

The following data are given for the reaction: $P + Q \rightarrow Z$ is first-order w.r.to P and zero-order w.r.to Q. fill the following table.

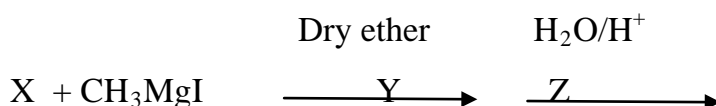
Exp. No.	[P], mol L ⁻¹	[Q], mol L ⁻¹	Rate of formation of (Z) mol L ⁻¹ s ⁻¹
1	0.1	0.1	2×10^{-2}
2	-	0.2	4×10^{-2}
3	0.4	0.4	-
4	-	0.2	2×10^{-2}

- Predict the spontaneity of exothermic and endothermic reaction in term of enthalpy, entropy and free energy change. [5]
- Cast iron is extracted in a furnace which is known as blast furnace. Write the chemical reactions involved in the zone of reduction of blast furnace. What happens when copper sulphate is allowed to react with ammonia solution till excess? Write the important use of silver. [2+2+1]
- What are volatile metals? How is steel manufactured by open hearth process? Explain with well labelled diagram. [1+4]
- Write the equations for
 - excess ethanol is heated with conc. H_2SO_4 at $140^\circ C$
 - ethanol is heated with excess H_2SO_4 at $160^\circ C-170^\circ C$
 - 2-methylpropan-2-ol vapour is passed through heated copper at $300^\circ C$
 - Ethanol is refluxed with $SOCl_2$ in the presence of pyridine
 - Ethanol reacts with sodium metal

Or

Chloroform is an important chemical compound which has wide scope of synthetic utility as well as medicinal value, how does chloroform reacts with

- Zn in the presence of steam
 - Conc. Nitric acid
 - Air in the presence of sunlight
 - Phenol in the presence of NaOH
 - Acetone in the presence of alkali [1+1+1+1+1]
- Write the two methods of preparation of chlorobenzene. Why is nucleophilic substitution in chlorobenzene difficult in comparison to chloroethane? How is chlorobenzene converted into benzoic acid? [2+2+1]
 - i) Write the functional isomer of CH_3COCH_3 and give a chemical test to distinguish them. (1+1)
 - Identify the compound X, Y and Z in the following reaction.



X is the aliphatic aldehyde, which can give cannizzaro's reaction. [1+1+1]

- What do you mean by OPC and PPC cement? Write down the flow sheet diagram for the manufacture of portland cement. [3+2]

Group 'C'

Long answer questions (3× 8=24)

- 9.a) What is the solubility product? Write the application of common ion effect and solubility product. (1+4)
- b) The solubility of AgCl in water at 25 °C is $1.43 \times 10^{-3} \text{ gL}^{-1}$. Calculate its solubility in 0.5 M KCl solution. [3]

Or

- a. Draw energy profile diagram for exothermic and endothermic reaction. What is Gibb's free energy? Derive Gibb's Helmholtz equation. [2+1+1]
- a. What is a calomel electrode? Why is this electrode used as a reference electrode? [2]
- b. Give the reason why the blue colour of copper sulphate solution is discharged when an iron rod is dipped in it. Given $E_{\text{Cu}^{2+}/\text{Cu}}^0 = 0.34\text{V}$ and $E_{\text{Fe}^{2+}/\text{Zn}}^0 = -0.44\text{V}$. [2]
10. i) An alkene (A) on ozonolysis yields acetone and an aldehyde. The aldehyde is easily oxidized to an acid (B). When (B) is treated with Br_2/P it yields a compound (C), which on hydrolysis gives a hydroxyl acid (D). This acid can also be obtained from acetone by the reaction with HCN followed by hydrolysis. Identify the compound A, B, C and D. (5)
- ii) How does methanal reacts with
- a) NH_3 b) Conc. NaOH (1.5+1.5)
11. A. Give reason:
- a. It is dangerous to boil old sample of ether.
- b. Ethers are stored in the bottle containing iron wire.
- c. The boiling point of ethers are low as compared to boiling point of corresponding alcohols.
- d. Ethers are commonly used as solvents.
- e. Ethers are considered as inert compounds. [1+1+1+1+1]
- B. Why is nucleophilic substitution in chlorobenzene difficult in comparison to chloroethane? How is chlorobenzene converted into benzoic acid? [2+1]