

(Section-A) Marks= (18) Time Allowed: 20 Minutes

All questions of this section must be answered on this page and handed over to the Superintendent within given time

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Student Name *

Name of Paper CHEMISTRY (CH I)

Paper Date 23-MAY 26

Paper Code 73

Signature of Student.

Paper Version

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سوالات

- According to the rate law: Rate = $k[A]^2[B]$, the order of reaction with respect to A is: a) 0, b) 1, c) 2, d) 3
- The elevation in boiling point of a solution occurs because: a) the vapour pressure of the solution decreases, b) the vapour pressure increases, c) the solvent evaporates completely, d) the solute becomes volatile
- The process which is generally endothermic is: a) combustion of fuel, b) neutralization reaction, c) photosynthesis, d) respiration
- The substance that loses electrons during a redox reaction is called: a) reducing agent, b) oxidizing agent, c) catalyst, d) solvent
- The efficiency of chemical reaction is determined by: a) percent yield, b) actual yield, c) theoretical yield, d) ideal yield
- The high heat of fusion of ice means that it: a) melts very quickly, b) requires large amount of heat to convert into water, c) forms easily at high temperature, d) does not absorb heat
- The reaction which correctly represents both forward and reverse reactions is: a) $N_2 + 3H_2 \rightleftharpoons 2NH_3$, b) $N_2 + 3H_2 \rightarrow 2NH_3$, c) $2H_2O \rightleftharpoons 2H_2 + O_2$, d) $NaCl \rightleftharpoons Na^+ + Cl^-$
- For the reaction $2SO_2 + O_2 \rightleftharpoons 2SO_3$, the correct equilibrium expression is: a) $K_c = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$, b) $K_c = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$, c) $K_c = \frac{[SO_3]}{[SO_2][O_2]}$, d) $K_c = \frac{[SO_3]}{[SO_2]^2[O_2]}$
- Buffer which maintains a pH value of less than 7 is: a) acidic, b) basic, c) neutral, d) amphoteric
- A salt produced from a weak acid and strong base gives a solution that is: a) neutral, b) basic, c) acidic, d) amphoteric
- During vaporization, a substance changes from: a) solid to liquid, b) gas to liquid, c) liquid to gas, d) solid to gas
- At dynamic equilibrium, the amount of each phase: a) changes continuously, b) remains constant with time, c) becomes zero, d) increases indefinitely
- The particles in solids show only: a) random motion, b) vibrational motion, c) translational motion, d) rotational motion
- The habit of a crystal refers to its: a) chemical composition, b) external shape, c) atomic arrangement, d) melting point
- The correct electronic configuration of oxygen (Z = 8) according to the Aufbau principle is: a) $1s^2 2s^2 2p^3$, b) $1s^2 2s^2 2p^4$, c) $1s^2 2s^1 2p^5$, d) $1s^2 2p^5$
- The number of σ and π bonds percent in a double bond is/are: a) 2σ and 1π , b) 1σ and 1π , c) 2σ and 2π , d) 1σ only
- If the electronegativity difference between two bonded atoms is from 0.4 to 1.7, it is: a) pure covalent, b) metallic bond, c) coordinate bond, d) polar covalent bond
- According to Graham's law, the gas with smaller molar mass: a) diffuses more slowly, b) diffuses at the same rate, c) diffuses more rapidly, d) does not diffuse at all

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If the Candidate is absent, The Superintendent Should fill this Circle and pack the sheet with solved OMR sheets in roll number order

Time: 2 Hours 40 Minutes

SECTION-B

Marks: 40

NOTE Attempt any ten of the following short questions. Each question carries 4 marks.

- Q.1 For the reaction $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$, (i) Write mole ratio between Al and Cl_2 . (ii) Write mole ratio between Cl_2 and AlCl_3 . (iii) If 6 moles of Cl_2 react completely, how many moles of AlCl_3 will be formed?
- Q.2 Explain the difference between theoretical yield and actual yield. If the actual yield of a product is 18 g and the theoretical yield is 24 g, calculate the percentage yield.
- Q.3 (i) Calculate the radius of the third orbit ($n=3$) and fourth orbit ($n=4$)
(ii) Explain how the radius changes with increase in 'n'.
- Q.4 Write down any four main postulates of valence shell electron pair repulsion theory.
- Q.5 Write down the mathematical expressions of Boyle's law, Charles' law and Avogadro's law. Explain how combining these expressions lead to a single gas equation.
- Q.6 What is atmosphere? How is it maintained around the earth's surface? What is its composition and on which factors does the actual value of atmospheric pressure depend?
- Q.7 Define vacuum distillation. Explain its working with example. Also write down its main advantages.
- Q.8 Explain the motion of molecules in liquids according to the kinetic molecular theory. How does it differ from solids and gases?
- Q.9 Explain why hydrochloric acid (HCl), nitric acid (HNO_3), chloric acid (HClO_3) and sulphuric acid (H_2SO_4) show similar acidic strength in water.
- Q.10 Define heterogeneous catalysis. Explain how the reactant molecules interact with the catalyst surface during a heterogeneous catalytic reaction.
- Q.11 Define hydration. Explain how water molecules surround K^+ and Cl^- ions during hydration of KCl . Also draw diagram.
- Q.12 What is state function? Explain the characteristics of state function with examples.
- Q.13 Define electrode potential and standard electrode potential. Explain the two possible tendencies that occur when a metal strip is placed in a solution of its own ions.

SECTION-C

Marks: 27

NOTE: Attempt any three of the following questions. Each question carries 9 marks.

- Q.14 i. What is bond length? How is it measured? Explain why the calculated bond length of HF molecules is greater than the experimentally observed value. Also mention the calculated and actual values of bond lengths.
ii. What are x-rays? Mention their wavelength in Å and nm units. Write any four properties of x-rays.
- Q.15 i. Define crystalline and amorphous solids with examples. Why do crystalline solids have sharp melting points while amorphous solids do not? Give reason.
ii. (i) State Dalton's law of partial pressure. Give a suitable example.
(ii) A mixture contains three gases with partial pressures 150 mmHg, 250 mmHg and 350 mmHg. Calculate the total pressure.
- Q.16 i. State Le-Chatelier's Principle. Explain the effects of increase in temperature on the following chemical equilibria: (i) $\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2\text{HI}_{(g)}$ $\Delta H = 53.0 \text{ kJ}$ (ii) $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$ $\Delta H = -92.384 \text{ kJ}$
ii. Define the following terms with reference to the Born-Haber Cycle, giving one example for each
(i) Heat of sublimation (ii) Ionization enthalpy (iii) Electron affinity (iv) Lattice energy
- Q.17 i. (i) What is meant by parts per million (ppm)? Write down its formula.
(ii) Sea water contains 5 mg of oxygen in 2 kilogram of water. Calculate the concentration of oxygen in parts per million in sea water.
ii. (i) Define Faraday's first law of electrolysis and express it mathematically.
(ii) Calculate the mass (W) deposited when 3 A current (I) flows for 20 minutes. ($Z = 0.0015 \text{ g/C}$)