Department of Chemistry
Indian Institute of Technology Patna

CH103	**Question Paper**	**Marks 40**
Time: 2hrs	Mid-Semester	Date: 29/12/2022

All questions are compulsory, no explanations will be given during exam, questions proven wrong will carry full marks.

1. Name the coordination complex having the formula $[Co(NH_3)_5Br]SO_4$, $[Br_4Re\ ReBr_4]^{2+}$, $[Co(en)_3]Cl_2$. Predict the isomerism in the following compound: **[1.5+1.5]**

   a. $[Cr(NH_3)_5Cl]SO_4$ and $[Cr(NH_3)_5(SO_4)]Cl$

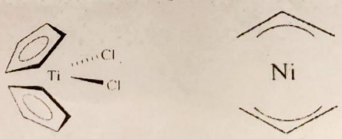
   b. $[Fe(NH_3)_6]\ [Cr(CN)_6]$ and $[Cr(NH_3)_6]\ [Fe(CN)_6]$

   c. $[Cr(H_2O)_5Cl]Cl_2.H_2O$ and $[Cr(H_2O)_6]Cl_3$

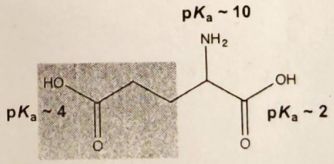
2. Draw the possible geometrical isomers for the compound $[Pt(NH_3)_2Cl_2]$ and $[Cr(H_2O)_3Cl_3]$. Draw a pictorial diagram of enantiomers of octahedral complexes (showing Δ and Λ configurations). **[2+1]**

3. Using Valence Bond Theory, predict the hybridization and magnetic behavior of Ni^{2+} in octahedral and tetrahedral complex. **[2]**

4. How is Grignard reagent prepared? Draw the structure of first generation of Grubb's catalyst. Predict which of the following organometallic complex follow 18 electron rule; **[1+1+1]**



5. What do you mean by essential amino acids? Define Isoelectric point (pI) of an amino acid. Find the pI value for the following amino acid. **[1+1+1]**

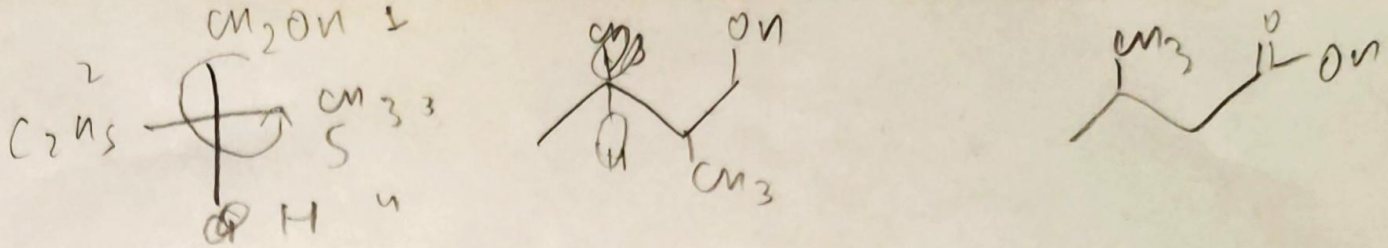


6. Explain with example the difference between Exopeptidase and Endopeptidase. **[2]**

7. Why DNA and RNA are named as nucleic acid? Draw the structure of ATP (adenosine 5-triphosphate) and explain why energy is released when ATP is hydrolyzed. **[1+2]**

8. How many polypeptide chains are there in *Insulin*? How the amino acids are there in each chain? Show pictorially, how each chain are held together. **[2]**

9. Why DNA or RNA is named as nucleic acid? Draw the structure of all five N-containing bases. **[1+2]**



10. Define epimers with example. Draw structure of open chain D-glucose and cyclic α-D-glucopyranose and β-D-glucopyranose. **[1.5+1.5]**

11. (S)-(−) 2-Methyl-1-butanol can be converted to (+) -2-methylbutanoic acid without breaking any of the bonds to the asymmetric carbon. What is the configuration of (−)-2-methylbutanoic acid? **[2]**

12. A solution prepared by mixing 10 mL of a 0.15 M solution of the *R* enantiomer and 30 mL of a 0.15 M solution of the *S* enantiomer was found to have an observed specific rotation of +7.8°. What is the specific rotation of each of the enantiomers? **[3]**

13. Why do female mosquito bite and suck blood? Why humans cannot eat cotton and wood? **[2]**

14. How do you differentiate between sp^3, sp^2 and *sp* C-H hydrogen with the help of IR spectroscopy? Which is higher in energy per photon, electromagnetic radiation with wavenumber 3000 cm^{-1} or with wavelength 200 nm? **[1+2]**

15. How many signals will be observed for the compounds with approximate chemical shift-δ-value for a) CH_3CHO; b) $CH_3CH_2OCH_3$; c) CH_3CH_2OH d) $ClCH_2CH_2CH_2CH_2Cl$. **[2+1]**

**********GOOD LUCK**********