

Term End External Examination 1<sup>ST</sup> Semester (Session-Feb 2025)

Subject: Chemistry

Course No and Title: CHM122M/ Chemistry-I

Time: 2.15 hours

Max Marks:100

Min. Marks:40

Section A: Objective Type Questions

- Q1. Choose the appropriate Answer: (8x1.5=12)**
- i. Lattice energy of a solid increases if**  
 A The ions are large      B The ions are small  
 C The ions are equal in size      D Charge on the ions is small
- ii. The bond order in super oxide (O<sub>2</sub><sup>-</sup>) is**  
 A 2      B 2.5  
 C 1.5      D 3
- iii. For one mole of a gas the total kinetic energy is equal to**  
 A RT      B 3RT/2  
 C 2RT/3      D C<sub>p</sub>-C<sub>v</sub>/RT
- iv. The temperature of a sample of SO<sub>2</sub> is raised from 27 to 327°C. The average Kinetic energy of the gas molecule is**  
 A doubled      B raised to the power 2  
 C halved      D multiplied by a factor 327/27
- v. Arrange the following carbocations in order of increasing stability:**  
 CH<sub>3</sub><sup>+</sup>, C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub><sup>+</sup>, CH<sub>3</sub>CH<sub>2</sub><sup>+</sup>, (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>CH<sup>+</sup>, (CH<sub>3</sub>)<sub>3</sub>C<sup>+</sup>, (CH<sub>3</sub>)<sub>2</sub>CH<sup>+</sup>
- A** (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>CH<sup>+</sup> < C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub><sup>+</sup> < (CH<sub>3</sub>)<sub>3</sub>C<sup>+</sup> < (CH<sub>3</sub>)<sub>2</sub>CH<sup>+</sup> < CH<sub>3</sub>CH<sub>2</sub><sup>+</sup> < CH<sub>3</sub><sup>+</sup>      **B** CH<sub>3</sub><sup>+</sup> < (CH<sub>3</sub>)<sub>2</sub>CH<sup>+</sup> < (CH<sub>3</sub>)<sub>3</sub>C<sup>+</sup> < CH<sub>3</sub>CH<sub>2</sub><sup>+</sup> < C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub><sup>+</sup> < (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>CH<sup>+</sup>
- C** C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>CH<sup>+</sup> > (CH<sub>3</sub>)<sub>3</sub>C<sup>+</sup> > C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub><sup>+</sup> > (CH<sub>3</sub>)<sub>2</sub>CH<sup>+</sup> > CH<sub>3</sub>CH<sub>2</sub><sup>+</sup> > CH<sub>3</sub><sup>+</sup>      **D** CH<sub>3</sub><sup>+</sup> < CH<sub>3</sub>CH<sub>2</sub><sup>+</sup> < (CH<sub>3</sub>)<sub>2</sub>CH<sup>+</sup> < C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub><sup>+</sup> < (CH<sub>3</sub>)<sub>3</sub>C<sup>+</sup> < (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>CH<sup>+</sup>
- vi. Which of the following is most basic**  
 A CsOH      B KOH  
 C LiOH      D RbOH
- vii. Which of the following is a covalent hydride**  
 A CaH<sub>2</sub>      B LaH<sub>2</sub>  
 C RbH      D SiH<sub>4</sub>

- viii. Meso tartaric acid is optically inactive due to**  
 A External plane of symmetry      B internal plane of symmetry  
 C Both a and b      D racemization

Section-B: Descriptive Type Questions (Short Type)**Q2: Answer all the Questions (8 x 4 =32)**

- i.** What is Born-Haber Cycle. How does it explain stability of ionic compound?
- ii.** What is carbon-cation? Explain its structure and stability.
- iii.** Explain the structure of CO molecules with the help of molecular orbital theory.
- iv.** Draw configuration of the following chiral molecules:  
 a. (R) glyceraldehyde      b. (S)-lactic acid  
 c. (R)- 2 chlorobutane      d. (S)- glyceraldehyde
- v.** What are the causes of deviation of gases from ideal behavior?
- vi.** Define compressibility factor.
- vii.** What is diagonal relationship
- viii.** Why hydroxides of alkaline earth metals are less basic than those of alkali metals

Section – C: Descriptive Type Questions (Medium Type)**Answer all the questions: (4 x 7=28)**

- Q3.** What do you understand by polarizing powers and polarizability? How do these determine the ionic character of a compound?  
**OR**  
 Explain Molecular Orbital Theory with specific reference to O<sub>2</sub> molecule.
- Q4.** Explain conformation of cyclohexane  
**OR**  
 What is optical Isomerism? Explain Enantiomerism and Diastereomerism with examples

- Q5. Explain:
- $\text{Li}_2\text{CO}_3$  is unstable while all other metal carbonates are relatively more stable
  - Alkali metals are strong reducing agents.

OR

What is effective nuclear charge? How will you find the effective nuclear charge for a 3d electron in cobalt ( $z=2$ )

- Q6. Define the term 'mean free path' what is the effect of temperature and pressure on mean free path?

OR

Explain:

- Root mean square velocity
- Liquid crystals

**Section – D: Descriptive Type Questions (Long Type)**

Answer any two of the following: (2 x 14=28)

- Q7. With the help of VSEPR theory explain structure of  $\text{IF}_7$ ,  $\text{XeF}_2$ ,  $\text{XeOF}_4$ , and  $\text{SF}_6$ .
- Q8. Explain with suitable examples
- Inductive effect
  - Resonance
  - Hyperconjugation
- Q9. Explain Maxwell's distribution of molecular speeds. What is the effect of temperature on this distribution?
- Q10. Explain
- Pauling and Mulliken scale of electronegativity
  - Chemical characteristics of oxides, hydrides and halides of alkali metals