9. (a) What is lanthanide contraction? Discuss its consequences. 5

   (b) What do you mean by NMR shift reagents? Discuss the use of lanthanides as NMR shift reagent with suitable example. 2+3=5

Or

10. (a) Describe one method of separation of lanthanides. 5

    (b) Write a note on complexation behaviours of lanthanides and actinides. 5

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UG (CBCS) EVEN SEMESTER EXAMINATION, 2024

EDUCATION
(B.Sc. B.Ed.)

6th Semester

Course No. : BSCH – 602
(Inorganic Chemistry)

Full Marks : 50
Pass Marks : 20

Time : 2 hours

The figures in the margin indicate full marks for the questions

1. (a) Calculate the lattice enthalpy of KCl(s) using a Born-Haber cycle and the information in the margin. 5

	ΔH^{θ} (kJ mol^{-1})
Sublimation of K(s)	+ 89
Ionization of K (g)	+ 425
Dissociation of Cl_2 (g)	+ 244
Electron gain by Cl (g)	- 355
Formation of KCl (s)	- 438

   (b) Calculate the maximum radius of a sphere that may be accommodated in an octahedral hole in a close packed solid composed of spheres of radius *r*. 5

Or

2. (a) Write down the Born-Mayer equation for lattice enthalpy with the signifcance of each parameter. 5

   (b) What are spinel and anti-spinel structures? Give example for each of them. 5

3. (a) Describe the bonding in metal carbonyl compounds (terminal as well as bridging) with appropriate orbital diagam. 5

   (b) Discuss the Orgel diagram of d^8-configuration in O_h field. Mention all the possible electronic transitions. 5

Or

4. (a) Arrange the followings in the increasing order of CN stretching frequencies : 3

   $[Ag(CN)_2]^-$, $[Ag(CN)_4]^{3-}$, $[Ag(CN)_3]^{2-}$

   (b) How do you distinguish terminal and bridging carbonyl groups in metal carbonyl compounds using IR spectroscopy? Explain with example. 4

   (c) How do you distinguish structural isomerism in coordination compounds using IR spectroscopy? Provide suitable example. 3

5. (a) Explain the inner sphere electron transfer mechanism with one suitable example. Under what conditions inner sphere mechanism is favorable over outer sphere mechanism? 5

   (b) "The rate constant for the overall reaction is $6.2x10^{-10}$ s^{-1} in neutral solution, but $1.4x10^{-8}$ in acidic solution." Explain with mechanism. 5

$$[Cr(H_2O_5F]^{2+} + H^+ \rightleftharpoons [(OH_2)_5Cr \text{ ..... } F\text{.....}H\ ]^{3+}$$

$$[\ (OH_2)_5Cr \text{ .....}F\text{..... } H\ ]^{3+} + H_2O \qquad [Cr(H_2O)_6\ ]^{3+} + HF$$

Or

6. (a) Write the products for the following reaction. 5

   $[Co(NH_3)_5Cl]^{2+} + [Cr(H_2O)_6]^{2+}$

   (b) What is trans effect? Explain the same with appropriate example. 5

7. (a) What is Chelate effect? Provide one example. 3

   (b) Discuss the factors that affect the extent of splitting of metal d-orbitals in O_h or T_d field. 4

   (c) "Although Nitrosyl cation NO^+ is isoelectronic with CO, the nitrosyl group behaves in a manner not observed for CO". Explain. 3

Or

8. (a) Provide the structure of Co_4 $(CO)_{12}$ and calculate the number of terminal and bridging carbonyl groups. 4

   (b) Discuss the splitting of metal d-orbitals in a square planner field. 3

   (c) "$Mn(CO)_5$ and $Co(CO)_4$ do not exist as stable compounds" Explain. 3