REV-01
BMB/19/24

2023/06

SET A

B.Sc. MICROBIOLOGY
FOURTH SEMESTER
CHEMISTRY-II
BMB-405
[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 mins. **Marks: 20**

Choose the correct answer from the following: ***1×20=20***

1. Keesom interaction is:
   a. Dipole-dipole interaction
   b. Dipole-induced dipole interaction
   c. Induced dipole-induced dipole interaction
   d. None of the above

2. Solubility of ethanol is highest in:
   a. Propanol
   b. Propane
   c. Octane
   d. Oil

3. 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

4. Which statement is not true about hydrogen bond?
   a. It is special type of dipole dipole interaction
   b. It forms between hydrogen and highly electropositive elements
   c. It increases boiling point of polar protic compounds
   d. None of the above

5. 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

6. Boiling point of a compound is related to:
   a. Vanderwall's force
   b. Hydrogen bond
   c. Both a and b
   d. None of the above

7. Find the paramagnetic species.
   a. CN^-
   b. NO^+
   c. CO
   d. O_2^-

8. Find the diamagnetic species.
   a. H_2
   b. H_2^-
   c. He_2^+
   d. H_2^+

9. The hybridization of XeF_4 is:
   a. sp^3d b. sp^3
   c. sp^3d^2 d. sp^2

10. Find the molecule having the highest bond order.
   a. O_2^+ b. O_2^-
   c. O_2^{2-} d. O_2

11. The formal charge of O_3 molecule is:
   a. -1,+1,-1 b. -1,0,+1
   c. +1,+1,-1 d. None of the above

12. Which of the following species are isoelctronic?
   a. N_2, CO, NO^+ b. O_2, N_2, CO
   c. O_2, NO, CO_2 d. All of the above

13. The geometry of BF_3 molecule is:
   a. Trigonal planar b. Tetrahedral
   c. Square planar d. All of the above

14. $[Ni(CN)_4]^{2-}$ has which geometry?
   a. Square planer b. Trigonal bipyramid
   c. Tetrahedral d. None of the above

15. Fe atom in $[Fe(CN)_6]^{4-}$ is:
   a. dsp^2 hybridized b. d^2sp^3 hybridized
   c. sp^3d^2 hybridized d. None of the above

16. $[Co(NH_3)_6][Cr(CN)_6]$ and $[Co(CN)_6][Cr(NH_3)_6]$ refers to:
   a. Polymerization Isomerism b. Coordination Isomerism
   c. Linkage Isomerism d. None of the above

17. Trans-isomers are optically:
   a. Active b. Inactive
   c. Opaque d. None of the above

18. $[Fe(CN)_6]^{4-}$ is a low spin complex, because CN- is a:
   a. Strong field ligand b. Weak field ligand
   c. Ferromangetic species d. None of the above

19. Square planer complex is a s special case of:
   a. Tetragonal bipyramidal complex b. Tetrahedral complex
   c. Octahedral complex d. None of the above

20. Greater the CFSE of the complex,
   a. Smaller is the stability of the complex b. Greater is the stability of the complex
   c. It becomes optically active 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) 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 °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 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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