OR

N_2 can not act as a good ligand. Justify the statement.

4. a) Write a hort note on hydrides. 3

b) i) Write a short note on ortho hydrogen and para hydrogen. 3

OR

ii) Complete the following reaction

$CsF + XeF_4 = ??$

What is the geometry of the product ? What is the structure of it ? Is it an stereochemically non-rigid species ?

c) Comment on the structure of basic beryllium acetate. How is it prepared ? 3

d) Compare and contrast the chemistry of Be with other elements of group 2. $3\frac{1}{2}$

Ex/Int/CH/VII/18/2018

INTER B.SC. EXAMINATION, 2018

(1st Semester)

CHEMISTRY (HONOURS)

INORGANIC CHEMISTRY

PAPER - VII

Time : Two hours Full Marks : 50

The figures in the margin indicate full marks.

Attempt ***all*** questions .

1. a) Briefly describe how would you determine the age of minerals and rocks. 2

b) How can you establish the inner-sphere nature of the following electron transfer reaction by ^{36}Cl labeling experiment : $1\frac{1}{2}$

$$[(NH_3)_5Co^{III} - Cl^*]^{2+} + [Cr^{II}(H_2O)_6]^{2+}$$

$$+ 5H_2O \rightarrow [Co^{II}(H_2O)_6]^{2+} + [(H_2O)_5Cr^{III} - Cl^*]^{2+}$$

c) Auger effect and radiation emission (i.e., X-ray production) are not the nuclear phenomenon – Explain. 1

d) How would you calculate $k_H/k_D \sim 6.5$ in the light of zero-point energy ? 2

e) In a material found in a cave has a C-14 β -decay rate of 2 dpm/g of C-14. Calculate the age of the sample, if the C-14 decay rate of normal sample is 15.5. [Given $t_{1/2}$ of C-14 is 5700 y]. 3

f) What are the different type of radioactive equilibria ? In the radioactive decay process. 3

$$A \xrightarrow{k_A} B \xrightarrow{k_B} C \quad (k_A > k_B)$$

Show that

$$t_{max} = \frac{2 \cdot 303}{(k_B - k_A)} \log \frac{k_B}{k_A}$$

where, t_{max} is the time when B attains its maximum activity.

2. a) The E^o for Cu^{2+}/Cu^+ couple (0.15V) is less than that for the $I_2/2I^-$ couple (0.54V), yet Cu^{2+} is found to oxidize I^- to I_2. Explain the reason behind this observation. $2\frac{1}{2}$

b) Write a short note on (any one) of the following : 2

i) Saturated calomel electrode

ii) Concentration cell

c) Define redox indicator. Give two examples, and mention their redox potentials and colors in the oxidized and reduced forms. 2

d) State the Lux-Flood theory of acids and bases and explain it with suitable examples. 2

e) Comment on the relative acidity of BF_3 and BBr_3. $1\frac{1}{2}$

f) Write a brief account on the "Pearson-Pauling Paradox". $2\frac{1}{2}$

3. a) Calculate bond order of He_2, He_2^+, and comment on their stability. 2

b) Show that Cr(II) acetate is diamagnetic while Cu(II) acetate is antiferromagnetic. $2\frac{1}{2}$

OR

First lonization Potential of NO is less than both N_2 and O_2. Explain it by MOT.

c) Discuss metal-metal bonding pattern in $Re_8Cl_2^{2-}$. Why its colour is intense blue ? 3

d) Why intensity of colour increases on going from F_2 to I_2 ? 1

e) H_3 species can not be bent but H_3^+ can be bent. Explain it by MOT. 2

OR

Draw MO diagram of HF_2^-.

f) Discuss different types of H-bonding. 2