

[4]

Ex/Int/CH/VII/18/2018

OR

N₂ can not act as a good ligand. Justify the statement.

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

OR

ii) Complete the following reaction



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. 3½

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.

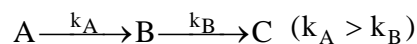
Attempt *all* questions .

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 ³⁶Cl labeling experiment : 1½
- $$[(\text{NH}_3)_5\text{Co}^{\text{III}} - \text{Cl}^*]^{2+} + [\text{Cr}^{\text{II}}(\text{H}_2\text{O})_6]^{2+} + 5\text{H}_2\text{O} \rightarrow [\text{Co}^{\text{II}}(\text{H}_2\text{O})_6]^{2+} + [(\text{H}_2\text{O})_5\text{Cr}^{\text{III}} - \text{Cl}^*]^{2+}$$
- c) Auger effect and radiation emission (i.e., X-ray production) are not the nuclear phenomenon – Explain. 1
- d) How would you calculate $k_{\text{H}}/k_{\text{D}} \sim 6.5$ in the light of zero-point energy ? 2

[Turn over

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- 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



Show that

$$t_{\max} = \frac{2.303}{(k_B - k_A)} \log \frac{k_B}{k_A}$$

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

2. a) The E° for $\text{Cu}^{2+}/\text{Cu}^+$ couple (0.15V) is less than that for the $\text{I}_2/2\text{I}^-$ 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
- Saturated calomel electrode
 - Concentration cell
- c) Define redox indicator. Give two examples, and mention their redox potentials and colors in the oxidized and reduced forms. 2

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- 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 Ionization Potential of NO is less than both N_2 and O_2 . Explain it by MOT.

- c) Discuss metal-metal bonding pattern in $\text{Re}_8\text{Cl}_2^{2-}$. 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