

**B.Sc. CHEMISTRY
INORGANIC CHEMISTRY III
FOURTH SEMESTER
BSC - 401**

(Use Separate Answer Scripts for Objective & Descriptive)

Duration: 3 hrs.

Full Marks: 70

(PART-A: Objective)

Time: 20 min.

Marks : 20

Choose the correct answer from the following:

1X20=20

- Complex salt -
 - Doesn't lose its identity in solution
 - Lose its identity in solution
 - Insoluble in aqueous media
 - Soluble in aqueous media
- The Effective Atomic number of Ni in $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is
 - 35
 - 36
 - 37
 - 38
- The Complex $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ can exhibit
 - Geometrical Isomerism
 - Linkage isomerism
 - Hydrate isomerism
 - Optical isomerism
- The correct name of the compound $[\text{Co}(\text{NH}_3)_2(\text{H}_2\text{O})_2(\text{CN})_2]\text{Cl}$
 - DiamminodiaquadicyanoCobalt (III)chloride
 - DiamminediaquadicyanoCobalt (III) Chloride
 - DiaquadiamminedicyanoCobalt(III) Chloride
 - DicyanodiamminediaquaCobalt (III) Chloride
- $[\text{Cr}(\text{NH}_3)_6]^{3+}$ will have a magnetic moment of (spin only value)
 - 1.73 BM
 - 2.84 BM
 - 3.87 BM
 - 4.87 BM
- The chelated complexes are more stable because of increase of-
 - Enthalpy
 - Entropy
 - Free energy
 - Enthalpy and Entropy.
- The Crystal Field Stabilization Energy for high spin d^6 complex will be
 - $-2.4\Delta_o + 3P$
 - $-0.4\Delta_o + P$
 - $2.4\Delta_o + 3P$
 - $0.4\Delta_o + P$
- The sizes of the third transition elements (after lanthanum)are almost the same as the elements lying just above in the second transition series due to
 - d-contraction
 - Lanthanide contraction
 - Actinide contraction
 - None of the above.
- The lower oxidation states of the metals like -1,0,+1 are stabilized by
 - CO
 - O_2
 - F^-
 - None of the above.

10. Hydroxyl amine decomposes readily to NH_3 and H_2O because in the Frost-Ebsworth diagram because
- The points for NH_2OH lies above the line connecting NH_3 and N_2
 - The points for NH_2OH lies below the line connecting NH_3 and H_2O
 - The points for NH_2OH lies in the same line connecting NH_3 and H_2O
 - None of the above.
11. Ferromagnetic substance is one in which alignments of magnetic moments lie
- Some in one direction and some in opposite direction
 - All in the same direction
 - All in opposite direction
 - None of the above.
12. Anhydrous cobalt (II) salts absorb in the red region , and, therefore, appear
- blue
 - red
 - yellow
 - None of the above.
13. Synergetic mechanism involve
- Sigma-donation and pi-back donation
 - Pi-donation and sigma-back donation
 - Sigma- donation and sigma-back donation.
 - None of the above.
14. Effective magnetic moment of a d-block element with 3 unpaired electrons is
- 1.73
 - 4.90
 - 3.87
 - 2.84
15. Which of the following is correct statement
- The five co-ordinated high spin $\text{Fe}(\text{II})$
 - The six co-ordinated high spin $\text{Fe}(\text{III})$
 - The five co-ordinated low spin $\text{Fe}(\text{II})$
 - None of the above
16. Which of the following is wrong statement
- Haemoglobin picks up oxygen from lungs
 - Haemoglobin carries oxygen to the muscle tissues via the circulating system
 - Both (a) & (b)
 - None of the above
17. Which of the following is trace elements
- Aluminium
 - Silicon
 - Iron
 - All of the above
18. Which of the following is important constituent of thyroxine
- Iodine
 - Bromine
 - Calcium
 - Manganese
19. Which of the following metal atom present in heme group
- Fe
 - Co
 - Ni
 - Zn
20. Which of the following metal is important constituent of nitrogenase enzyme
- Fe
 - Co
 - Zn
 - Ni

(PART-B : Descriptive)

Time : 2 hrs. 40 min.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. a. Explain the toxicity of the following metals 4+3
=10
(i) Mercury (ii) Cadmium
- b. Draw the Structure of the isomers for the complex of the Formula $[ML_3X_3]$, $[ML_4X_2]$ and $[M(LL)_3]$
- c. From the following Latimer Diagram,
 $Cu^{2+} \xrightarrow{+0.16V} Cu^+ \xrightarrow{+0.52V} Cu$
State which among Cu^{2+} and Cu^+ is unstable? How is it stabilized?
2. a. Draw the energy level diagram showing the details of splitting pattern for d-orbitals of octahedral complexes. 5+5=10
- b. What are the factors that determine the Crystal Field Stabilization energy?
3. a. Explain what is Chelate Effect? 5+5=10
- b. Explain the Jahn-Teller Effect for high spin d^1 and d^4 complexes.
4. a. What is lanthanide contraction? Why is it difficult to separate lanthanides from one another? How are they separated by ion exchange method? 5+5=10
- b. What is synergetic effect? Explain the mechanism of synergetic effect with respect to metal carbonyls.
5. a. What happens when Vanadium (+5) is reduced with Zinc? Discuss the changes in oxidation state and the colours. 5+5=10
- b. What happens when vanadium penta fluoride is heated? Discuss the polymeric structures of VF_5 .
6. a. Explain why and how are the magnetic properties of lanthanides different from those of the transition metals? 5+5=10
- b. What are the characteristics of the spectra of the tripositive lanthanide ions? How are they different from those of the d-block elements?
7. a. What are haemoglobin and myoglobin? Explain the structure of haemoglobin and myoglobin. 5+5=10
- b. What are the role of myoglobin and haemoglobin in biological system?

8. a. Explain about sodium potassium pump.

4+6=10

b. Write the biological function, excess and deficiency of the following trace elements

(i) Cobalt (ii) Manganese (iii) Copper

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