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UNIT - 1032B

6. Explain the basis of bond breaking based on Szilard-Chalmer's reaction. What is retention? Describe the nuclear reason for retention OR explain why recoil reactions are sometimes called "hot atom reactions". $2 + \frac{1}{2} + 1 \frac{1}{2}$
7. What is fission yield? Explain with examples prompt and delayed neutrons. Comment on the β -activity observed in fission products. $\frac{1}{2} + 1 + 1$
8. Compare the critical energy required for the final splitting of a compound nucleus of U^{235} and U^{238} using a neutron as the projectile OR present a critical discussion on the importance of the "fission parameter" in understanding nuclear fission. $1 \frac{1}{2}$
9. Define critical size and reproduction factor of a fissionable material and explain the relationship between them. Write the importance of Fermi's four factor formula. Describe one use of "Neutron Activation Analysis". $2 + 1 + \frac{1}{2} + 1$

Ex/M.Sc/CH/1/U-1031/9/2019

M. Sc. CHEMISTRY EXAMINATION, 2019

(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

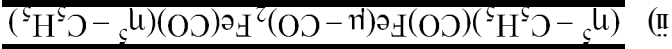
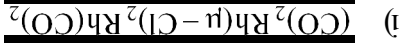
1. Answer the following questions :
- a) Show pictorially, the formation of different bonding molecular orbitals that can be constructed in an octahedral complex of the type ML_6 . Also draw the relevant MO diagram of the complex taking into consideration both σ - and π interactions. 4
- b) Absorption spectrum of $[CoF_6]^{4-}$ displays three bands at 7.15, 15.2, and 19.2 kK. Assign the bands with the help of Orgel diagram. Calculate the $10 Dq$ and B value of the complex from the spectral data. What would be the expected color of the complex? 3
- c) 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. 2

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- d) Two complexes of Ni(II) are believed to be octahedral and tetrahedral. Each has three absorption bands, but complex A has $\epsilon \approx 10$ and B = $150 \text{ M}^{-1} \text{ cm}^{-1}$. Which probably is the tetrahedral complex. Explain $1 \frac{1}{2}$
- e) KReO_4 is colorless whereas KMnO_4 is intense purple. Explain. 2

2. Answer the following questions :

- a) Determine the number of metal-metal bonds in the following complexes which obey the 18 electron rule. 2



- b) Define migratory insertion reaction. Explain the mechanism of insertion for the following conversion : $1+2 \frac{1}{2}$



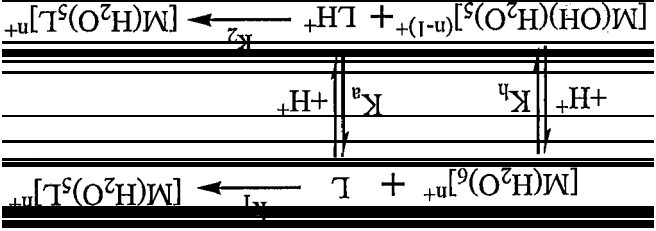
- c) Define oxidative addition reaction. Discuss the S_{N}^2 reaction mechanism of oxidative addition. $1+2$

- d) Which of the two, $\text{Ir}(\text{dppe})\text{Cl}(\text{CO})$ [dppe = 1, 2-bis(diphenylphosphino)ethane] and $\text{Ir}(\text{dmpe})\text{Cl}(\text{CO})$ [dmpe = 1, 2 - (dimethylphosphino) ethane], will react faster with methyl iodide? Justify your answer. 2

- e) Explain why the organometallic compounds of s-block elements are highly reactive. 2

UNIT - 1032A

3. With the proper interpretation of "Proton Ambiguity", arrive at the expression for the overall rate of the reactions leading to the formation of $[\text{M}(\text{H}_2\text{O})_5\text{L}]^{\text{n}+}$, as shown in the scheme below :



4. Although biguanide complexes of Co(III) or Cr(III) are thermodynamically more stable than their corresponding ethylenediamine complexes but the acid catalyzed aquation is much faster for the biguanide complexes. Explain. 3

5. Explain the labilty sequene : $\text{AlF}_6^{3-} > \text{SiF}_6^{2-} > \text{PF}_6^- > \text{SF}_6^-$ (for example, with F^- exchange). 3