

**2025/FYUG/ODD/SEM/
CHMDSC-101T/454**

FYUG Odd Semester Exam., 2025

**CHEMISTRY
(1st Semester)**

Course No. : CHMDSC-101T

(Inorganic Chemistry)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

UNIT—I

1. Answer any *two* from the following : 2×2=4
- (a) State and explain Pauli's exclusion principle.
- (b) Why are Bohr's orbits called stationary states? Why is Bohr's model not applicable for multi-electronic atoms or ions? 1+1=2
- (c) Calculate the uncertainty in the position of an electron if the uncertainty in velocity is 0.1% of velocity of light.

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2. Answer any *one* from the following : 10

(a) (i) Write the expression for the three-dimensional Schrödinger wave equation in Cartesian coordinates and explain the terms involved in it. Explain the significances of ψ and ψ^2 . 3+2=5

(ii) (1) State and explain Heisenberg uncertainty principle. How does Heisenberg uncertainty principle lead to the concept of orbital? 1½+1½=3

(2) State and explain Hund's rule of maximum multiplicity with example. 2

(b) (i) Discuss normalized and orthogonal wave functions. Draw the radial probability distribution curve for 1s-, 3s- and 3p-orbitals. 2+3=5

(ii) Define quantum number. Explain the significances of each quantum number. 1+4=5

UNIT—II

3. Answer any *two* from the following : 2×2=4

(a) Define electron gain enthalpy with example.

(b) Mention the general electronic configuration of *d*- and *f*-block elements.

(c) Explain why the electron affinity of F is lower than that of Cl although the electronegativity of F is higher than that of Cl.

4. Answer any *one* from the following : 10

(a) (i) Define atomic radii. Explain the terms 'van der Waals and covalent radii' with diagrammatical representation. $1+1\frac{1}{2}+1\frac{1}{2}=4$

(ii) (1) What is meant by electronegativity? Distinguish between electron affinity and electronegativity. $1+2=3$

(2) What is effective nuclear charge of an atom? Calculate the effective nuclear charge felt by a $2p$ -electron of N atom. $1+2=3$

(b) (i) Define ionization enthalpy. Discuss the factors on which ionization enthalpy depends. Explain the variation of ionization enthalpy from left to right in a period and down a group in the periodic table. $1+2+2=5$

- (ii) (1) Explain why the size of Na^+ ion is smaller than that of Na atom. Calculate the C—F bond length if covalent radius of C = 0.77 Å, F = 0.72 Å, $x_{\text{C}} = 2.5$ and $x_{\text{F}} = 4.0$. 1+2=3
- (2) Discuss the variation of electron gain enthalpy in group and period in s- and p-block elements in periodic table. 2

UNIT—III

5. Answer any *two* from the following : 2×2=4
- (a) Discuss the shape of ClF_3 according to VSEPR theory.
- (b) Explain why He_2 does not exist but He_2^+ exists.
- (c) Draw the resonance structures of N_3^- and HN_3 .
6. Answer any *one* from the following : 10
- (a) (i) Draw the molecular orbital diagram of N_2 molecule. Mention its bond order. Comment on its magnetic nature. 3+1+1=5

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- (ii) Define dipole moment. Discuss different applications of dipole moment. 2+3=5
- (b) (i) Define polarization power of a cation. State and explain Fajan's rule of polarization with its consequence. 2+3=5
- (ii) Calculate the bond-orders of O_2 , O_2^+ , O_2^- and O_2^{2-} . Discuss the shape of XeF_4 using VB theory. Mention two postulates of VBT. 2+2+1=5

UNIT—IV

7. Answer any *two* from the following : 2×2=4
- (a) Write a brief note on ion-dipole interaction.
- (b) What is metallic bonding?
- (c) Mention two important characteristics of van der Waals' forces.
8. Answer any *one* from the following : 10
- (a) (i) Define conductor, insulator and semiconductor. What are *p*-type and *n*-type semiconductors? Give examples. 3+2=5

- (ii) What do you mean by imperfection in solid? Discuss Schottky and Frenkel defects in solid with example. 2+3=5
- (b) (i) Explain with example different types of weak chemical forces. 5
- (ii) Define hydrogen bonding. Discuss different types of H-bonding with example. 2+3=5

UNIT—V

9. Answer any *two* from the following : 2×2=4
- (a) Define redox reaction. Give example. 1+1=2
- (b) Write two applications of standard electrode potential in inorganic reactions.
- (c) What is zone refining?
10. Answer any *one* from the following : 10
- (a) (i) Explain the principle and write the redox reactions involved in volumetric quantification of Fe^{2+} by KMnO_4 . 3

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(ii) Give an example of disproportionation reaction. What is the driving force behind this reaction? 1+1=2

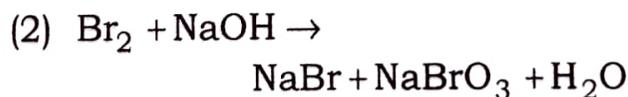
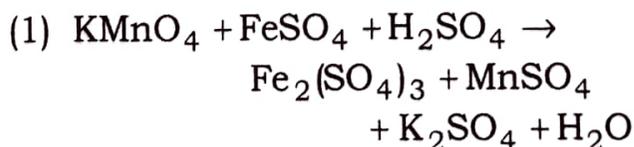
(iii) Write short notes on the following : 2½×2=5

(1) Mond process

(2) Electrolytic reduction

(b) (i) Describe the Ellingham diagram for reduction of metal oxide by using carbon and carbon monoxide as reducing agent. 5

(ii) Balance the following reactions by ion-electron method : 2½×2=5



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