



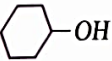
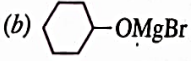

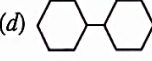
General Instructions :

Read the following instructions carefully and follow them :

- This question paper contains 33 questions. All questions are compulsory.
- This question paper is divided into five sections Section A, B, C, D and E.
- Section A questions number 1 to 16 are multiple choice type questions. Each question carries 1 mark
- Section B questions number 17 to 21 are very short answer type questions. Each question carries 2 marks
- Section C questions number 22 to 28 are short answer type questions. Each question carries 3 marks
- Section D questions number 29 and 30 are case-based questions. Each question carries 4 marks
- Section E questions number 31 to 33 are long answer type questions. Each question carries 5 marks
- There is no overall choice given in the question paper. However, an internal choice has been provided in few questions in all the sections except Section A.
- Use of calculators is not allowed.

SECTION A

Questions no. 1 to 16 are Multiple Choice type Questions, carrying 1 mark each. (16 × 1 = 16)

- In the reaction $R-OH + HCl \xrightarrow{ZnCl_2} R-Cl + H_2O$, what is the correct order of reactivity of alcohol?
 (a) $1 < 2 < 3$ (b) $1 > 3 > 2$ (c) $1 > 2 > 3$ (d) $3 > 1 > 2$
- Addition of catalyst during a chemical reaction alter which of the following quantity of the reaction?
 (a) Enthalpy (b) E_a (c) Entropy (d) Internal energy
- In a dry cell the cathode is
 (a) Zn container (b) MnO_2 (c) graphite (d) NH_4Cl
- The unit of rate constant of a zero order reaction is
 (a) litre/second (b) $litre\ mole^{-1}\ second^{-1}$ (c) $mole\ litre^{-1}\ second^{-1}$ (d) $mole\ second^{-1}$
- In the reaction $A \longrightarrow B$ the rate of reaction increases two times on increasing the concentration of A four times, the order of reaction is
 (a) 2 (b) 0 (c) $1/2$ (d) 3
- In the reaction $\text{Cyclohexyl-Br} \xrightarrow[\text{dry ether}]{Mg} 'X' \xrightarrow[\text{dry ether}]{H_2O} 'Y'$, compound 'Y' is
 (a)  (b)  (c)  (d) 
- Rate law cannot be determined from balanced chemical equation if ____
 (a) reverse reaction is involved (b) it is an elementary reaction
 (c) it is a sequence of elementary reactions (d) any of the reactants is in excess
- Which of the following statement is not correct for the catalyst?
 (a) It catalyses the forward and backward reaction to the same extent.
 (b) It alters ΔG of the reaction.
 (c) It is a substance that does not change the equilibrium constant of a reaction.
 (d) It provides an alternate mechanism by reducing activation energy between reactants and Products.
- Unit of Molar Conductivity is.....?

10. When 0.1 mole of MnO_4^{2-} is oxidised, the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is

- (a) 96500 C (b) 9650 C (c) 96.50 C (d) 2×96500 C

11. Solubility of gas in liquid decreases with rise in temperature because dissolution is an

- (a) Endothermic and reversible process (b) exothermic and reversible process
(c) endothermic and irreversible process (d) exothermic and irreversible process

12. The quantity of electricity required to obtained one mole of Al from Al_2O_3 is

- (a) 1F (b) 6F (c) 3F (d) 2F

For Questions number 13 to 16, two statements are given one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

13. Assertion (A): If $\lambda_{\text{Na}^+}^0$ and $\lambda_{\text{Cl}^-}^0$ are molar limiting conductivity of sodium and chloride ions respectively, then the limiting molar conductivity for sodium chloride is given by the equation: $\lambda_{\text{NaCl}}^0 = \lambda_{\text{Na}^+}^0 + \lambda_{\text{Cl}^-}^0$

Reason (R) : This is according to Kohlrausch law of independent migration of ions.

14. Assertion (A) : Molarity of a solution changes with temperature.

Reason (R) :Molarity is a colligative property.

15. Assertion (A) : Conductivity decreases for weak electrolyte and increases for strong electrolyte with decrease in concentration.

Reason (R) : On dilution, the number of ions per unit volume that carry the current decreases.

16. Assertion (A) : An electrochemical cell can be setup only if the redox reaction is spontaneous,

Reason (R) : A reaction is spontaneous if free energy change is negative..

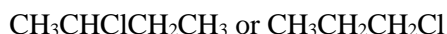
SECTION-B

17. Define half-life of a reaction. Write the expression of half-life for

(i)Zero order reaction

(ii) first order reaction.

18. Which one of the following compounds is more easily hydrolysed by KOH and why?



19. What is the role of ZnCl_2 in a dry cell?

20.How do you convert the following:

(i) Prop-1-ene to 1-fluoropropane

(ii) Aniline to Iodobenzene

21. Explain why P-nitrobenzene under goes S_N reaction faster than Chlorobenzene?

OR

Although Chlorine is an electron withdrawing group yet it is ortho-para directing in the electrophilic aromatic substitution reaction. Why?

SECTION-C

22. Give one chemical test to distinguish between the following pairs of compounds:

(i) Propanol and 2-methylpropan-2-ol.

(ii)Why S_N reaction is slow in aromatic halides?

23. A first order reaction has a rate constant $1.15 \times 10^{-3} \text{ s}^{-1}$. How long will 5 g of this reactant take to reduce to 3 g?

OR

Write product of Electrolysis of conc H_2SO_4 in platinum electrode

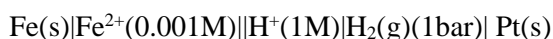
24. Mention the factors which affect the rate of a chemical reaction.

25. Henry's law constant for the molality of methane in benzene at 298 K is $4.27 \times 10^5 \text{ mm Hg}$. Calculate the solubility of methane in benzene at 298 K under 760 mm Hg.

26. Write short notes on the following:

- (i) Friedel craft alkylation (ii) Fitting reaction (iii) Sandmayers reaction

27. Write the Nernst equation, standard Gibbs free energy and emf of the following cells at 298 K



$$\text{Given } E^\circ_{\text{Fe}^{2+}|\text{Fe(s)}} = -0.14\text{V}$$

28. Concentrated nitric acid used in the laboratory work is 68% nitric acid by mass in aqueous solution. What should be the molarity of such a sample of acid if the density of the solution is 1.504 g mL^{-1} ?

SECTION-D

Case base study

29. The spontaneous flow of the solvent through a semipermeable membrane from a pure solvent to a solution or from a dilute solution to a concentrated solution is called osmosis. The phenomenon of osmosis can be demonstrated by taking two eggs of the same size. In an egg, the membrane below the shell and around the egg material is semi-permeable. The outer hard shell can be removed by putting the egg in dilute hydrochloric acid. After removing the hard shell, one egg is placed in distilled water and the other in a saturated salt solution. After some time, the egg placed in distilled water swells-up while the egg placed in salt solution shrinks. The external pressure applied to stop the osmosis is termed as osmotic pressure (a Colligative property). Reverse Osmosis takes place when the applied external pressure becomes larger than the osmotic pressure.

A. What do you expect to happen when red blood corpuscles (RBC's) are placed in 0.5% NaCl solution?

B. Which one of the following will have higher osmotic pressure in 1 M KCl or 1 M urea solution?

C. Name one SPM which can be used in the process of reverse osmosis.

D. What are isotonic solutions?

OR

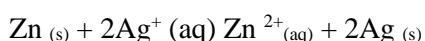
Write van't Hoff equation for dilute solution?

30. The rate of reaction is concerned with decrease in concentration of reactants or increase in the concentration of products per unit time. It can be expressed as instantaneous rate at a particular instant of time and average rate over a large interval of time. Mathematical representation of rate of reaction is given by rate law. Rate constant and order of a reaction can be determined from rate law or its integrated rate equation. Give the mechanism of addition of Grignard reagent to carbonyl compound forming an alcohol.

1. What is average rate of reaction?
2. (i) What happens to rate of reaction for zero order reaction?
(ii) What is the unit of k for zero order reaction?
3. (i) For a reaction $\text{P} + 2\text{Q} \longrightarrow \text{Products}$
 $\text{Rate} = k[\text{P}]^{1/2}[\text{Q}]^1$. What is the order of the reaction?
(ii) Define pseudo first order reaction with an example.

SECTION-E

31. a. Depict the galvanic cell in which the reaction takes place



(i) which of the electrodes is negatively charged?

(ii) calculate Gibbs free energy of the reaction?

(iii) Define fuel cell. Write two fuels that can be used in fuel cells.

OR

(b) (i) State the Kohlrausch law.

(ii) Define Corrosion.

(iii) Primary batteries and secondary batteries

(iv) Give one example in each case.

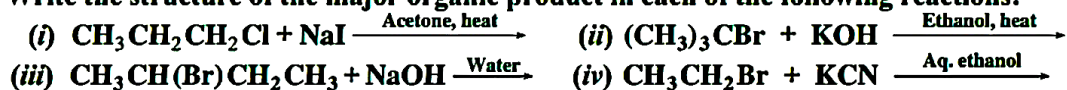
32. (a) (i) A solution of glucose in water is labelled as 10% w/w, what would be the molality and mole fraction of each component in the solution? If the density of solution is 1.2 g mL^{-1} , then what shall be the molarity of the solution?

(ii) A reaction is first order in A and second order in B

a. Write the differential rate law

b. How the rate is affected when concentration of both A and B is doubled?

33 a. **Write the structure of the major organic product in each of the following reactions:**



b. Account for the following

(i) benzyl chloride is highly reactive towards $\text{S}_{\text{N}}1$ reaction.

(ii) Butan-2-ol is optically inactive, but it contains chiral carbon.