

## SUBJECT : CHEMISTRY (SET-I)

Time : 3 Hrs.

M.M.: 70

## General Instructions :

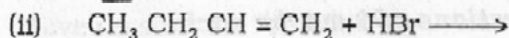
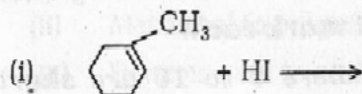
- (i) All questions are compulsory.
  - (ii) Question numbers 1 to 5 are very short answer type questions of 1 mark each.
  - (iii) Question numbers 6 to 10 are short answer type questions of 2 marks each.
  - (iv) Question numbers 11 to 22 are also short answer type questions of 3 marks each.
  - (v) Question number 23 is a value based question carrying 4 marks.
  - (vi) Question numbers 24 to 26 are long answer type questions of 5 marks each.
  - (vii) Use log tables, if necessary. Use of calculators is not allowed.
- Q1. Name a salt which is added to  $\text{AgCl}$  so as to produce cation vacancies.
- Q2. What does the part '6, 6' mean in the polymer and nylon -6, 6?
- Q3. Why is red phosphorus less reactive than white phosphorus?
- Q4. Give the IUPAC name of the following compound :
- $$\text{CH}_2 = \text{CH} - \underset{\text{OH}}{\text{CH}} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$$
- Q5. Write the structure of N-Ethyl-N-methyl propanamine.
- Q6. (a) For the elementary reaction :  $\text{A} + \text{H}_2\text{O} \rightarrow \text{B}$ , rate  $\propto [\text{A}]$ . What are its molecularity and order?
- (b) Define activation energy of a reaction.
- Q7. A coordination compound has the formula  $\text{CoCl}_3 \cdot 4\text{NH}_3$ . It does not liberate ammonia but precipitates chloride ions

as AgCl. Give the structural formula of the compound. Also draw its possible geometrical isomers.

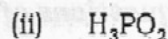
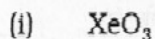
- Q8. With a suitable example, show that an optically active alkyl halide undergoing  $S_N1$  mechanism is accompanied by racemisation.

OR

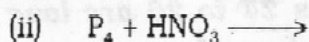
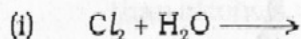
Complete the following chemical reactions :



- Q9. Draw the structures of the following molecules :



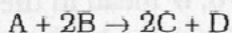
- Q10. Complete the following reactions :



- Q11. (a) Calculate the packing efficiency of a metal crystal for a face centred cubic lattice.

- (b) Define the term - coordination number, in relation to crystalline solids.

- Q12. For a certain chemical reaction



The experimentally obtained information is tabulated below:

Experiment	[A] $\text{mol L}^{-1}$	[B] $\text{mol L}^{-1}$	Initial rate of reaction
1	0.30	0.30	0.096
2	0.60	0.30	0.384
3	0.30	0.60	0.192
4	0.60	0.60	0.768

For this reaction :

- (i) Derive the order of reaction w.r.t. both the reactants A and B.
- (ii) Write the rate law.

- (iii) Calculate the value of rate constant  $K$ .
- Q13. (a) Explain the principles of refining of metals by the following methods :
- Zone refining
  - Vapour phase refining
- (b) State the role of silica in the metallurgy of copper.
- Q14. (a) Using the valence bond approach, deduce the shape and magnetic behaviour of  $[\text{Ni}(\text{CO})_4]$
- (b) Write the IUPAC name of  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$
- Q15. Give reasons for the following :
- Sulphur in vapour state exhibits paramagnetism.
  - Of the noble gases only xenon is known to form the compounds.
  - Nitrogen does not form pentahalides.
- Q16. Calculate the emf of the following cell at  $25^\circ\text{C}$  :
- $$\text{Cu(s)} / \text{Cu}^{2+} (10^{-1} \text{ M}) \parallel \text{Ag}^+ (10^{-3} \text{ M}) \mid \text{Ag}$$
- Given  $E^\circ_{\text{cell}} = +0.46\text{V}$

OR

- (a) Calculate the equilibrium constant of the reaction :
- $$2 \text{Fe}^{3+} (\text{aq}) + 2\text{I}^- (\text{aq}) \rightarrow 2 \text{Fe}^{2+} (\text{aq}) + \text{I}_2 (\text{s})$$
- Given  $E^\circ_{\text{cell}} = 0.236\text{V}$  at  $298 \text{ K}$ .
- (b) Why is not possible to measure the single electrode potential?
- Q17. (a) Why is adsorption always exothermic?
- (b) Why are powdered substances more effective adsorbent than their crystalline forms?
- (c) Why does physisorption decrease with increase of temperature?
- Q18. Explain the following reaction with an example of each :
- Williamson's synthesis
  - Reimer-Tiemann reaction

(iii) Diazotisation reaction

Q19. Distinguish between the following pairs of organic compounds (using suitable chemical test) :

- (i) Ethanal and propanal
- (ii) Methyl amine and dimethyl amine
- (iii) Phenol and benzoic acid

Q20. Explain the following observations :

- (i) Ortho-nitrophenol is more acidic than ortho-methoxyphenol
- (ii) Aniline does not undergo Friedal-Crafts reation.
- (iii) Gabriel phthalimide synthesis is preferred for synthesising primary amines.

Q21. (a) How is dacron obtained from ethylene glycol and terephthalic acid?

- (b) Arrange the following polymers in order of increasing tensile strength : Nylon - 6, Buna - S, polythene
- (c) Give one use of bakelite.

Q22. (i) Draw the structure of monomer of natural rubber.

- (ii) Out of C and CO, which is a better reducing agent at 673 K?
- (iii) What is the role of a depressant in froth floatation process?

Q23. Anil and his neighbour Sunil have got their garden fenced with iron rods. Anil saw the next day that Sunil was painting the iron fence. Sunil suggested Anil to do the same to increase the longevity of the iron rods by preventing corrosion. Anil argues that it is a waste of time and his iron rods are quite strong.

After reading he above passage, answer the following questions :

- (i) Whose opinion is correct according to you? What values are promoted here?



- (ii) Why do car owners living near the sea wash their cars regularly?
- (iii) Are there any other ways to prevent corrosion other than painting?

Q24. (a) How will you prepare :

- (i)  $K_2MnO_4$  from  $MnO_2$
- (ii)  $Na_2Cr_2O_7$  from  $Na_2CrO_4$ ?

(b) Account for the following :

- (i)  $Mn^{2+}$  is more stable than  $Fe^{2+}$  towards oxidation to +3 state.
- (ii) Actinoids show wide range of oxidation states.
- (iii) The enthalpy of atomisation is lowest for Zn in 3d series of the transition elements.

OR

- (a) (i) Which transition element of 3d series has positive  $E^\circ (M^{2+}/M)$  value and why?
- (ii) Out of  $Cr^{3+}$  and  $Mn^{3+}$  which is a stronger oxidising agent and why?
- (iii) Why Zn, Cd and Hg are not considered as a transition element?

(b) Complete the following equations :

- (i)  $MnO_4^- + 8H^+ + 5e^- \longrightarrow$
- (ii)  $Cr_2O_7^{2-} + 2OH^- \longrightarrow$

Q25. (a) What type of deviation is shown by a mixture of ethanol and acetone? Give reason.

(b) Calculate the boiling point of a solution prepared by adding 10 g of  $CaCl_2$  to 200 g of water.

[ $K_b$  for water =  $0.512 \text{ K kg mol}^{-1}$ , molar mass of  $CaCl_2 = 111 \text{ g mol}^{-1}$ ]

OR

(a) Define the following terms :-

- (i) Azeotrope

- (ii) Osmotic pressure
- (b) Calculate the mass of a non-volatile solute (molar mass  $40 \text{ g mol}^{-1}$ ) which should be dissolved in  $114 \text{ g}$  of octane to reduce its vapour pressure to  $80\%$ .
- Q26. (a) How will you bring about the following conversions :
- Toluene to benzaldehyde
  - Methanal to propanol
  - Benzoic acid to aniline
- (b) Give reasons for the following :
- Carboxylic acids do not give the characteristic reactions of carbonyl group.
  - The boiling points of carboxylic acids are higher than alcohols.

OR

- (a) A compound (X) with molecular formula  $\text{C}_4\text{H}_{10}\text{O}$  on oxidation forms compound (Y). The compound (Y) gives positive iodoform test. Compound (Y) on reaction with methyl magnesium bromide followed by hydrolysis gives compound (Z). Identify (X), (Y) and (Z) and write the reactions involved.
- (b) Arrange the following in the increasing order of :
- Methanal, Propanal, Butanone, Propanone (nucleophilic addition reaction)
  - Acetaldehyde, ethyl alcohol, propane (boiling points)