

**B.Sc. MICROBIOLOGY
FOURTH SEMESTER (REPEAT)
CHEMISTRY-II
BMB-405**

**SET
A**

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

Time: 30 mins.

Marks: 20

(Objective)

Choose the correct answer from the following:

1 × 20 = 20

- Keesom interaction is:
 - Dipole-dipole interaction
 - Dipole-induced dipole interaction
 - Induced dipole-induced dipole interaction
 - None of the above
- Solubility of ethanol is highest in:
 - Propanol
 - Propane
 - Octane
 - Oil
- Which is true about Latimer diagram?
 - Shows relative stability of different oxidation states
 - Shows standard reduction potential connecting various oxidation states of an element
 - Both a and b
 - None of the above
- 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
- Transition metal complexes are colored due to:
 - Variable oxidation state
 - Presence of partially filled d orbital
 - Splitting of d orbitals and transition of electrons between two different energy states
 - None of the above
- Boiling point of a compound is related to:
 - Vanderwall's force
 - Hydrogen bond
 - Both a and b
 - None of the above
- Find the paramagnetic species.
 - CN⁻
 - NO⁺
 - CO
 - O₂⁻
- Find the diamagnetic species.
 - H₂
 - H₂⁻
 - He₂⁺
 - H₂⁺

9. The hybridization of XeF_4 is:
- sp^3d
 - sp^3
 - sp^3d^2
 - sp^2
10. Find the molecule having the highest bond order.
- O_2^+
 - O_2^-
 - O_2^{2-}
 - O_2
11. The formal charge of O_3 molecule is:
- 1,+1,-1
 - 1,0,+1
 - +1,+1,-1
 - None of the above
12. Which of the following species are isoelectronic?
- $\text{N}_2, \text{CO}, \text{NO}^+$
 - $\text{O}_2, \text{N}_2, \text{CO}$
 - $\text{O}_2, \text{NO}, \text{CO}_2$
 - All of the above
13. The geometry of BF_3 molecule is:
- Trigonal planar
 - Tetrahedral
 - Square planar
 - All of the above
14. $[\text{Ni}(\text{CN})_4]^{2-}$ has which geometry?
- Square planar
 - Trigonal bipyramid
 - Tetrahedral
 - None of the above
15. Fe atom in $[\text{Fe}(\text{CN})_6]^{4-}$ is:
- dsp^2 hybridized
 - d^2sp^3 hybridized
 - sp^3d^2 hybridized
 - None of the above
16. $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ and $[\text{Co}(\text{CN})_6][\text{Cr}(\text{NH}_3)_6]$ refers to:
- Polymerization Isomerism
 - Coordination Isomerism
 - Linkage Isomerism
 - None of the above
17. Trans-isomers are optically:
- Active
 - Inactive
 - Opaque
 - None of the above
18. $[\text{Fe}(\text{CN})_6]^{4-}$ is a low spin complex, because CN^- is a:
- Strong field ligand
 - Weak field ligand
 - Ferromagnetic species
 - None of the above
19. Square planar complex is a special case of:
- Tetragonal bipyramidal complex
 - Tetrahedral complex
 - Octahedral complex
 - None of the above
20. 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

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(Descriptive)

Time : 2 hr. 30 mins.

Marks : 50

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

1. a) Discuss all types of Vander wall's forces seen in compounds showing examples. 4
b) Write the postulates of VSEPR theory. 3
c) Name the following according to IUPAC system. 3
(i) $K_4[Fe(CN)_6]$
(ii) $K[Ag(CN)_2]$
(iii) $[Cu(NH_3)_4]SO_4$
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 $-42^\circ C$ but ethanol has $78^\circ C$?
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 H_2O , H_2S , H_2Se and H_2Te . 3
b) Calculate the formal charge of NO_2 molecule. 3
c) When does strong distortion occur in an octahedral complex? What are its impacts? 4
5. a) Explain the molecular orbital energy level diagram of O_2^- and O_2^+ ions and calculate bond order, magnetic moment for each ion. 6+4=10
b) Explain the structure of SF_6 molecule using hybridisation.
6. a) Why He_2 molecule does not exist? 2+3+3+2=10
b) Define hydrogen bonding? Why o-nitro phenol is more volatile than p-nitro phenol?
c) Calculate the bond order of N_2^+ ion using molecular orbital energy level diagram.
d) Mention the hybridization of the following molecules/ions.
(i) CO_2 (ii) CH_3^+ (iii) CH_3^- (iv) PCl_5
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) Draw the possible geometrical isomers of $[Co(en)_2Cl_2]$. 6+4=10
Which one of them is optically active and why?
b) Give a brief account of the optical activity of Trioxalato Chromate (III) ion.

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