2008 \lo

100351

CHEMISTRY (Optional)

रसायनशास्त्र (वैकल्पिक)

Time : 3 hours   **Maximum Marks : 200**

Note :

(i)   In all attempt <u>Five</u> questions.

(ii)   Question No. **1** is **compulsory**.

(iii)   Of the remaining Questions, Attempt <u>Any four</u> by selecting <u>one Question</u> from each **section**.

(iv)   Numbers of optional questions upto the prescribed number in the order in which questions have been solved will only be assessed and excess answers of the question/s will not be assessed.

(v)   Candidate should not write roll number, any names (including his/her own), signature, address or any indication of his/her identity anywhere inside the answer book otherwise he/she will be penalised.

---

1.   Attempt *any four* of the following :

     (a)   Explain :

         (i)   why is it impossible to measure simultaneously the position and velocity   5
                precisely of an electron.

         (ii)   why electron cannot exist in nucleus.   5

     (b)   Define osmosis and osmotic pressure. Derive relation between osmotic pressure   10
         of solution and molecular mass of solute.

     (c)   Discuss the type of hybridisation and shape of PCl_5 molecule. Comment on   10
         reactivity of the molecule.

     (d)   What do you understand by reactive intermediates ? Discuss any one of them   10
         with respect to structure and stability.

     (e)   Explain with suitable example the formation of ionic bond. Give the characteristics   10
         of ionic compounds.

P.T.O.

SECTION-A

2. (a) What are polymers ? How are they classified ? Differentiate between addition and condensation polymerisation. **10**

   (b) (i) Explain why molecular spectra is also called band spectra. **10**

   (ii) Explain shielding and deshielding effects in *nmr* spectra. Predict the high resolution *nmr* spectrum of $CH_2Cl-CHCl_2$. **10**

   (c) Give an account of manufacture of superphosphate of lime. Explain what is Thomas slag. **10**

3. (a) Write the structure, two properties and two uses for nylon 6 and urea-formaldehyde resin. **10**

   (b) (i) Show that frequencies of fundamental, first and second overtone bands are approximately in ratio 1 : 2 : 3 for anharmonic vibrations. **12**

   (ii) Explain how will you differentiate between CH_3-CH_2-CHO and $CH_2=CH-CH_2OH$ using infrared spectra. **08**

   (c) What are agrochemicals ? How are they classified ? Give the structures for Parathion, indole-3-acetic acid and monocrotophos. **10**

SECTION-B

4. (a) What is Joule-Thomson effect ? Prove that enthalpy of a system remains constant in an adiabatic expansion. **10**

   (b) (i) Giving reason explain that specific conductance of an electrolyte decreases while molar conductance increases on dilution. The molar conductance of NaCl, HCl and $CH_2ClCOONa$ at 298 K and at infinite dilution are 0.01264, 0.0426 and 0.00898 $S\ m^2\ mol^{-1}$. Calculate the molar conductance at infinite dilution for monochloroacetic acid. **10**

   (ii) Describe how solubility product of a sparingly soluble salt can be determined using chemical cell. **10**

   (c) What are the main points of Langmuir theory of adsorption. Show that Freundlich isotherm is special case of Langmuir isotherm. **10**

5. (a) (i) Derive the reduced equation of states for a gas.

(ii) Calculate the standard heat of formation of acetylene from the heat of combustion of C_2H_2, C (graphite) and H_2 being -1300 kJ mol^{-1}, -395 kJ mol^{-1} and -286 kJ mol^{-1}. **4**

(b) (i) Discuss any three types of reversible electrodes used to prepare electrochemical cells. **12**

(ii) The emf of the cell, $Pb\,|\,PbCl_2(s)$, KCl (soln), $Hg_2Cl_2(s)\,|\,Hg$ is 0.5356 V at 298 K. The temperature coefficient is 1.45×10^{-4} V K^{-1}. Write the oxidation and reduction reactions taking place in the cell and calculate ΔG and ΔH for the cell at 298 K (F = 96500 coulombs). **8**

(c) Explain using suitable examples the homogeneous and heterogeneous catalysis. Compare the two. **10**

SECTION-C

6. (a) What are d-block elements ? Discuss their general characteristics with respect to atomic and ionic radii and ionisation potential. **10**

(b) (i) What are coordination compounds ? Give postulates of Werner's theory of coordination compounds. Define complex ion, central ion and ligands. **12**

(ii) Define EAN. Give IUPAC name for $[Fe(H_2O)_6]$ SO_4 and K_4 $[Fe(CN)_6]$. Calculate EAN for $K_4[Fe(CN)_6]$ (Fe = 26). **08**

(c) Discuss in detail wet corrosion. **10**

7. (a) What are lanthanides ? Discuss in detail the phenomenon of lanthanide contraction. **10**

(b) (i) State the assumptions of valence bond theory. Taking a suitable example, explain the formation of square planar complex on basis of this theory. **10**

(ii) Discuss the natural method for fixation of nitrogen. **10**

(c) Outline the various methods employed to prevent corrosion. **10**

P.T.O.

SECTION-D

8. (a) (i)   Describe Skraup synthesis with mechanism.   **10**

         (ii)   What are electrophilic addition and substitution reactions ? Give one example   **10**
of each. Explain the mechanism for nitration of benzene with conc. HNO_3
and conc. H_2SO_4. Say whether it is electrophilic addition or substitution
reaction.

    (b) Discuss Hoffmann rearrangement reaction with mechanism.   **10**

    (c) Explain :   **10**

        (i)   Cleansing action of soap.

        (ii)   Hydrogenation of oil.

9. (a) (i)   Discuss S_N1 and S_N2 reactions with one example of each.   **10**

        (ii)   Describe Cannizzaro reaction with mechanism.   **10**

    (b) Which organic reactions are known as Pinacol rearrangement ? Describe their   **10**
mechanism.

    (c) (i)   Differentiate between oils and fats.   **5**

        (ii)   What are advantages of detergent on over soap ?   **5**

-oOo-