TDC (CBCS) Odd Semester Exam., 2023

CHEMISTRY

(Honours)

(1st Semester)

Course No. : CHMHCC–101T

(Inorganic Chemistry)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer *ten* questions, taking any *two* from each Unit : 2×10=20

UNIT—I

1. Mention two important postulates of Bohr theory.

2. Derive the equation $mvr = n\frac{h}{2\pi}$ considering de Broglie's concept.

3. How many orbitals are possible for fourth main shell?

UNIT—II

4. Calculate Z_{eff} for Cl^- ion.

5. Discuss sp^3d^2 hybridization with suitable example.

6. Compare the electron affinity of chlorine and fluorine.

UNIT—III

7. Draw the Born-Haber cycle with a suitable example.

8. Discuss the structure of XeF_2.

9. Bond angles of CH_4 and H_2O are different. Explain.

UNIT—IV

10. Which of the following is more covalent and why?

$NaCl$, $MgCl_2$, $AlCl_3$

11. Explain how dipole moment values can be used in calculating the percentage of ionic character in a compound.

12. What do you mean by intermolecular and intramolecular H-bonding?

(Continued)

UNIT—V

13. Arrange the following in the increasing oxidation number of carbon :

CCl_4, CH_2Cl_2, $CHCl_3$, CH_3Cl, CH_4

14. Write down the Nernst equation for galvanic cell.

15. Define electrochemical series.

SECTION—B

Answer *five* questions, taking *one* from each Unit : 6×5=30

UNIT—I

16. *(a)* Find an expression for energy of an electron present in first shell of H-atom. 3

(b) State and explain Aufbau principle with example. 3

17. *(a)* State and explain Heisenberg uncertainty principle. Mention its significance. 3

(b) What do you mean by eigenfunction and eigenvalues? 3

UNIT—II

18. *(a)* Considering suitable example, calculate the Z_{eff} of $3d$ electron in first transition series. 3

(b) Define ionization energy. What are the factors on which ionization energy depends? 3

19. *(a)* Define covalent radius and van der Waals' radius. Compare with suitable example. 3

(b) Define electronegativity. Distinguish between electron affinity and electronegativity. 3

UNIT—III

20. *(a)* Draw the MO diagram of nitrogen molecule. Comment on its magnetic property. 3

(b) What are the different types of two-dimensional packing in crystal? Discuss with diagram. 3

21. *(a)* Comment on the geometry of XeF_4 and ClF_3. $1\frac{1}{2}\times2=3$

(b) Draw the MO diagram of NO molecule. Comment on its bond order. 3

UNIT—IV

22. *(a)* State and explain Fajan's rule of polarization with suitable examples. 3

(b) Explain Schottky and Frenkel defects in crystal. 3

23. *(a)* What do you mean by *n*-type and *p*-type semiconductors? Give examples. 3

(b) Discuss the different types of weak chemical forces. 3

UNIT—V

24. *(a)* Balance the following reaction by ion-electron method : 3

$$Br_2 + NaOH \longrightarrow NaBr + NaBrO_3 + H_2O$$

(b) How much $K_2Cr_2O_7$ is required to prepare 0·1 *N* 250 solution? 3

25. *(a)* Discuss the principle and steps involved in the estimation of Fe(II) by $KMnO_4$ solution. 3

(b) Balance the following reaction by ion-electron method : 3

$$Fe^{2+} + Cr_2O_7^{2-} \longrightarrow Fe^{3+} + Cr^{3+}$$

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