

2023

CHEMISTRY

Paper-GE-II

Full Marks : 60

Time : 3 hours

Answer all questions as directed.

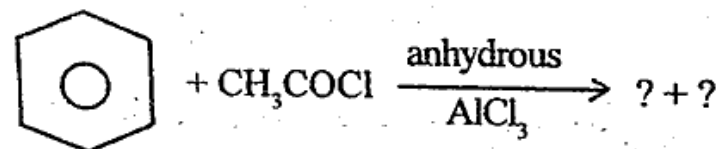
The figures in the right-hand margin indicate marks.

GROUP—A

Answer all questions : 1 × 8

1. (a) Refractive index of a substance is an _____ property (Extensive/Intensive)
- (b) Define state function.
- (c) For the reaction $2\text{NH}_{3(g)} \rightleftharpoons \text{N}_{2(g)} + 3\text{H}_{2(g)}$ write the expression for the relation between K_p and K_c .

- (d) What is the effect of temperature on pH of water ?
- (e) In SN_1 mechanism, which is the reaction intermediate.
- (f) Complete the reaction



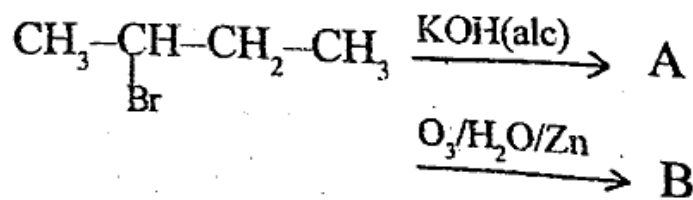
- (g) Name the reagent used to distinguish between CH_3CHO and CH_3COCH_3 .
- (h) Write the chemical name of picric acid.

GROUP—B

2. Answer any eight : 1.5 × 8
- (a) Write the relationship between ΔG and K_c .

(3)

- (b) State 3rd law of thermodynamics.
- (c) The equilibrium constant (K_c) for the reaction $A + B \rightleftharpoons C + D$ is 2×10^2 , then calculate the equilibrium constant for the reaction $C + D \rightleftharpoons A + B$.
- (d) Find out the pH of 0.005M H_2SO_4 solution.
- (e) Establish the relationship between solubility (S) and solubility constant (K_{sp}) of $Al(OH)_3$.
- (f) Find out A and B for the reactions :



- (g) How do you prepare chlorobenzene from Benzene diazonium chloride ? Give equation.
- (h) State Saytzev's rule with an example.

(4)

- (i) Write a note on Clemmensen's reaction.
- (j) What happens when formaldehyde reacts with conc. NaOH solution ? Give equation.

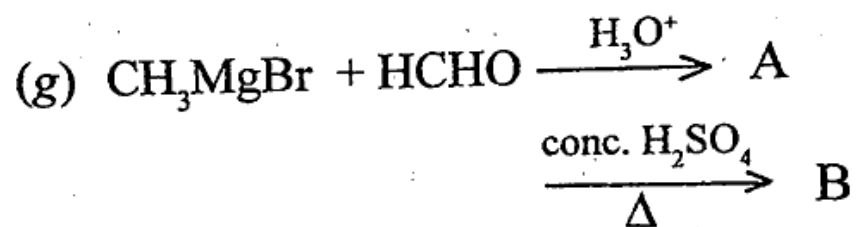
GROUP—C

3. Answer any *eight* : 2 × 8

- (a) Derive the relationship between ΔH and ΔU for a chemical reaction containing gaseous components.
- (b) Define path function. Give two examples.
- (c) Calculate the degree of ionisation of 0.1 M CH_3COOH solution ($K_a = 1 \times 10^{-5}$)
- (d) Explain why $CuSO_4$ solution is acidic in nature.

(5)

- (e) Derive Henderson's equation for an acidic buffer solution.
- (f) Explain why chlorobenzene is less reactive than chloromethane towards SN reaction.



What are A and B ?

- (h) What happens when phenol reacts with bromine water? Give equation.
- (i) How do you distinguish between H-CHO and CH₃-CHO? Give equation.
- (j) Write a note on Wolff-Kishner reduction.

(6)

GROUP—D

4. Write short notes on :

3+3

- (a) Enthalpy of formation
- (b) Bond energy

Or

State and explain Le-Chatelier's principle with an application.

6

5. Write short notes on :

3+3

- (a) Ionic product of water
- (b) pH of solution

Or

Derive hydrolysis constant, degree of hydrolysis and pH of NH₄Cl solution.

6

(7)

6. Briefly explain SN_1 and SN_2 mechanism.

Or

Write the mechanism of the following reactions : 3+3

(a) Sulphonation of Benzene

(b) Benzene mechanism

7. Explain the following reaction with mechanism :

(a) Esterification

(b) Reimer-Tiemann reaction

Or

(a) Benzoin condensation

(b) Clemmensen's reduction