

June : 2026

CHEMISTRY

Paper: CHM-M-201

General Chemistry-II

Time: 2 Hours

Total Mark: 45

(The figures in the right margin indicate full marks of the questions)

SECTION A: Inorganic Chemistry

1. Choose the correct answer from the following options: 1×2=2
 - a) The ore that contains both iron and copper is
 - (i) Dolomite
 - (ii) Malachite
 - (iii) Azurite
 - (iv) Copper pyrites
 - (b) Identify the pair which does not represent correct bond order of the species.
 - (i) $O_2 = 2$
 - (ii) $O_2^+ = 2.5$
 - (iii) $O_2^- = 3$
 - (iv) $O_2^{2-} = 1$
2. Answer the following questions (any two): 2×2=4
 - (a) How does zone refining method help to refine impure metals? 2
 - (b) Discuss the use of dimethylglyoxime in inorganic analysis. 2
 - (c) Write the necessary conditions for the combination of two atomic orbitals to form molecular orbitals. 2
 - (d) Write the differences between bonding and antibonding molecular orbitals. 2
3. Answer the following questions (any three): 3×3=9
 - (a) Define the term hydrometallurgy. How it helps to purify Cu from copper ores? 1+2=3
 - (b) Write short notes on reduction of metal oxides by carbon. 3

- (c) Draw the molecular orbital energy diagram of N_2 molecule and determine its bond order and magnetic property.

$$2 + \frac{1}{2} + \frac{1}{2} = 3$$

- (d) Of the following species, which has the shortest bond length: NO, NO^+ , NO^{2+} , NO^- ? Explain.

3

SECTION B: Physical Chemistry

4. Choose the correct answer from the following options: $1 \times 2 = 2$

- (a) A crystal having unit cell dimensions

$$a \neq b \neq c \text{ and } \alpha = \beta = \gamma = 90^\circ \text{ is-}$$

- i) Trigonal ii) Orthorhombic
iii) Hexagonal iv) Cubic

- (b) For an ideal gas the change in internal energy under isothermal expansion is

- i) Positive ii) Negative
iii) Zero iv) None of the above

5. Answer the following questions (any two): $2 \times 2 = 4$

- (a) Calculate the Miller indices of crystal planes which cut through the crystal axes at-

- i) $(2a, -3b, -3c)$ ii) $(2a, b, \infty)$ $1 + 1 = 2$

- (b) Calculate the number of atoms present in per unit cell of (i) face centered cubic and (ii) body centered cubic lattices.

$$1 + 1 = 2$$

- (c) Prove that the work done in a reversible process is the maximum work obtainable. 2

- (d) Calculate the pressure-volume work performed by the system during reversible isothermal expansion of two moles of an ideal gas from 2 litres to 10 litres at $20^\circ C$. 2

6. Answer the following questions (any three): $3 \times 3 = 9$

- (a) Define packing fraction. Calculate the packing efficiency of-
(i) Simple cubic and (ii) face centered cubic lattice. $1 + 1 + 1 = 3$

- (b) Write a short notes on Schottky and Frenkel defect. $1 \frac{1}{2} \times 2 = 3$

- (c) What is Joule-Thomson effect? Why Joule-Thomson coefficient is zero for ideal gas? What is inversion temperature? $1 + 1 + 1 = 3$

- (d) Derive a relation between temperature and volume for reversible adiabatic expansion of an ideal gas. 3

SECTION C: Organic Chemistry

7. Choose the correct answer from the following options: $1 \times 2 = 2$

- (a) The most stable conformation of cyclohexane is-

- (i) Boat (ii) Twist boat
(iii) Chair (iv) Half-chair

- (b) Markownikoff's rule is related to

- (i) Elimination reaction (ii) Addition of HX to alkene
(iii) Oxidation reaction (iv) Polymerisation

8. Answer the following questions (any two): $2 \times 2 = 4$

- (a) Draw the conformations of Butane. 2

- (b) Explain why chair conformation is stable than boat conformation. 2

- (c) State Saytzeff's rule with an example. 2

- (d) What happens when ethene reacts with alkaline $KMnO_4$? 2

9. Answer the following questions (any three): $3 \times 3 = 9$

- (a) Discuss Newman and sawhorse representation of ethane. $1 \times 2 = 3$

- (b) What do you mean by the terms enantiomers and diastereoisomers? How do they differ? Give your answer with example. $1 + 1 + 1 = 3$

- (c) What is meant by anti-Markownikoff's addition? Give its mechanism. $1 + 2 = 3$

- (d) Explain (i) Alkynes are less reactive than alkene towards electrophilic addition reactions. $1 \frac{1}{2}$

- (ii) Acidic nature of acetylenic protons. $1 \frac{1}{2}$