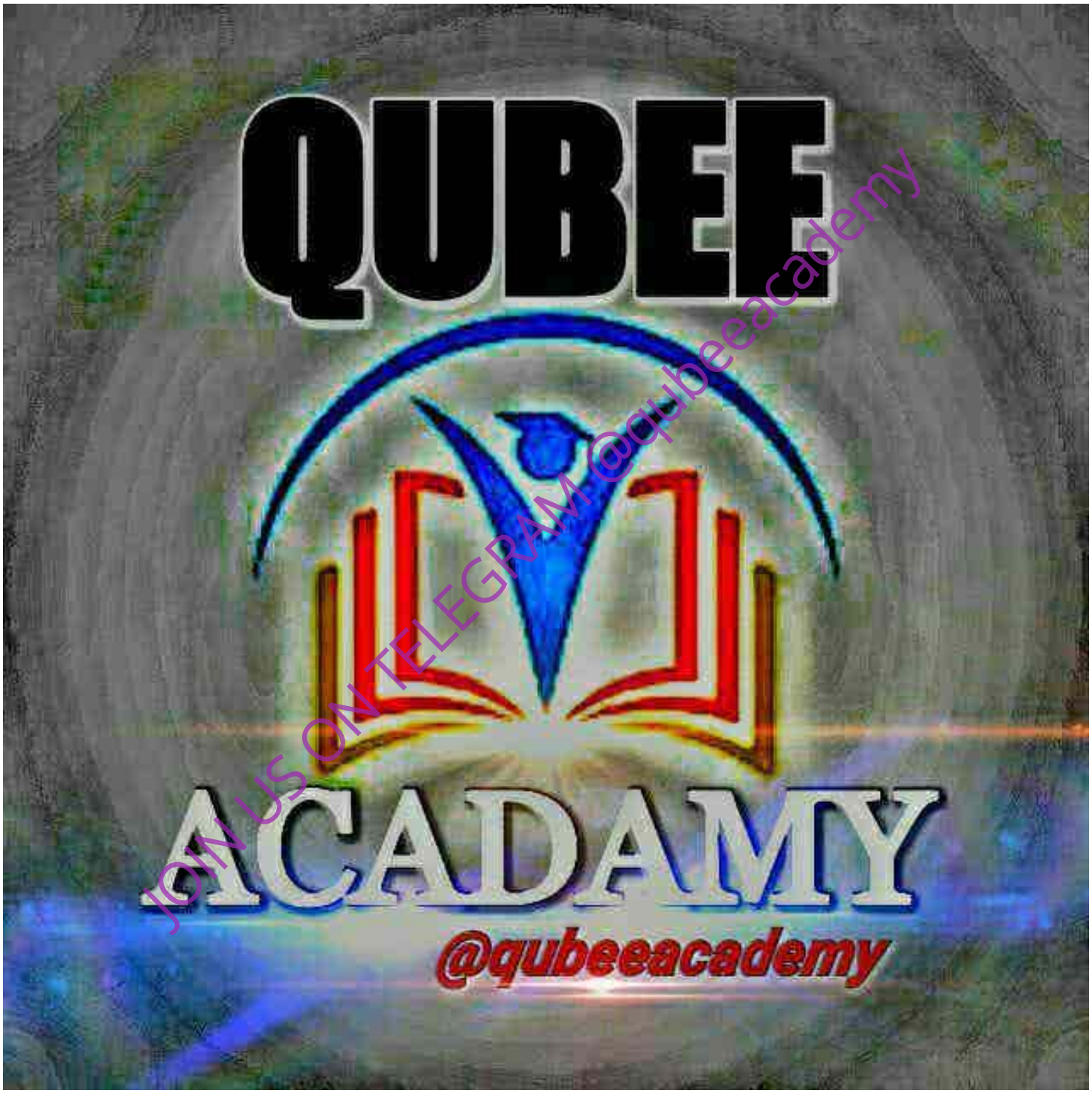

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NATIONAL EDUCATIONAL ASSESSMENT AND EXAMINATIONS AGENCY (NEAEA)
ETHIOPIAN SECONDARY SCHOOL LEAVIG CERTIFICATE EXAMINATION (ESSLCE)
CHEMISTRY, HIDAR 2013/14 OCTOBER 2021

BOOKLET CODE: 15 **SUBJECT CODE: 05**
NUMBER OF ITEMS:80 **TIME ALLOWED: 2:30 HOURS**

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IN THIS EXAMINATION, THERE ARE A TOTAL OF ***80 MULTIPLE CHOICE QUESTIONS.*** CAREFULLY SELECT THE BEST ANSWER AND ***BLACKEN*** ONLY THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED. FOLLOW THE INSTRUCTIONS ON THE ANSWER SHEET AND THE EXAMINATION PAPER CAREFULLY. USE ONLY ***PENCIL*** TO MARK YOUR ANSWERS. YOUR ANSWER MARK SHOULD BE ***HEAVY*** AND ***DARK***, COVERING THE ANSWER SPACE COMPLETELY. PLEASE ERASE ALL UNNECESSARY MARKS COMPLETELY INCLUDING ANSWERS YOU HAVE CHANGED FROM YOUR ANSWER SHEET.

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BOOKLET CODE: 15 **SUBJECT CODE:05**

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1. The branch of chemistry that is involved in separation, identifying and determining the relative amounts of components in a sample of material is known as
   A. biochemistry.
   B. analytical chemistry.
   C. physical chemistry.
   D. inorganic chemistry.

2. Significant figures are figures with
   A. measured values with the highest precision.
   B. measured values with the highest accuracy.
   C. measured values with the highest uncertainty.
   D. exactly known digits with the last digit uncertain.

3. For the determination of the density of a new ceramic, a student measured the mass of a piece on an analytical balance and obtained 3.8056 gram and its volume 2.5 mL by displacement of water in a graduated cylinder. The correct reported density of the ceramic should be
   A. 1.5222 g/mL
   B. 1.5224 g/mL
   C. 1.5 g/mL
   D. 3.5 g/mL

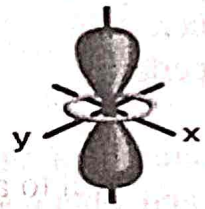
4. The scientific method is
   A. a collection of scientific guesses and hypotheses by seeking patterns in the observations.
   B. a method of arriving at an organized body of knowledge based on reproducible experiments and observations.
   C. the sum total of unique guidelines for the practice of science in the world.
   D. the result of fortunate, accidental discovery in the development of science.

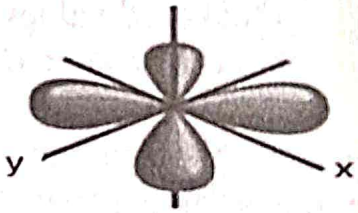
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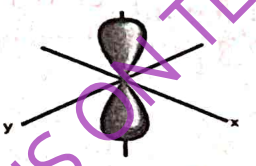
5. One of the following is **NOT** a cause of uncertainty in measurement?
   A. The type of material measured
   B. The person doing the experiment
   C. The measuring device
   D. The environment where the measurement is made

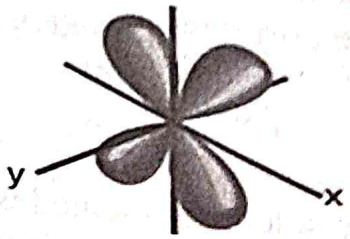
6. Which of the following is true about isotopes? Isotopes of an element have
   A. the same number of electrons and neutrons.
   B. different number of neutrons and the same number protons.
   C. different physical and chemical properties.
   D. the same atomic mass but different atomic numbers.

7. The following diagrammatic representations shows the shape for various orbitals. Which one represents the d_z^2 orbitals?

A. 

C. 

B. 

D. 

8. Sliver (Z=47) has several known isotopes, but two occur naturally, ^{107}Ag and ^{109}Ag. Given the following mass spectrometric data, calculate the atomic mass of Ag

Isotope	Mass(amu)	Abundance (%)
^{107}Ag	106.90509	51.84
^{109}Ag	108.90476	48.16

A. 108.9 amu
B. 107.94 amu
C. 107.4 amu
D. 107.86 amu

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9. Which statement correctly describes Heisenberg's uncertainty principle?
   A. If we measure the momentum of a particle precisely then its position will be correspondingly precise.
   B. A particle with a mass moving at a given speed can be described by the wave characteristics of material particles.
   C. A small particle like the electron can behave both as a particle and a wave.
   D. Both the location and the momentum of a subatomic particle like the electron cannot be precisely known.

10. Which of the following statement is correct about energy changes when an electron changes its energy level?
   A. When an electron jumps from a lower energy level to a higher level, the photon emitted is equal to the difference between the two energy levels.
   B. When an electron falls from a higher energy level to a lower energy level, the energy is equal to the difference between the two energy levels is observed.
   C. When an electron jumps from a lower energy level to a higher energy level, the energy is equal to the difference between the two energy levels is absorbed.
   D. When an electron falls from a higher energy level to a lower energy level, the energy is higher than the difference between the two energy levels is emitted.

11. The sanitizer in wide use for protection against Covid-19 is labeled 83% alcohol. How can one scientifically check the concentration? This can be done by
   A. forming a hypothesis.
   B. experimentation.
   C. collection of data.
   D. making observation.

12. The correct electronic configuration for chromium (Cr, Z=24) is
   A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4d^2$
   B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^6$
   C. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$
   D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$

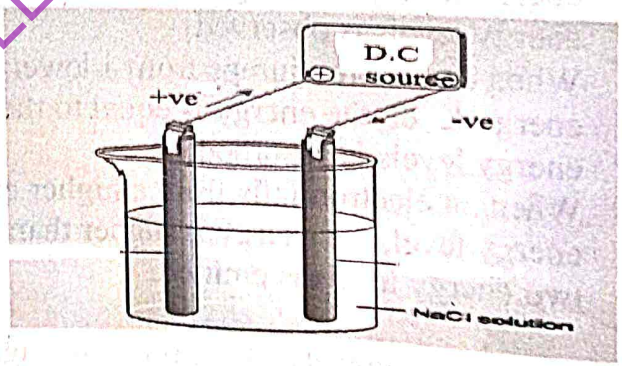
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13. According to Hund's rule equal energy(degenerate) orbitals are filled with
    A. two electrons of opposite spins placed in the first orbitals.
    B. maximum number of unpaired electrons with parallel spins.
    C. two electrons of parallel spins placed in the first orbital.
    D. maximum number of unpaired electrons with opposite spins.

14. In the modern periodic table
    A. non -metals are placed on the right hand side of the periodic table.
    B. elements with similar properties are placed in the same period.
    C. metals are placed on the right hand side of the periodic table.
    D. transition and inner transition elements are placed in the middle of the periodic table.

15. The electrolysis of liquid (molten) NaCl in the set-up for the electrochemical cell is given in the following figure below



Which of the following statements is true about the electrolysis of molten sodium chloride?
    A. Cl_2 is formed at the cathode.
    B. Na is oxidized at the anode.
    C. The net reaction produces Cl_2 at the anode and Na at the cathode.
    D. O_2 is produced at the anode due to oxidation of water.

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16. Covalent compounds are liquids or gases at room temperature and have low melting and boiling points. Which of the following statements explains these properties of covalent compounds?
    A. The intermolecular forces of attraction in covalent compounds are strong.
    B. The unit of particles in covalent compounds are ions.
    C. There are no forces of attraction between the molecules in covalent compounds.
    D. Covalent compounds exist as separate molecules.

17. Both carbonyl sulphide, COS (SCO), S=C=O and carbon dioxide (CO_2) O=C=O are linear molecules. COS is polar whereas CO_2 is non-polar. this is because
    A. CO_2 has a net dipole moment of zero.
    B. the C=O bonds in both COS and CO_2 are polar.
    C. regions of high negative charge is distributed equally around the central atom in COS.
    D. Sulphur is more electronegative than oxygen.

18. Which of the following statements is true about the formation of CH_4 according to valence bond theory?
    A. The 2s and two 2p orbitals in carbon hybridize to form three sp^2 orbitals.
    B. The 2s and three 2p orbitals in carbon hybridize to form four sp^3 orbitals.
    C. The 2s and one 2p orbitals in carbon hybridize to form two sp orbitals.
    D. Carbon can form two hybrid orbitals as it has got only two half-filled orbitals.

19. Phosphorus (Z=15) has the electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^3$, what kind of hybridization does phosphorus undergo in the formation of phosphorus pentachloride(PCl_5)?
    A. sp^3
    B. sp^3d
    C. sp^2
    D. sp

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20. One of the following reactions illustrates the formation of coordinate covalent bond?
A. $NaOH + HCl \rightarrow NaCl + H_2O$
B. $Be + 2F_2 \rightarrow BeF_2$
C. $NH_3 + HCl \rightarrow NH_4^+ + Cl^-$
D. $CaCO_3 + HCl \rightarrow CaCl_2 + H_2O + CO_2$

21. Hydrogen bonding occurs in compounds that contain H-N, H-O and H-F bonds. These bonds are stronger than the ordinary dipole-dipole interactions because
A. the partially positive H of one molecule is attracted to the partially negative lone pairs on the N, O or F of another molecule.
B. the H-N, H-O and H-F bonds are less polar than ordinary covalent bonds.
C. the small sizes of N, O and F makes these atoms so electropositive that their covalently bonded H is highly negative.
D. the H-N, H-O and H-F bonds are non-polar and thus do not interact with neighboring molecules.

22. Which of the following is an example of exception to the octet rule?
A. NH_3
B. CCl_4
C. H_2O
D. PCl_5

23. Which of the following pair is true about the general properties of the different types of crystalline solids

Type of solid	Hardness	Melting point	Conduction of heat of electricity
I. Ionic	Hard	High	Good
II. Covalent	Hard	High	Poor
III. Molecular	Soft	Low	Good
IV. Metallic	Soft to hard	Low to high	Good

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

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24. When the boiling point of hydrides of group VIA elements, H_2O, H_2S, H_2Se and H_2Te are arranged in the order of increasing boiling point. The trend is $H_2Te < H_2Se < H_2S < H_2O$, water having the highest boiling point, this is due to

A. the small size of O compared to the other group VIA elements.
B. the basic different structures of each hydride.
C. increasing boiling points with increasing molecular mass.
D. hydrogen bonding present in H_2O molecules.

25. Given the following catalyzed reactions

I. $2SO_2(s) + O_2(g) \longrightarrow 2SO_3(g)$; $V_2O_5(s)$ as a catalyst
II. $OCl^-(aq) + I^-(aq) \longrightarrow OI^-(aq) + Cl^-(aq)$; $OH^-(aq)$ as inhibitor
III. $CO(s) + H_2(g) \longrightarrow CH_4(g) + H_2O(g)$; $Ni(s)$ as a catalyst
IV. $CO(s) + H_2(g) \longrightarrow HCHO(g)$; $Cu(s)$ as a catalyst

Which reactions is examples for homogeneous catalysis?

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

26. Which statement is true about catalysis?

A. A catalyst slows down or speeds up a reaction, itself being consumed.
B. A positive catalyst decreases the rate of a reaction by increasing the activation energy.
C. A negative catalyst increases the rate of a reaction by decreasing the value of activation energy.
D. The role of a catalyst is to increase or decrease the rate of a reaction by lowering or increasing the activation energy.

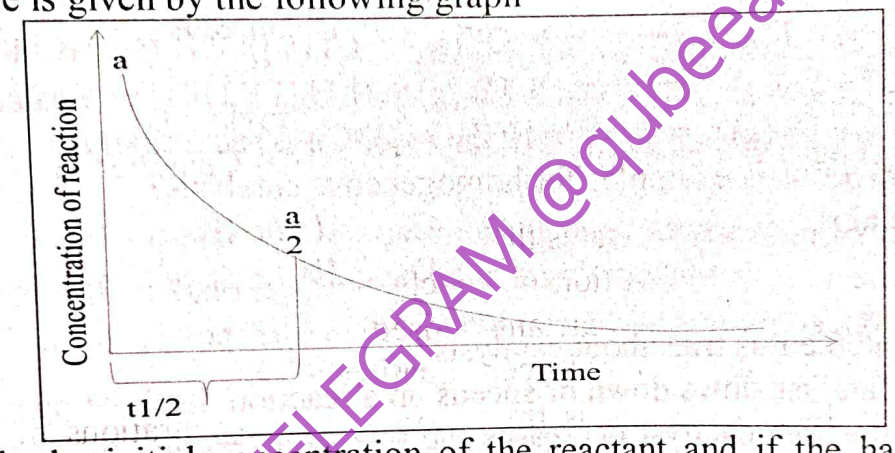
27. According to the transition state theory

A. the collision between two reacting species results in the formation of an activated complex, which has less energy than both the reactants and products.
B. in the activated complex, the original bonds are weakened and the new bonds are partially formed.
C. the activation energy is the energy that must be absorbed or released by reactants to reach the activated complex.
D. the standard reaction enthalpy (ΔH^0) depends on the magnitude of the activation energy (E_a).

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28. Which of the following is true about the rate constant?
A. It expresses the relationship between the rate of a chemical reaction and the volume of reacting species.
B. The value of a rate constant tells us how fast or slow a reaction is.
C. The value of a rate constant is independent of reaction conditions.
D. A small rate constant indicates a faster reaction and a larger rate constant indicates a slower reaction.

29. For a first order reaction, the concentration versus time of the reaction mixture is given by the following graph



If a is the initial concentration of the reactant and if the half-life is 1hr, after how many hours would be the concentration of reactant reduced to a/32?
A. 1 hr
B. 4 hr
C. 5 hr
D. 3 hr

30. The mathematical expression $\log k = (\frac{-Ea}{2.3303R})\frac{1}{T} + \log A$ derived from the Arrhenius equation is of important as it shows
A. reactions with larger activation energies have higher values of k and are therefore faster.
B. for a given value of activation energy the value of the rate constant increases as the temperature increases.
C. reactions with larger activation energies, the value of the rate constant decreases as the temperature increases.
D. for a given value of activation energy, the value of the rate constant decreases as the temperature increases.

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31. From the magnitude of the equilibrium constant, K_{eq} one can deduce that
A. small K_{eq} values indicate the reaction yields very higher amounts of products near equilibrium.
B. large K_{eq} value indicates that the reaction reaches equilibrium with very little reactants remaining.
C. intermediate K_{eq} value indicates that the reaction does proceed in the forward direction.
D. K_{eq} will be larger when we have higher amounts of reactants over products.

32. The statement 'If a system at equilibrium is subjected to a stress, the system will readjust itself to reduce the effects of the stress is known as
A. Faradays law
B. Avogadro's principle
C. Boyle's law
D. Le- Chatelier's principle

33. The law of mass action states that
A. the rate of a reaction is directly proportional to the product of the concentration of reactants raised to the power of their respective coefficients in the balanced equation.
B. the K_{eq} expression is the ratio of the concentrations of reactants to the products raised to their coefficients.
C. a chemical equilibrium is attained only when the reaction is started with reactants.
D. for a reaction at equilibrium, the reaction quotient, Q is always less than the equilibrium constant, K_{eq}.

34. For the reaction between gaseous NO and O_2 to form $NO_2(g)$, what will be the equilibrium constant expression,

$$2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$$

A. $Kc = \frac{[NO2]^2}{[NO]^2[O2]}$
C. $Kp = \frac{(P_{NO2})^2}{[NO]^2[O_2]}$
B. $Kp = \frac{(P_{NO2})}{(P_{NO})(P_{O2})}$
D. $Kp = \frac{(P_{NO})^2(P_{O2})}{(P_{NO2})}$

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35. The equilibrium constant Kp for the reaction
$2SO_2(g) \longrightarrow 2SO_2(g) + O_2(g)$ is 3.8×10^{-3} Kp at 227 °C.
What is the value of Kc for the reaction at the same temperature?
A. 1.8×10^{-3} mol m^{-3}
B. 4.6×10^{-4} mol m^{-3}
C. 9.1×10^{-4} mol m^{-3}
D. 2.3×10^{-4} mol m^{-3}

36. In the production of NH_3 by the Haber process according to the equation
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ $\Delta H = -92$ KJ mol^{-1}
What are the favorable conditions for the production of high yield of NH_3?
A. Law pressure and low temperature
B. High pressure and low temperature
C. High pressure and high temperature
D. Low pressure and high temperature

37. Which one of the following statements describes laboratory and industrial preparation of acetic acid respectively?
A. Reduction of toluene by $KMnO_4$ and reduction of ethanol by sodium dichromate.
B. Reduction of ethanol by $NaBH_4$ and fermentation of propanol.
C. Oxidation of toluene by $KMnO_4$ and fermentation of ethanol.
D. The oxidation of ethanol by sodium dichromate and fermentation of ethanol.

38. Which of the following is true about carboxylic acids?
A. Carboxylic acid with the formula RCOOH.
B. Methanoic, Ethanoic and Citric acids are monocarboxylic acids.
C. Propanedioic acid is the simplest dicarboxylic acid.
D. Citric acid is a typical dicarboxylic acid.

39. What is the IUPAC name for the branched carboxylic acid
CH_3-CH(Cl)-$CH(CH_3)$-$CH(CH_3)$-COOH
A. 1, 2-dimethyl-4-chloro 1-pentanoic acid.
B. 4-chloro-2, methyl 1-pentanoic acid.
C. 4- chloro-2, 3-dimethyl 1-pentanoic acid.
D. 4-chloro-1-methyl 1-pentanoic acid.

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40. Esters are characterized by the following properties **EXCEPT**
A. esters have pleasant odors of perfumes and food flavoring.
B. esters have lower boiling point compared to the carboxylic acid and alcohols.
C. all esters are soluble in inorganic solvents and organic.
D. esters have higher boiling point than carboxylic acid and alcohols.

41. Oils are unsaturated fatty acids. The process of converting oils to solid fats involves
A. esterification of the acids.
B. saponification with NaOH
C. hydrogenation of the C-C double bonds.
D. halogenations of the C-C double bonds.

42. A chemistry teacher has added different reactants and reagents in three different test tubes as described below.
I. Into the test tube A he added ethanol, sodium dichromate, sulphuric acid.
II. Into the test tube B he added acetaldehyde, sodium borohydride and water.
III. Into the tube C he added methyl acetate and ethanol and sodium hydroxide.
In which test tube would a reaction takes place that provide acetic acid?
A. III C. II and III
B I and II D. I

43. The difference between colloids and suspension is that
A. colloidal particles are small enough and do not settle down unlike in a suspension.
B. most colloids and suspensions appear cloudy.
C. both colloids and suspensions are heterogeneous mixtures.
D. colloids are as transparent as solutions.

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44. The solubility of a substance is the amount of a substance that
A. gives an unsaturated solution of the substance at given temperature.
B. dissolves more amount of solute than it can normally dissolve.
C. gives a saturated solution of the substance at a given temperature.
D. dissolves double the amount of solute than it can normally dissolve.

45. 50 mL of the supernatant saturated solution of NaCl was taken in an evaporating dish (weight = w_o) and evaporated over a Bunsen burner until all the water has evaporated and dry sodium chloride is left in the evaporating dish. The evaporating dish with the dry sodium chloride is weighed (weight = w_1). Given the following information, w_o= 47.5 g and w_1 = 66.2. Calculate the solubility of NaCl in water assuming 50 mL of the solution is equal to 50 mL of the solvent
A. 37.4 g/100 g of water
B. 113.7 g/100 g of water
C. 18.7 g/100 g of water
D. 187 g/100 g of water

46. The "like dissolves like " rule accounts for one of the following observation
A. The solubility of C_6H_6 in CCl_4
B. The solubility of C_2H_6 in H_2O
C. The solubility of KBr in C_7H_8
D. The insolubility of I_2 in H_2O

47. Which of the following concentration units is correctly defined?
A. mass percentage = $\frac{mass\ of\ solute}{mass\ of\ solvent} x\ 100$
B. ppm (parts per million) = $mass\ of\ solute/mass\ of\ solvent$ x10^6
C. ppb (parts per billion) = $mass\ of\ solute/mass\ of\ solution$ x10^6
D. mass percentage = $\frac{mass\ of\ solute}{mass\ of\ solution} x\ 100$

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48. The concentrated sulphuric acid H_2SO_4 we use in the laboratory is 98% H_2SO_4 by mass and has a density of 1.83 g/ mL. Below are given the concentrations of the acid in various units. which of the given alternatives correctly describes the concentration of the acid?

	Molarity	Normality	Mole fraction
A	18.3 M	36.6 N	0.9
B	36.6 M	18.3 N	0.1
C	18.3 M	3.66 N	0.9
D	1.83 M	3.66 N	0.9

49. How do you prepare 500mL of 1N $Ca(OH)_2$ solution?
(Ca= 40, H=1, O= 16)
A. By dissolving 37 g of $Ca(OH)_2$ in 1 liter of solution.
B. By dissolving 74 g of $Ca(OH)_2$ in 500.mL of solution.
C. By dissolving 74 g of $Ca(OH)_2$ in 1 liter of solution.
D. By dissolving 37 g of $Ca(OH)_2$ in 500.mL of solution.

50. The Ka of acetic acid CH_3COOH is 1.8×10^{-5}. What is the percent ionization of 1M CH_3COOH?
A. 3.6
B. 1.42
C. 1.34
D. 4.2

51. According to the Lewis definition of an acid, an acid is a substance that
A. dissociates in water to yield H_3O^+
B. accepts a H^+ ion.
C. donates an OH^- ion.
D. accepts a pair of electrons.

52. Water is a weak electrolyte, because
A. it has a very high ionic product, Kw.
B. it can accept a proton from an acid and donate a proton to a base.
C. it undergoes a reversible dissociation with a very low ionic product, Kw.
D. it acts both as Bronsted-Lowry acid and base.

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53. Which of the following reactions represent the amphiprotic behavior of water

A. $HCl + H_2O \longrightarrow H^+ + Cl$ and
$NaOH + H_2O \longrightarrow Na^+ + OH^-$

B. $HCl + H_2O \rightleftharpoons H_3O^+ + Cl^-$ and
$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$

C. $H_3O^+ + OH^- \longrightarrow 2H_2O$ and
$H^+ + OH^+ \longrightarrow H_2O$

D. $H_2O + H^+ \rightleftharpoons H_3O^+$ and
$NH_3 + H^+ \rightleftharpoons NH_4^+$

54. For an acidic solution, which of the following is correct?

A. pH = pOH and pH = 1/2pKw = 7
B. pH > pOH and pKw - pH < 7
C. pH < pOH and pKw - pH > 7
D. for acidic solution pH < 7 and $[H^+] < 1x10^{-7}$

55. What is the pH of 0.25 M HF solution at 25°C. The ionization of the weak acid, HF is given by

$HF(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + F^-(aq)$, ka for HF is 6.8×10^{-4}

A. 12.1 C. 12.3
B. 1.89 D. 1.741

56. One of the following given pairs represents examples of buffer systems

A. NaOH/HCl and HNO_3/KOH
B. NH_4Cl/H_2O and H_2O/CH_3COONa
C. NH_4OH/CH_3COOH and NH_4Cl/CH_3COONa
D. NH_4OH/NH_4Cl and CH_3COOH/CH_3COONa

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57. The reaction between a weak acid and strong base as represented by the reaction between acetic acid and NaOH gives a basic solution because

$CH_3COOH + NaOH \longrightarrow Na^+ + CH_3OO^- + H_2O$

A. Na^+ is a strong acid and causes high concentration of H^+
B. CH_3COO^- as a strong base picks up H^+ and causes excess OH^- ions.
C. the OH^- ions from NaOH are not completely neutralized.
D. CH_3COOH does not produce sufficient amount of H^+ ions.

58. An acid is a substance that
A. has a bitter taste.
B. produces more OH^- ions in water than H^+ ions.
C. donates a proton in a chemical reaction.
D. donates a pair of electrons to a chemical species.

59. One of the following given masses of acids constitutes the corresponding equivalent of the acid
A. $H_2SO_4 = 98\ g = 2$ equivalent
B. $HCl = 36.5\ g = 2$ equivalents
C. $H_2SO_4 = 49\ g = 4$ equivalents
D. $H_3PO_4 = 98\ g = 2$ equivalents

60. One of the following pairs shows Bronsted-Lowry acids behavior in water?
A. HNO_3 and NO_3^-
B. H_3O^+ and NH_3
C. HPO_4^{2-} and PO_4^{3-}
D. HCl and NH_4^+

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BOOKLET CODE: 15 **SUBJECT CODE:05**

61. In the reaction mixture of the two species NH_4OH and NH_4Cl

$$NH_4OH \rightleftharpoons NH_4^+ + OH^-$$

$$NH_4^+Cl^- \longrightarrow NH_4^+ + Cl^-$$

Which one of the is true about the reaction mixture?

A. The NH_4^+ ion is a spectator ion in the reaction mixture.
B. The presence of NH_4^+ ion suppresses the dissociation of the weak base NH_4OH
C. The presence of NH_4^+ in the reaction mixture makes the solution more basic.
D. The reaction equilibrium is shifted towards the right due to the presence of NH_4^+ ions.

62. Which one the following is correct about K_w at different temperature?
The ionic product of water K_w equals

$K_w = 1.0 \times 10^{-14}$ at 25 °C $\sqrt{Kw} = 1x10^{-7}$

$K_w = 2.92 \times 10^{-14}$ at 40 °C $\sqrt{Kw} = 1x10^{-7}$

A. Water is dissociate to a higher extent at 40 °C than at 25 °C.
B. At 40 °C pure water is no more neutral.
C. Hydrogen ion concentration at 25 °C is higher than at 40 °C.
D. Hydroxyl ion concentration is higher at 40 °C than hydrogen ion concentration.

63. What is reduction? Reduction is

A. gain of electrons and increase in oxidation number.
B. loss of electrons and decrease in oxidation number.
C. gain of electrons and decrease in oxidation number.
D. gain of electrons and no change in oxidation number.

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64. During the electrolysis of dilute aqueous sulphuric acid, the ions present in solution are H^+, OH^- and SO_4^{2-}. Which ions are preferentially discharged at the cathode and anode, respectively?

A. Anode = $4OH^-(aq) \longrightarrow H_2O(l) + O_2(g) + 4e^-$
Cathode = $2H^+(aq) + 2e^- \longrightarrow H_2(g)$

B. Anode = $SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \longrightarrow SO_2(g) + 2H_2O$
Cathode = $2H^+(aq) + 2e^- \longrightarrow H_2(g)$

C. Anode = $4OH^-(aq) \longrightarrow H_2O(l) + O_2(g) + 4e$
Cathode = $2H_2O(l) + 2e^- \longrightarrow H_2(g) + 2OH^-(aq)$

D. Anode = $2H_2O(l) \longrightarrow O_2(g) + 4H^+(aq) + 4e^-$
Cathode = $2H^+(aq) + 2e \longrightarrow H_2(g)$

65. Which one of the following is NOT correct about electrodes and electrochemical cells?

A. Electrons flow spontaneously from negative to positive electrode.
B. The overall cell potential is calculated by the formula $E^o_{cell} = E_{cathode} - E_{anode}$
C. E^o_{cell} is greater than zero for non-spontaneous process.
D. The difference in the electrical potential of the electrode is positive that is positive cell.

66. The mathematical expressions for Faraday's first law is summarized as

A. $n = \frac{mIt}{MF}$
B. $m = \frac{MIt}{nF}$
C. $M = \frac{mIt}{nF}$
D. $m = \frac{It}{F}$

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67. In the electrolysis of copper sulphate solution using graphite electrodes, O_2 is liberated at the anode and copper metal is deposited at the cathode. If the electrolysis of $CuSO_4$ is performed using copper electrode, what happens at the anode and cathode?

A. At the anode the copper electrode dissolves and copper metal is deposited at the cathode.

B. At the anode H_2 is liberated, whereas copper is deposited at the cathode.

C. At the anode copper is reduced, whereas copper is oxidized at the cathode.

D. No electrochemical reaction takes place involving copper.

68. The statement 'the amount of a substance consumed or produced in an electrolytic cell is directly proportional to the amount of electricity that passes through the cell' is known as

A. Dalton's law.
B. Raoult's law.
C. Faraday's law.
D. Henry's law.

69. Given the following electromotive series of selected metals with their standard reduction potentials

Metal	Cu	Pb	Ni	Cd	Zn	Al	Ca	K
E°/V	+0.34	-0.13	-0.25	-0.40	-0.76	-1.66	-2.87	-2.93

Which of the following statements is correct about reactivity of the metals?

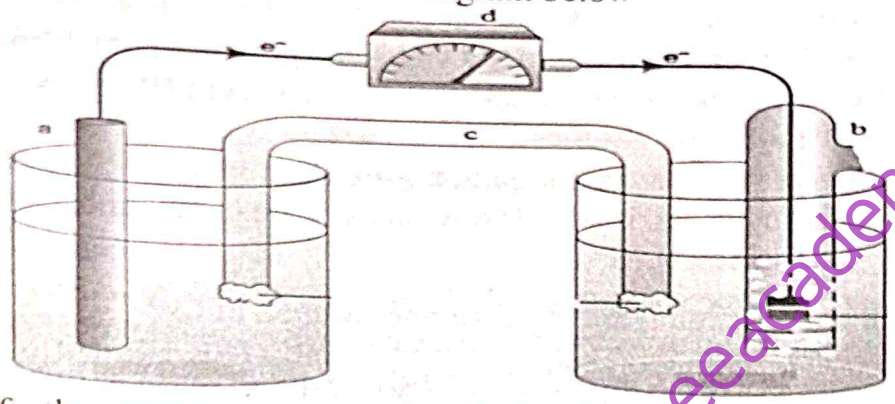
A. Cu is the strongest reducing agent in the group.
B. K is the strongest reduction agent among the metal silver.
C. The reaction $Cu + Zn^{2+} \longrightarrow Cu^{2+} + Zn$ is spontaneous.
D. Pb is more easily oxidized than Al

70. One of the following is **NOT** true about the effects of corrosion?

A. It causes deterioration of metals by spontaneous chemical process.
B. It causes enormous damage to buildings, bridges, ships and cars.
C. Damage from corrosion costs billions of dollars annually.
D. Corrosion forms protection oxide layers to prevent damage.

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71. In the Galvanic cell given in the diagram below



identify the component parts correctly labelled for the letters a, b, c, d and choose the correct one among the following

	a	b	c	d
A.	Zinc anode	copper cathode	salt bridge	voltmeter
B.	Copper anode	Zinc cathode	voltmeter	salt bridge
C.	Zinc anode	Copper cathode	$ZnSO_4$(sol)	salt bridge
D.	copper cathode	zinc anode	$CuSO_4$(sol)	voltmeter

72. The conversion of nitrogen gas into useful nitrogen compounds is known as

A. Respiration.
B. Photosynthesis.
C. Fixation.
D. Oxidation.

73. CO_2 is released into the atmosphere by one of the following processes

A. Plants consume atmospheric carbon dioxide during photosynthesis.
B. Animals eat plants and release CO_2 by photosynthesis.
C. Natural fires and volcanoes release CO_2 into the air.
D. Utilization of electrical energy as energy sources.

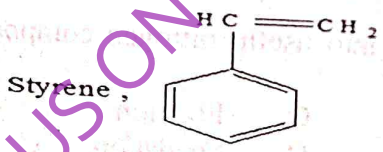
74. One of the following is **NOT** a common application of silicon

A. in the construction of transistors and microprocessors.
B. in the control of the frequency of television transmissions.
C. in the production of polish body parts cars.
D. in coating iron to prevent it from rusting.

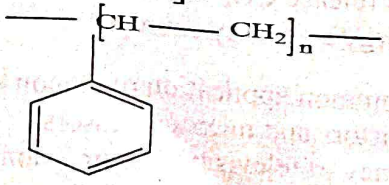
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75. One of the following is **NOT** among the chemical properties of silicon
   A. silicon reacts with CH_3Cl at 300 °C in the Cu as a catalyst by further reactions with H_2O yields the polymer$[(CH_3)_2SiO_2]_n$
   B. silica is resistant to attack by all acids except HF, which it reacts to give SiF_4 and H_2O_2
   C. silica dissolves in hot molten Na_2CO_3 to give Na_4SiO_4 and CO_2
   D. silicon occurs as silica(SiO_2) and silicate compounds containing the silicate ion(SiO_4^{-4})

76. Which one the following is a common reaction of tin?
   A. $Sn\,(s) + dil.2HCl\,(aq) \longrightarrow SnCl_2\,(aq) + H_2\,(g)$
   B. $Sn\,(s) + H_2O\,(g) \longrightarrow SnO_2\,(s)$
   C. $Sn\,(s) + 2H_2O\,(g) \longrightarrow Sn(OH)_2\,(s)$
   D. $Sn\,(s) + 2Cl_2\,(g) \longrightarrow SnCl_2\,(s)$ in cold media

77. The monomer of natural rubber is
   A. 2-chloro-1,3-butadiene(chloroprene)
   $H_2C{=}C(Cl){-}CH{=}CH_2$
   B. 2-methyl-1,3-butadiene(isoprene)
   $CH_2{=}C(CH_3){-}CH{=}CH_2$
   C. 1,3-butadiene
   $H_2C{=}CH{-}CH{=}CH_2$
   D. 

Styrene

78. All of the following are examples of addition polymers **EXCEPT**
   A. $-[CH_2\text{-}CH_2]_n-$
   B. $-[CH_2\text{-}CHCl]_n-$
   C. 

   D. $-[CH_2CH_2]_n-[CH_2\text{-}CH(CH_3)]_n-$

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79. One of the following examples of polymers is correctly matched with its uses.
   A. Polyethylene; food containers
   B. Polypropylene; electrical insulation
   C. Polyvinyl chloride; making pipes
   D. Polytetrafluoroethylene; making shoes

80. Natural polymers are
   A. polymers produced by the addition reaction of monomer units.
   B. polymers produced by condensation reaction of monomer units.
   C. polymers found in some substances like rubber in nature.
   D. polymers produced by the substitution of one or more atoms in the monomer units.

THE END

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