This question paper contains 7 printed pages.]

Your Roll No. .....

507

Subsidiary for B.Sc. Honours/II A

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.

Section – B
(Physical Chemistry)
(Marks : 17)
Attempt any **two** questions.
Use of calculator is allowed.

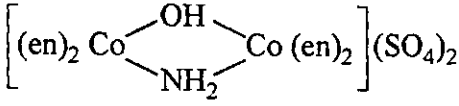
Section – A
(Inorganic Chemistry)
Attempt any **four** questions.

1. (a) Name the following compounds according to IUPAC system of nomenclature : 5

(i) $[Pt(NH_3)_4Cl_2]\,[PtCl_4]$

(ii) $Na_2[Fe(CN)_5NO]$

(iii) $[Cr(NCS)_3(NH_3)_3]$

(iv) 

(v) $[Ni(NH_2)_2(H_2O)_2 Cl_2]^{2-}$

(b) Write the structural formula of the following : 4

(i) Sodium tetraiodozincate (ii)

(ii) Tetrammine copper(ii) tetrachlorocuperate (ii)

(iii) Tetraaquachloronitrito–o–cobalt(iii) ion

(iv) Bis(ethylenediamine)bromo chloronickel (ii)

2. Explain the following : 2 × 4

(a) $CuSO_4 \cdot 5H_2O$ is coloured whereas $ZnSO_4 \cdot 7H_2O$ is colourless.

(b) Compounds of Sc^{3+} are diamagnetic whereas Ti^{3+} are paramagnetic.

(c) While filling electrons 4s orbital is filled first followed by 3d orbital, but during the process of ionization 4s electrons are lost before 3d.

(d) The ionic radii of transition metal ions vary irregularly down the group.

3. Giving chemical equations, explain what happens when

(a) Phosphorus pentaoxide is treated with conc. nitric acid.

(b) SO_2 is passed through ferric chloride solution.

(c) Hydrazine reacts with nitrous acid.

(d) Stannous chloride solution is treated with gold chloride solution. **2 × 4**

4. (a) Write down the structures of the following complexes and predict the type of hybridization and magnetic property.

[Atomic No. of Co = 27 and Cr = 24] **2 × 2**

(i) $[Co(CN)_6]^{3-}$ $[Cr(NH_3)_6]^{3+}$

(b) Give the formulas and structures of Marshall's and Caro's acids. 2

(c) Explain the use of hydrogen sulphide in analytical applications. 2

5. (a) Giving reasons arrange the following in order of increasing basic character : 2

(i) CH_3OH, CH_3NH_2, CH_3F

(ii) F^-, Cl^-, Br^-, I^-

(b) Giving reasons arrange the following in order of increasing acidic character. 2

(i) $CH_2ClCOOH$, $CHCl_2COOH$, CCl_3COOH

(ii) $HClO$, $HClO_2$, $HClO_3$, $HClO_4$

(c) Classify the following as Lewis acid and Lewis base : 2

BCl_3, SO_2, Co^{2+}, Cl^-

(d) How is hydrazine prepared ? Draw its structure. 2

6. (a) Discuss the role of metal ions in bio system. 3

(b) Give the structures of the following : 3

(i) $SOCl_2$

(ii) H_3PO_3

(iii) P_4O_{10}

(c) A compound with empirical formula $CoCl_3 \cdot 6NH_3$ is treated with $AgNO_3$ solution. 3 moles of AgCl is precipitated out. Deduce the formula of the compound and write structure on the basis of Werner's theory. 2

Section – B

(Physical Chemistry)

Attempt any **2** questions. Use separate answer sheets for Section A and B. Calculator may be used.

1. (a) Define specific, molar and equivalent conductance. Give the relationship between these along with their SI units. 3

(b) What are the advantages of conductometric titrations over volumetric titrations ? 2

(c) The specific conductance of a 0.01 N solution of acetic acid was found to be 0.000163 Ohm^{-1} cm^{-1} at 25 °C. Calculate it's degree of ionization. Given equivalent conductance of CH_3COOH at infinite dilution as 390.7 Ohm^{-1} cm^{-2} $equiv^{-1}$ at 25 °C. 3

2. (a) What is solubility product ? Illustrate with suitable examples.

(b) State the effect of pressure and temperature on the following equilibrium reactions :

(i) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

$\Delta H = -92.4$ kJ mol^{-1}

(ii) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

$\Delta H = 180.7$ kJ mol^{-1}

(c) Calculate the pH of

(i) 0.004 molar HCl solution.

(ii) 0.02 molar NaOH solution.

(d) Name the indicator that can be used for the following titrations. Explain your choice.

(i) NH_4OH against HCl.

(ii) NaOH against CH_3COOH 2 × 4

3. Write short notes on any **three** of the following : $3 \times 3 = 9$

(a) Conductometric titrations.

(b) Faraday's laws of Electrolysis.

(c) Acid-base indicators.

(d) Buffer solutions.
