

**B.Sc. BIOTECHNOLOGY
FOURTH SEMESTER (REPEAT)
CHEMISTRY-II
BBT-403**

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

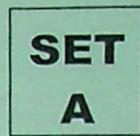
Time: 30 mins.

Marks: 20

Choose the correct answer from the following:

$$1 \times 20 = 20$$

1. Solubility of ethanol is highest in:
 - Propanol
 - Propane
 - Octane
 - Oil
 2. Which statement is not true about hydrogen bond?
 - It is special type of dipole-dipole interaction
 - It forms between hydrogen and highly electropositive elements
 - It increases boiling point of polar protic compounds
 - None of the above
 3. Boiling point of a compound is related to:
 - Vanderwall's force
 - Hydrogen bond
 - Both a and b
 - None of the above
 4. Find the diamagnetic species.
 - H_2
 - H_2^-
 - He_2^+
 - H_2^+
 5. Find the molecule having the highest bond order.
 - O_2^+
 - O_2^-
 - O_2^{2-}
 - O_2
 6. Which of the following species are isoelectronic?
 - N_2 , CO , NO^+
 - O_2 , N_2 , CO
 - O_2 , NO , CO_2
 - All of the above
 7. $[Ni(CN)_4]^{2-}$ has which geometry?
 - Square planar
 - Trigonal bipyramidal
 - Tetrahedral
 - None of the above
 8. $[Co(NH_3)_6][Cr(CN)_6]$ and $[Co(CN)_6][Cr(NH_3)_6]$ refers to:
 - Polymerization Isomerism
 - Coordination Isomerism
 - Linkage Isomerism
 - None of the above
 9. $[Fe(CN)_6]^{4-}$ is a low spin complex, because CN^- is a:
 - Strong field ligand
 - Weak field ligand
 - Ferromagnetic species
 - None of the above
 10. Greater the CFSE of the complex,
 - Smaller is the stability of the complex
 - Greater is the stability of the complex
 - It becomes optically active
 - None of the above



11. Keesom interaction is:
- a. Dipole-dipole interaction
 - c. Induced dipole-induced dipole interaction
 - b. Dipole-induced dipole interaction
 - d. None of the above
12. Which is true about Latimer diagram?
- a. Shows relative stability of different oxidation states
 - b. Shows standard reduction potential connecting various oxidation states of an element
 - c. Both a and b
 - d. None of the above
13. Transition metal complexes are colored due to:
- a. Variable oxidation state
 - b. Presence of partially filled d orbital
 - c. Splitting of d orbitals and transition of electrons between two different energy states
 - d. None of the above
14. Find the paramagnetic species.
- a. CN⁻
 - b. NO⁺
 - c. CO
 - d. O₂⁻
15. The hybridization of XeF₄ is:
- a. sp³d
 - b. sp³
 - c. sp³d²
 - d. sp²
16. The formal charge of O₃ molecule is:
- a. -1,+1,-1
 - b. -1,0,+1
 - c. +1,+1,-1
 - d. None of the above
17. The geometry of BF₃ molecule is:
- a. Trigonal planar
 - b. Tetrahedral
 - c. Square planar
 - d. All of the above
18. Fe atom in [Fe(CN)₆]⁴⁻ is:
- a. dsp² hybridized
 - b. d²sp³ hybridized
 - c. sp³d² hybridized
 - d. None of the above
19. Trans-isomers are optically:
- a. Active
 - b. Inactive
 - c. Opaque
 - d. None of the above
20. Square planer complex is a special case of:
- a. Tetragonal bipyramidal complex
 - b. Tetrahedral complex
 - c. Octahedral complex
 - d. None of the above

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(Descriptive)

Time : 2 hr. 30 mins.

Marks : 50

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

1. a) Explain the molecular orbital energy level diagram of CO and NO molecules. 5
b) What are the postulates of VSEPR theory? 5
2. a) Explain the significance and utility of Latimer diagram of an element in different oxidation states. 5+5=10
b) Explain the origin of color observed in transition metal compounds, considering the crystal field theory.
3. a) How do intermolecular forces affect solubility? 3+3+4=10
b) Why propane has boiling point of -42 °C but ethanol has 78 °C?
c) Discuss how shape of molecules and number of electrons held by molecules affect Vander wall's force.
4. a) Explain the trend of boiling points of H₂O, H₂S, H₂Se and H₂Te. 3
b) Calculate the formal charge of NO₂ molecule. 3
c) When does strong distortion occur in an octahedral complex? 4
What are its impacts?
5. a) Explain the molecular orbital energy level diagram of O₂⁻ and O₂⁺ ions and calculate bond order, magnetic moment for each ion. 6+4=10
b) Explain the structure of SF₆ molecule using hybridisation.
6. a) Iron (Fe) reacts with perchloric acid (HClO₄). Write down briefly the redox chemical changes occurring during this reaction and determine the thermodynamically feasible oxidation state of Fe. 6+4=10
b) Why zinc (Zn) is colorless? Explain with proper diagram.
7. a) Why does Cu(II) form Square planer complexes rather than tetrahedral complexes? 4+6=10
b) Give a brief account of the splitting of d-orbitals in an octahedral field.
8. a) What do you mean by the Jahn-Teller effect? 5+5=10
b) State the rules of Nomenclature of Complexes.

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