

**B.Sc. CHEMISTRY
FOURTH SEMESTER
INORGANIC CHEMISTRY III
BSC – 401
[USE OMR FOR OBJECTIVE PART]**

**SET
A**

Duration: 3 hrs.

Full Marks: 70

Time: 30 min.

(Objective)

Marks: 20

Choose the correct answer from the following:

1X20=20

- According to Werner's theory of coordination compounds
 - Primary valency is ionisable
 - Secondary valency is ionisable
 - Both a and b
 - None of the above
- Which of the following ligand will not show chelation?
 - EDTA
 - DMG
 - Ethylene-1,2-diammine
 - SCN⁻
- Correct formulae of tetraamminechloronitroplatinum (IV) sulphate can be written as
 - [Pt(NH₃)₄(NO₂)SO₄]Cl
 - [Pt(NH₃)₄Cl(NO₂)](SO₄)₂
 - [Pt(NH₃)₄Cl(NO₂)]SO₄
 - None of the above
- What will be the electronic configuration of d⁵ in terms of t_{2g} and e_g in an octahedral field when Δ_o < P, where P is the energy required for pairing of electrons in a single orbital?
 - t_{2g}⁵, e_g⁰
 - t_{2g}², e_g³
 - t_{2g}³, e_g²
 - t_{2g}⁰, e_g⁵
- Assign the following complexes as inert or labile: [Mn(H₂O)₆]²⁺, [Co(CN)₆]³⁻, [Co(CN)₆]⁴⁻
 - [Mn(H₂O)₆]²⁺ and [Co(CN)₆]³⁻ are labile, [Co(CN)₆]⁴⁻ is inert
 - [Mn(H₂O)₆]²⁺ and [Co(CN)₆]⁴⁻ are labile, [Co(CN)₆]³⁻ is inert
 - [Co(CN)₆]⁴⁻ and [Co(CN)₆]³⁻ are labile, [Mn(H₂O)₆]²⁺ is inert
 - [Mn(H₂O)₆]²⁺ and [Co(CN)₆]⁴⁻ are inert, [Co(CN)₆]³⁻ is labile
- Zinc is a 3d element but not considered to be a true transition element because it has
 - Totally vacant d-orbitals
 - Half filled d-orbitals
 - Totally filled d-orbitals
 - None of the above
- Lanthanum is a
 - s-block element
 - d-block element
 - p-block element
 - f-block element.
- The effective magnetic moment of a d-block element with 3 unpaired electrons is
 - 1.73 BM
 - 4.90 BM
 - 3.87 BM
 - None of the 4 above.

9. A ferromagnetic substance is one in which alignments of magnetic moments are in the
 - a. Opposite directions
 - b. Same direction
 - c. No direction
 - d. None of the above.
10. Transition metals exhibit catalytic properties because they possess
 - a. Variable valence and large surface area
 - b. Are all metals
 - c. High electrical conductivity
 - d. None of the above.
11. Low oxidation states of metals like -1, 0, +1 are stabilized by
 - a. CO
 - b. O²⁻
 - c. F⁻
 - d. None of the above.
12. 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
 - a. d-block contraction
 - b. Lanthanide contraction
 - c. Actinide contraction
 - d. None of the above.
13. Hydroxyl amine decomposes to ammonia and nitrogen because in the Frost-Ebsworth Diagram the points for hydroxyl amine lies
 - a. Below the line connecting the points for ammonia and nitrogen
 - b. Above the line connecting points for ammonia and nitrogen
 - c. Lies in the same level as ammonia and nitrogen.
 - d. None of the above.
14. Anhydrous cobalt(II) salts absorb in the red region, therefore, appear
 - a. blue
 - b. Red
 - c. yellow
 - d. None of the above.
15. The synergetic mechanism involves
 - a. A sigma-donation and pi-back donation
 - b. Pi-donation and sigma-back donation
 - c. Both a & b
 - d. None of the above.
16. Which of the following statement is correct
 - a. As(III) is more poisonous than As(V)
 - b. As(V) is more poisonous than As(III)
 - c. Enzymes are activated when As (III) binds with SH groups of enzymes.
 - d. All of the above
17. Choose the wrong statement
 - a. Mercury is a cumulative poison for mammals
 - b. Methyl mercury and other organomercury compounds are polar in nature
 - c. The mercury of waste products is converted into methyl mercury
 - d. None of the above

18. Which of the following is correct statement for Haemoglobin and myoglobin
- a. The oxygen carrier protein haemoglobin and an oxygen storage protein myoglobin
 - b. Heme group consist of an Iron atom which is coordinated to six nitrogen atoms of porphyrin ring
 - c. These are the respiratory pigments which combine irreversibly with O_2
 - d. All of the above
19. Which of the following statement is **not** correct for Na - K pump
- a. These helps in maintain pH of blood
 - b. Both Na^+ and K^+ ions act as cofactors for ATPase enzymes.
 - c. These two ions are known to activate certain enzymes in the animal body
 - d. None of the above
20. Transferrin and ferritin are
- a. Fe(III) protein molecules
 - b. Fe(II) protein molecules
 - c. These transport Fe for myoglobin synthesis
 - d. All of the above

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(Descriptive)

Time : 2 hrs. 30 mins.

Marks : 50

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

1. a. Explain Jahn- Teller effect. Give example. 3
b. Why does atomic volume in the same transition series first decreases and reaches a minimum and then increases. 3
c. Write the functions, excess and deficiency of manganese and cobalt. 4
2. a. Show the d orbital splitting in octahedral, tetrahedral and square planar coordination complexes. 5
b. What do you mean by labile and inert complex? Calculate CFSE of the complexes: $[\text{CoF}_6]^{3-}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$, $[\text{Fe}(\text{CN})_6]^{3-}$ 5
3. a. Discuss all types of isomerism shown by coordination complexes. What kind of isomerism shown by the following compounds: $\text{K}_3[\text{Co}(\text{NO}_2)_6]$, $[\text{CoCl}_2(\text{en})_2]^+$, $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ 5
b. Write IUPAC name of the following complexes: $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$, $[\text{NiCl}_2(\text{PPh}_3)_2]$ 2
c. Write formula of the following complexes: Potassium trioxalatoaluminate(III), Hexaamminecobalt(III) sulphate. 2
4. a. What is lanthanide contraction? 2+4+4 =10
b. Why is it difficult to separate one lanthanide from the other?
c. Discuss the ion-exchange method of separation of lanthanides.
5. a. What happens when Vanadium (+5) compounds are reduced with zinc? Discuss the changes in the oxidation states and the colour. 5+2+3 =10
b. What happens when vanadium penta fluoride is heated?
c. Narrate the polymeric forms of vanadium penta fluoride .

6. a. Explain why and how are the magnetic properties of lanthanides different from those of the d-block elements? **5+5=10**
- b. What are the characteristics of the spectra of tri positive lanthanide ions? How are they different from the d-block transition elements?
7. a. Discuss the toxicity of the following metal ions **5+5=10**
- i. Mercury
 - ii. Lead
- b. Explain the occurrence and structure of haemoglobin and myoglobin.
8. a. Explain about the sodium potassium pump. **5+5=10**
- b. Write the stereochemical structure of Zn in carbonic anhydrase. Discuss the mechanism for reversible hydration of CO₂ in carbonic anhydrase.

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