate
B. pentyl formate
C. Propyl ethanoate
D. Ethyl propanoate

60. What is the characteristic smell of an ester?
A. Fruity like smell
B. Fish like smell
C. Rotten egg smell
D. Alcoholic smell

61. Which of the following is **NOT** the correct geometric configuration for the given molecule?
A. SF_6, octahedral
B. BF_3, trigonal planar
C. CH_4, tetrahedral
D. NF_3, trigonal planar

62. Which one of the following substances has London dispersion forces as its only intermolecular force? (No hydrogen bonding, no dipole-dipole forces).
A. H_2S
B. CH_4
C. CH_3OH
D. NH_3

63. Which of the following is a basic chemical bonding theory?
A. Ionic Bonding Theory
B. Valence Shell Electron Repulsion (VSEPR) Theory
C. Molecular Orbital Theory
D. Covalent Bonding Theory

64. Which types of intermolecular forces are present in molecular crystalline solids?
A. Covalent, dispersion, dipole-dipole, hydrogen bonding
B. Metallic, dispersion, dipole-dipole, hydrogen bonding
C. Ionic, dispersion, dipole-dipole, hydrogen bonding
D. Dispersion, dipole-dipole, hydrogen bonding

65. Which statement is **NOT** correct about the valence bond theory?
   A. Valence bond theory treats electrons as localized between pairs of atoms.
   B. According to valence bond theory, each bond only involves two atoms.
   C. According to valence bond theory, hybrid orbitals are formed by overlapping of atomic orbitals.
   D. According to valence bond theory, molecular orbitals are formed by combining atomic orbitals.

66. Which of the following statements is correct about fats and oils?
   A. The burn without leaving ash
   B. They are soluble in polar solvents
   C. They are heavier than water
   D. They are readly volatile

67. Which of the following is the correct procedure during the preparation of soap?
   A. Placing vegetable oil and animal fat in a reflux set up and boiling after addition of boiling chips.
   B. Placing animal fats or vegetable oil in a reflex set up and boiling with concentrated solution of brine.
   C. When saponification is complete, pouring the mixture quickly into a saturated NaCl solution.
   D. When saponification is complete, pouring the mixture quickly into a saturated NaOH solution.

68. Which of the following descriptions about a suspension is correct?
   A. A suspension is a 'cloudy' mixture containing particles which will easily settle out when the suspension is left standing.
   B. A suspension contains particles which will not settle out if the suspension is left standing.
   C. A suspension is a heterogeneous mixture.
   D. A suspension is a homogenous mixture.

69. What is meant by the rate of dissolution of a solute?
A. The maximum amount of solute that a pure solvent can hold in solution
B. The dynamic equilibrium attained between the solute and solvent
C. The amount of solute that goes into solution per unit time
D. The ability of solute to go into solution

70. How can you prepare a supersaturated solution of sodium thiosulfate, if the solubility of the salt at 25°C is 50 g per 100 g water?
A. By dissolving 45 g of sodium thiosulfate in 95 g hot water and then cooling the solution to 25°C
B. By dissolving 70 g of sodium thiosulfate in hot 100 g water, carefully cooling the solution to 25°C and adding a seed crystal of the solute.
C. By dissolving 45 g of sodium thiosulfate in 100 g water
D. By dissolving 70 g of sodium thiosulfate in hot 100 g water and then carefully cooling the solution to 25°C

71. Which of the following factors will affect the rate of a chemical reaction?
A. Temperature, volume of container, presence of catalyst, concentration or pressure of reactants
B. Humidity, presence of catalyst, concentration or pressure of reactants, surface area of solid reactant
C. Temperature, volume of container, presence of catalyst, concentration or pressure of reactants, surface area of solid reactant
D. Temperature, presence of catalyst, concentration or pressure of reactants, surface area of solid reactant

72. Which statement is correct for the reaction: $2A + B \longrightarrow C$?
A. The rate of appearance of C equals the rate of disappearance of A.
B. The rate of disappearance of B is twice that of A.
C. C appears at a rate equal to the sum of the rates of the disappearance of A and B.
D. The rate of disappearance of A is twice that of B.

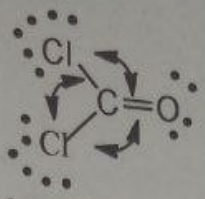
73. The theory that states "the collision between two reacting species results in the formation of an activated complex" is known as
   A. rate theory.
   B. intermediate state theory.
   C. collision theory.
   D. transition state.

74. For a reaction: $A + B \longrightarrow C$, the rate equation is $r = k[A]$
   Which of the following statement is **NOT** correct?
   A. The rate depends on the concentration of A.
   B. The unit of the rate constant is s^{-1}.
   C. The rate is independent of the concentration of B.
   D. A plot of [A] against time is linear.

75. What is meant by rate-determining step in chemical kinetics?
   A. The rate determining step is the mechanism step with the least activation energy.
   B. The rate determining step is the mechanism step with the average activation energy.
   C. The rate determining step is the slowest step of a chemical reaction that determines the speed (rate) at which the overall reaction proceeds.
   D. The rate determining step is the fastest step of a chemical reaction that determines the speed (rate) at which the overall reaction proceeds.

76. Which of the following properties is true about covalent molecules?
   A. Low melting and boiling points
   B. High electrical and thermal conductivity
   C. High melting but low boiling points
   D. Low melting but high boiling points

77. For the molecule (phosgene) shown below, why do the lone pairs and double bonds affect the bond angles?



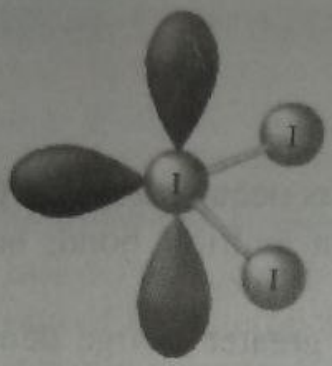
A. Both multiple bonds and lone pairs occupy less space.
B. Lone pairs occupy less space, but multiple bonds occupy more space than single bonds.
C. Lone pairs repel more due to a greater charge density than bonding pairs.
D. Lone pairs repel smaller than bonded pairs and multiple bonds have a higher charge density around the central atom.

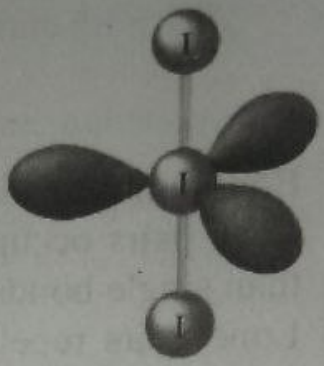
78. If you are provided with four covalent compounds namely naphthalene, graphite, iodine and ethanol to investigate their electrical conductivity, which one would you expect to conduct electricity either in the solid or in the liquid state?

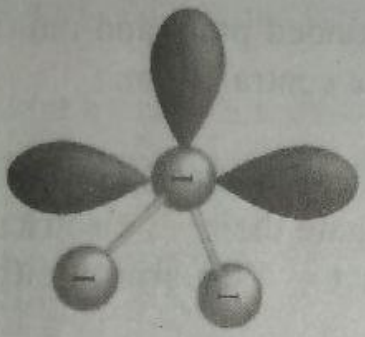
A. Iodine
B. Ethanol
C. Naphthalene
D. Graphite

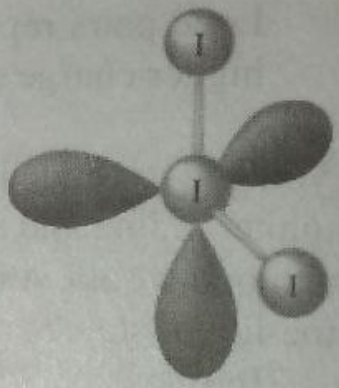
THE END

79. Based on the VSEPR model, what shape would you expect for the molecule $[I_3]^-$?

A. 

C 

B. 

D. 

80. Given the reaction:

$$NH_3 + H^+ \longrightarrow NH_4^+$$

The bond formed between NH_3 and H^+ is

A. coordinate covalent.
B. nonpolar covalent.
C. ionic bond.
D. simple covalent.

THE END