

[This question paper contains 6 printed pages.]

4407

Your Roll No.

Subsidiary for B.Sc. Honours/II

AS

CHEMISTRY – Paper III

Inorganic and Physical Chemistry

Time : 3 Hours.

Maximum Marks : 50

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

*Answer to Section-A and Section-B should
be written in separate answer books.*

SECTION A

(Inorganic Chemistry)

(Marks : 33)

Attempt any four questions.

Question No. 1 carries nine marks.

SECTION B

(Physical Chemistry)

(Marks : 17)

Answer any two questions.

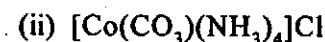
P.T.O.

SECTION A
(Inorganic Chemistry)

(Marks : 33)

Attempt any four questions.

1. (a) Name the following complexes according to the IUPAC system of nomenclature :



- (b) Write the formulae of the following complexes :



- (c) $[\text{Fe}(\text{CN})_6]^{4-}$ is diamagnetic whereas $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ is paramagnetic. Explain this behaviour on the basis of valence Bond Theory. (Atomic Number of Fe = 26). (3)

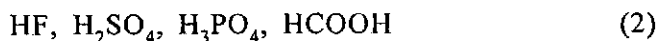
2. (a) Classify, giving reasons, the following species as Lewis acid and Lewis bases :



- (b) Arrange the following in the order of their increasing basic strength :



(c) What will be the conjugate bases for the following Bronsted Acids



3. (a) Explain the following :

(i) PbCl_2 is more stable than PbCl_4 .

(ii) Fluorine is a stronger oxidising agent than chlorine in spite of its low electron affinity value.

(iii) Nitrogen is inert at room temperature.

(2×3)

(b) The spin only magnetic moment of $[\text{MnBr}_4]^{2-}$ is 5.9 BM. Predict the geometry of the complex ion. (2)

4. Giving chemical equations, explain what happens when

(i) N_2H_4 reacts with aqueous solution of ferric chloride

(ii) HN_3 reacts with NaOH

(iii) PCl_5 reacts with insufficient amount of H_2O

(iv) P_4O_{10} reacts with $\text{C}_6\text{H}_{12}\text{O}_6$ (2×4)

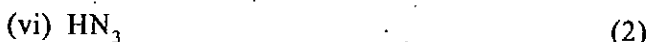
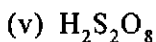
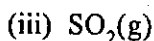
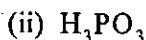
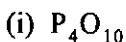
5. (a) Arrange the following in the order of their increasing acid strength and explain



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(b) Give the preparation, properties and structure of P_4O_{10} . (4)

(c) Draw the structures of any four of the following :



6. Write short notes on any two of the following :

(i) Bronsted-Lowry concept of acids and bases

(ii) Inner and outer orbital complexes

(iii) Oxyacids of phosphorous (2×4)

SECTION B

(Physical Chemistry)

(Marks : 17)

Answer any two questions.

1. (a) Define viscosity. Discuss the effect of concentration of soap on viscosity of water. (2)

(b) Derive Clausius-Clapeyron equation for liquid-vapour equilibrium. (3½)

- (c) Calculate the radius of the capillary in which the water level raises by 7.36 cm at 25°C. The density and surface tension of water at this temperature are 0.9971 g cm⁻³ and 0.072 Nm⁻¹, respectively. (3)
2. (a) Why can't we prepare absolute alcohol by practical distillation of a mixture of alcohol and water. (2)
- (b) What are non-ideal solutions? Discuss positive and negative deviations from the ideality giving examples. (3)
- (c) Pure benzene freezes at 5.53°C. Calculate the freezing point of a solution prepared by dissolving 1.00 g of cinnamaldehyde (M_m = 132.2 g mol⁻¹) in 50.00 g of benzene. Given molal freezing point depression constant of benzene = 2.53 K kg mol⁻¹. (3½)
3. (a) What is Van't Hoff factor? Give the relationship between the degree of association of a solute and its Van't Hoff factor. (2)
- (b) Draw a labelled phase diagram of water system. Indicate the normal freezing point and boiling point on the diagram. (3)

- (c) Calculate the amount of an alkaloid left in an aqueous solution, when a 100 cm^3 solution in water containing 1 g of the alkaloid in it is shaken with 100 cm^3 of chloroform. Given that the distribution coefficient of the alkaloid in the chloroform and water is 20, in favour of chloroform. $(3\frac{1}{2})$