

The Open University of Sri Lanka
 B. Sc. Degree Programme - 2006/2007
 CHU 2123/CHE 4123 - Inorganic Chemistry
 Assignment Test 11
 Answer Guide

Part A - MCQ test

- | | | |
|------|-------|-------|
| 1. 4 | 6. 3 | 11. 2 |
| 2. 3 | 7. 3 | 12. 2 |
| 3. 1 | 8. 4 | 13. 3 |
| 4. 2 | 9. 5 | 14. 4 |
| 5. 4 | 10. 3 | 15. 2 |

Part B - Structured Essay

1. (a) i. $[Mn(CO)_5]^{2-}$

Electrons in $Mn(CO)$ = Z of Mn = 25

Electrons in $Mn(Mn^{2+}) = 25 - 2 = 23$

Electrons obtained from 5 (CO) = 10

EAN of Mn in $[Mn(CO)_5]^{2-} = 23 + 10 = 33$

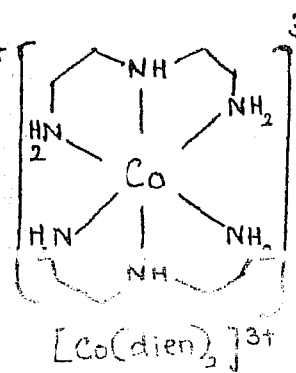
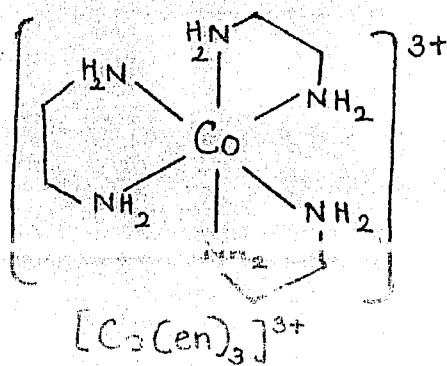
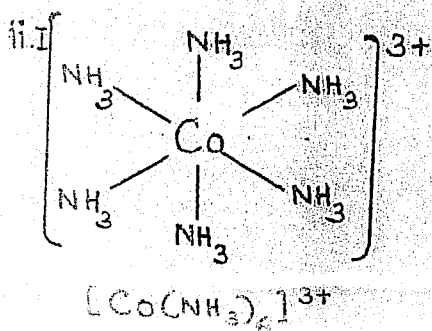
ii. $[Pt(NH_3)_4]^{2+}$

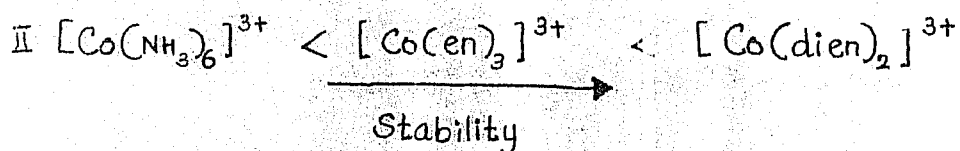
Electrons in $Pt(0)$ = Z of Pt = 78

Electrons in $Pt(II)$ = 78 - 2 = 76

Electrons obtained from 4 (NH_3) = 8

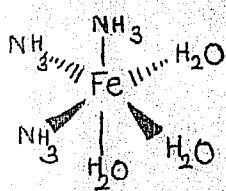
EAN of Pt(II) in $[Pt(NH_3)_4]^{2+} = 76 + 8 = 84$



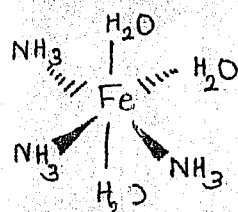


The Complexes containing chelate rings are usually more stable than similar complexes containing no rings. This effect is known as the chelate effect. or

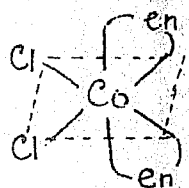
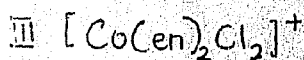
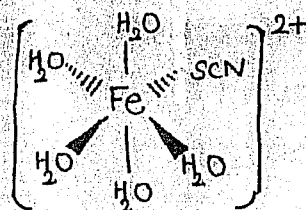
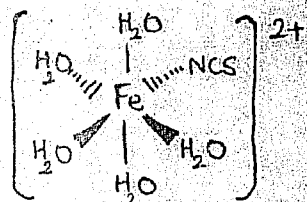
Higher the stability, higher the chelate effect.



Fac-isomer

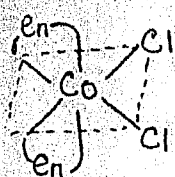


mer-isomer



Optical Isomerism

$\text{cis}-[\text{Co}(\text{en})_2\text{Cl}_2]^+$



Geometrical Isomerism

$\text{trans}-[\text{Co}(\text{en})_2\text{Cl}_2]^+$

(b) (i) - Ligands are treated as point charges .

- The bonding between the metal and the ligand is entirely electrostatic

- There is no interaction between metal orbitals and ligand orbitals

- In the free metal atom the d orbitals have the same energy .

ie they are degenerated .



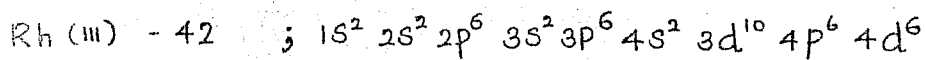
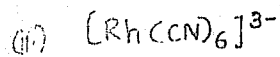
$$\bar{\nu} = 1/\lambda$$

$$27600 \text{ cm}^{-1} = 1/\lambda$$

$$\lambda_{\text{max}} = 362.3 \text{ nm}$$

$\bar{\nu}$ - frequency / Energy

λ - wave length



CN is a strong field ligand and have low spin.

splitting energy $>$ Pairing energy

$n = 0$

Therefore diamagnetic.

$$\mu = \sqrt{n(n+2)}$$

$$\mu = \sqrt{0(0+2)}$$

$$\mu = 0$$

2. (a)(i) Activity of a radioactive sample is the number of atoms that disintegrate per unit time.

$$(ii) \lambda = \frac{0.693}{t_{1/2}} = \frac{0.693}{1622 \times 365 \times 24 \times 60 \times 60 \text{ s}} = 1.36 \times 10^{-11} \text{ s}^{-1}$$

$$A = N \lambda = 2.67 \times 10^{21} \times 1.36 \times 10^{-11} \text{ s}^{-1}$$

$$(N = \frac{1 \text{ g}}{226 \text{ g mol}^{-1}} \times 6.023 \times 10^{23} \text{ mol}^{-1})$$

$$1 \text{ Ci} = 3.7 \times 10^{10} \text{ dps (Bq)}$$

