

**B.Sc. MICROBIOLOGY**  
**FOURTH SEMESTER [SPECIAL REPEAT]**  
**CHEMISTRY-II**  
**BMB-405**

**SET**  
**A**

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

Time: 30 mins.

( Objective )

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.  $\text{CN}^-$
  - b.  $\text{NO}^+$
  - c.  $\text{CO}$
  - d.  $\text{O}_2^-$
8. Find the diamagnetic species.
  - a.  $\text{H}_2$
  - b.  $\text{H}_2^-$
  - c.  $\text{He}_2^+$
  - d.  $\text{H}_2^+$





**( Descriptive )**

Time : 2 hr. 30 mins.

Marks : 50

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

1. 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.
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<sub>2</sub>O, H<sub>2</sub>S, H<sub>2</sub>Se and H<sub>2</sub>Te. 3  
b) Calculate the formal charge of NO<sub>2</sub> molecule. 3  
c) When does strong distortion occur in an octahedral complex? What are its impacts? 4
5. 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<sub>4</sub>[Fe(CN)<sub>6</sub>]  
(ii) K[Ag(CN)<sub>2</sub>]  
(iii) [Cu(NH<sub>3</sub>)<sub>4</sub>]SO<sub>4</sub>
6. a) Why He<sub>2</sub> 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<sub>2</sub><sup>+</sup> ion using molecular orbital energy level diagram.  
d) Mention the hybridization of the following molecules/ions.  
(i) CO<sub>2</sub> (ii) CH<sub>3</sub><sup>+</sup> (iii) CH<sub>3</sub><sup>-</sup> (iv) PCl<sub>5</sub>
7. a) Draw the possible geometrical isomers of [Co(en)<sub>2</sub>Cl<sub>2</sub>]. 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.
8. a) Explain the molecular orbital energy level diagram of O<sub>2</sub><sup>-</sup> and O<sub>2</sub><sup>+</sup> ions and calculate bond order, magnetic moment for each ion. 6+4=10  
b) Explain the structure of SF<sub>6</sub> molecule using hybridisation.

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