

**UNIT - 1032 B**

7. a) What is Szilard-Chalmer reaction ? Explain the essential conditions for this reaction for using in radioisotope enrichment. 2+3
- b) In a  $^{127}\text{I}(n,\gamma)^{128}\text{I}$  reaction the energy of  $\gamma$ -ray is 5 MeV. Calculate the recoil energy of Iodine. 2
- c) What is meant by retention ? Explain the nuclear reasons for retention. 1+3

OR

What is meant by neutron economy ? What are the main factors in maintaining the chain reaction of fission ? 1+3

- d) Write down the basic principle of isotope dilution analysis.  $1\frac{1}{2}$

**M. Sc. CHEMISTRY EXAMINATION, 2017**

( 1st Semester )

**INORGANIC CHEMISTRY****PAPER - III**

Time : Two hours

Full Marks : 50

( 25 marks for each unit )

Use a separate answerscript for each unit.

**UNIT - 1031**Answer *all* questions

- a) An octahedral  $\text{Ni}^{2+}$  complex exhibits three weak absorption bands at  $10,750\text{ cm}^{-1}$ ,  $17,500\text{ cm}^{-1}$ , and  $28,200\text{ cm}^{-1}$ . Assign the bands with the help of Orgel diagram. Calculate the  $10Dq$  and  $B$  value of the complex from the spectral data.

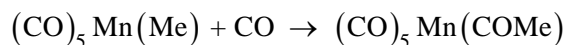
b) Find out all the Russell-Saunders states arising from a  $d^2$  configuration.

c) Show pictorially, the formation of different bonding molecular orbitals that can be constructed in an octahedral complex of the type  $\text{ML}_6$ . Also draw the relevant MO diagram of the complex taking into account only  $\sigma$ -interactions.

[ Turn over

[ 2 ]

- d) The molar extinction coefficients of the absorptions in  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$  are of the order of 0.01 - 0.05. Why the intensities of the absorptions are so weak ?
- e) What conclusion can be drawn if one considers the real size of the ligands in ionic CFT model ? Elaborate your comments pictorially by taking into consideration the outcome of theoretical calculations.  $3+2+3+2+2\frac{1}{2}$
2. a) Classify the octahedral complexes based on 18 electron rule. What probable structure do you expect for  $\text{Rh}_4(\text{CO})_{12}$  ?
- b) Define oxidative addition and reductive elimination reactions. Describe with example the importance of them in catalytic cycle.
- c) Describe 1, 1-and 1, 2-insertion reactions with examples. Explain the mechanism for insertion for the following conversion :

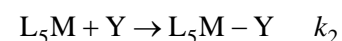
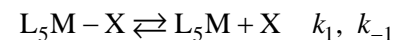


$$(3+1)+(2+2)+(2+2\frac{1}{2})$$

[ 3 ]

**UNIT - 1032 A**

3. Consider a reaction mechanism :



Derive the rate law when  $[\text{L}_5\text{M}]$  remains in a steady state. Under the boundary condition  $k_2[\text{Y}] \gg k_{-1}[\text{X}]$  what conclusion you can draw about the reaction mechanism ?

3+2

4. Explain the lability sequence :  $\text{AlF}_6^{3-} > \text{SiF}_6^{2-} > \text{PF}_6^- > \text{SF}_6$
5. An aged aqueous solution of  $\text{CoCl}_3 \cdot 6\text{H}_2\text{O}$  exchanges  $\text{H}_2\text{O}$  with labeled  $\text{H}_2\text{O}$  at a very fast rate. Explain.
6. Aquation rate of  $[\text{Co}(\text{NH}_3)_4 \text{Cl}_2]^+$  is much higher than that of  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]^{2+}$ . What conclusion about the reaction mechanism you can draw with this observation ?

 $2\frac{1}{2}$  $2\frac{1}{2}$  $2\frac{1}{2}$ 

[ Turn over