

**2023/FYUG/ODD/SEM/
CHMDSC-101T/092**

**FYUG Odd Semester Exam., 2023
(Held in 2024)**

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*

SECTION—A

Answer *ten* questions, taking *two* from each Unit :

2×10=20

UNIT—I

1. Write down the expression for wavelength of third line of Brackett series.

2. How many orbitals are possible for fourth shell?
3. Explain why 4s-orbital is filled first than 3d-orbital.

UNIT—II

4. Mention the general electronic configuration for *d*- and *f*-block elements.
5. Considering suitable example, explain why van der Waals' radius is greater than covalent radius.
6. Distinguish between electron affinity and electronegativity.

UNIT—III

7. Calculate the bond order of O_2 , O_2^+ , O_2^- and O_2^{2-} .
8. Discuss the shape of ClF_3 according to VSEPR theory.
9. Explain why oxides are more covalent than fluorides.

UNIT—IV

10. Considering hydrogen bonding, explain why *o*-nitrophenol is less soluble in water than *p*-nitrophenol.
11. What do you mean by metallic bonding?
12. Distinguish between Schottky defect and Frenkel defect.

UNIT—V

13. Define redox reaction. Illustrate with example.
14. What is oxidation number? Arrange the following in the increasing order of oxidation number of iodine :
 $\text{HIO}_4, \text{HI}, \text{I}_2, \text{ICl}$
15. Give one example of each of oxide and fluoride ore of aluminium.

(4)

SECTION—B

Answer *five* questions, taking *one* from each Unit :

10×5=50

UNIT—I

16. (a) Mention two important postulates of Bohr's theory. Derive the Schrödinger wave equation for hydrogenation. 2+3=5
- (b) What are the different spectral lines of hydrogen atom? For a particular line in Brackett series, the wavelength is observed at 434 nm. Identify the line of the series. 2+3=5
17. (a) Derive the equation $\lambda = h / mv$. Considering de Broglie concept, how can you confirm the Bohr quantum condition $mvr = nh / 2\pi$? 3+2=5
- (b) Discuss the radial and angular parts of the Schrödinger wave equation. Draw the radial probability distribution curve for 1s, 2p and 3d orbitals. How many nodal points are present in these orbitals? 2+2+1=5

UNIT—II

18. (a) Mention some characteristic properties of *p* and *d* block elements. Taking suitable examples, discuss the ionic radii of isoelectronic species. 3+2=5
- (b) Define EAN. Discuss Slater rule and its applications. 1+2+2=5
19. (a) Define ionization energy. What are the factors on which IE depends? Mention one application of IE. 2+2+1=5
- (b) Define electronegativity. Discuss the Pauling scale of electronegativity. 2+3=5

UNIT—III

20. (a) Draw the MO diagram of N_2 molecule and comment on its bond order and magnetic property. 3+2=5
- (b) What do you mean by polarization or ion deformation? State and explain Fajan's rule of polarization with its consequence. 2+3=5

21. (a) Draw and explain the Born-Haber cycle for the formation of strontium chloride (SrCl_2). Calculate the enthalpy of formation of SrCl_2 using the following data : 3+2=5

The enthalpy of sublimation of strontium = +164 kJ/mole

First ionization energy for strontium
= +549 kJ/mole

Second ionization energy for strontium
= +1064 kJ/mole

The enthalpy of dissociation of chlorine,
 Cl_2 = +243 kJ/mole

The electron affinity of chlorine
 Cl = -349 kJ/mole

Lattice energy of strontium chloride
= -2150 kJ/mole

- (b) Define dipole moment. Discuss the different applications of dipole moment. 2+3=5

UNIT—IV

22. (a) Discuss, in detail, the different types of weak chemical forces. 5
- (b) Define hydrogen bonding. Discuss the different types of H-bonding with examples. 2+3=5

23. (a) Define conductor, insulator and semiconductor. What are the different types of semiconductor? 2+3=5
- (b) What do you mean by imperfection in solid? Discuss Schottky and Frenkel defects in solid. 2+3=5

UNIT—V

24. (a) Balance the following reactions by ion electron method : 2½×2=5
- (i) $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} \rightarrow \text{Mn}^{2+} + \text{CO}_2$
- (ii) $\text{Br}_2 + \text{NaOH} \rightarrow \text{NaBr} + \text{NaBrO}_3 + \text{H}_2\text{O}$
- (b) Discuss how Fe(II) can be estimated from a solution volumetrically using KMnO_4 solution. 5
25. (a) Discuss Ellingham diagram for reduction of metal oxide by using carbon and carbon monoxide as reducing agent. 5
- (b) Write short notes on the following : 2½×2=5
- (i) Electrolytic reduction
- (ii) Zone refining

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