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B. Sc. (Hons) Chemistry (Semester –5th)
INORGANIC CHEMISTRY-III
Subject Code: BCHMS1-501
Paper ID: [19131630]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Short answer type questions.

a) Explain why $[Ni(en)_3]^{2+}$ is significantly more stable than $[Ni(NH_3)_6]^{2+}$.
b) Explain why NF_3 show little tendency to act as ligand.
c) Giving a neat diagram explain how the d-orbital energy level split when a transition metal ion is placed in the center of a (i)tetrahedral field and (ii)octahedral field
d) What is CFSE? Write the CFSE for d^7 high and low spin octahedral complex.
e) Explain why $CuSO_4$ lacks colour but $CuSO_4.5H_2O$ is blue.
f) Explain the functions of carbonic anhydrase.
g) What does the sodium-potassium pump do?
h) What factors cause the unique colors exhibited by some lanthanide ions?
i) Comment on the stability of Co^{3+} ion in water.
j) What is the principle of Ion exchange method for the separation of lanthanides.

Section B **(5 marks each)**

Q2. (a) Discuss the assumptions and limitations of valence bond theory. 3
(b) What is difference between inner orbital and outer orbital complexes? Explain with example 2

Q3. Explain stereoisomerism in coordination complexes, focusing on geometrical and optical isomers.

Q4. What are Latimer diagrams? How can you tell the relative oxidizing or reducing strength of different species from a Latimer diagram?

Q5. What are the various oxidation states of vanadium? Write the synthesis, important properties and uses of V_2O_5.

Q6. What makes heavy metals toxic to the body? How are chelating agents used in medicine to treat heavy metal poisoning?

Section C **(10 marks each)**

Q7. Discuss the crystal field theory as applied to octahedral complexes. How can the spectrochemical series be used to predict the relative splitting of d-orbitals in octahedral complexes?

Q8. How do tetragonal distortions arise in octahedral complexes according to the Jahn-Teller theorem? Explain taking suitable examples.

Q9. Describe the role of iron in biological systems and its function in hemoglobin. How is iron stored and transported within the human body?