

Bs/CHEM.M-1 (T)

2024

(FYUGP)

(1st Semester)

CHEMISTRY

(Minor)

Paper Code : CHEM.M-1 (T)

**(Inorganic Chemistry—I : Atomic Structure
and Chemical Bonding)**

Full Marks : 75

Pass Marks : 40%

Time : 3 hours

(PART : B—DESCRIPTIVE)

(Marks : 50)

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

1. (a) What quantum numbers reveal information about shape, energy and orientation of orbitals? 3
- (b) Give the postulates of Bohr's model of atom. Give its applications. 3+4=7

(2)

OR

2. (a) Write the electronic configurations of the following atom/ion : 2+2=4

(i) Cr^{3+}

(ii) Ag

- (b) State and explain Heisenberg's uncertainty principle. 3

- (c) Give the limitations of Bohr's model of hydrogen atom. 3

3. (a) What are the various factors that affect the electronegativity? 3

- (b) Describe the general trend in the atomic radii along the period and down the group. 3

- (c) Give the applications (any two) and limitations of Slater's rule. 4

OR

4. (a) Explain, in detail, why the ionization energy of Be is more than that of B. 4

- (b) Discuss the effective nuclear charge and screening or shielding effect. 4

- (c) Write a short note on van der Waals' radius. 2

5. (a) Describe the MO energy level diagram of N_2 and find its bond order and magnetic character. 5
- (b) What is Born-Haber cycle? Give its applications and limitations. 5

OR

6. (a) Describe valence bond theory. Give its limitations. 4
- (b) The central atom in the molecules of CH_4 , NH_3 and H_2O involves sp^3 hybridization of its valence shell orbitals. But the bond angles in these molecules are 109.5° , 107° and 104.5° respectively. Account for this. 3
- (c) Draw the Lewis structure of the following : 3
- (i) CCl_4
- (ii) NH_4^+
7. (a) Explain with examples, the application of redox reaction. 4
- (b) Differentiate between electrode potential and standard electrode potential. 3
- (c) Define the following terms : $1 \times 3 = 3$
- (i) Redox reaction
- (ii) Oxidation
- (iii) Endpoint of titration

OR

8. (a) How will you predict anode and cathode in an electrochemical cell? 2
- (b) Balance the following equation with oxidation number change method : 4
- $$\text{FeS}_2 + \text{O}_2 \longrightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2$$
- (c) Explain briefly the principles involved in the volumetric analysis. 4
9. (a) Discuss in detail the salient features of valence shell electron pair repulsion theory. 4
- (b) State Fajans' rules. Explain the consequences of polarization. 1+3=4
- (c) What do you know about coordinate-covalent bond? 2

OR

10. (a) Define hydrogen bonding. Discuss the different types of hydrogen bonding with examples. 1+4=5
- (b) Derive de Broglie equation. Describe the significance of ψ and ψ^2 . 2+3=5

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Subject Code : Bs/CHEM.M-1 (T)

To be filled in by the Candidate

BA / BSc / BCom / BBA / BCA

1st Semester End Term

Examination, **2024 (FYUGP)**

Subject

Paper

INSTRUCTIONS TO CANDIDATES

1. The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.
2. This paper should be **ANSWERED FIRST** and submitted within 1 (one) Hour of the commencement of the Examination.
3. While answering the questions of this booklet, any cutting, erasing, overwriting or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.

Signature of
Scrutiniser(s)

Signature of
Examiner(s)

Booklet No. A 6

Date Stamp

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**To be filled in by the
Candidate**

BA / BSc / BCom / BBA / BCA

1st Semester End Term

Examination, **2024 (FYUGP)**

Roll No.

Regn. No.

Subject

Paper

DESCRIPTIVE TYPE

Booklet No. B

Signature of
Invigilator(s)

2024

(FYUGP)

(1st Semester)

CHEMISTRY

(Minor)

Paper Code : CHEM.M-1(T)

**(Inorganic Chemistry—I : Atomic Structure
and Chemical Bonding)**

(PART : A—OBJECTIVE)

(Marks : 25)

The figures in the margin indicate full marks for the questions

SECTION—I

(Marks : 15)

Put a Tick (✓) mark against the correct answer in the
brackets provided : 1×15=15

1. For each value of l , the number of m values are

(a) $2l$ ()

(b) nl ()

(c) $2l+1$ ()

(d) $n-1$ ()

2. A subshell with $n=5$, $l=2$ can accommodate maximum _____ electrons.

(a) 10 ()

(b) 12 ()

(c) 36 ()

(d) 54 ()

3. Fe^{3+} has five unpaired electrons. It can be explained by

(a) Aufbau principle ()

(b) Hund's rule ()

(c) Pauli's exclusion principle ()

(d) Heisenberg's uncertainty principle ()

4. Which has the largest first ionization enthalpy?

(a) Li ()

(b) Na ()

(c) K ()

(d) Rb ()

5. O_2^{2-} is isoelectronic with

(a) H_2 ()

(b) N_2 ()

(c) F_2 ()

(d) S_2 ()

6. The last in d -block elements goes to

(a) nd ()

(b) $(n-1)d$ ()

(c) np ()

(d) $(n-1)s$ ()

7. The orbital angular momentum of an electron in $2s$ -orbital is

(a) $\pm \frac{1}{2} \frac{h}{2\pi}$ ()

(b) $+\frac{h}{2\pi}$ ()

(c) zero ()

(d) $\sqrt{2} \frac{h}{2\pi}$ ()

8. The number of elements present in the fifth period of the periodic table is

(a) 8 ()

(b) 10 ()

(c) 18 ()

(d) 32 ()

9. Which of the following molecules is not an example of sp hybridization?

(a) BeCl_2 ()

(b) BeH_2 ()

(c) SnCl_2 ()

(d) BeF_2 ()

10. sp^3d^2 hybridization is observed in

(a) BrF ()

(b) BrCl₃ ()

(c) ClF₃ ()

(d) SF₆ ()

11. Lateral overlapping of the two-half filled atomic orbitals is called

(a) sigma bond ()

(b) covalent bond ()

(c) pi bond ()

(d) coordinate bond ()

12. The square value of ψ indicates

- (a) nature of electrons ()
- (b) high probability of finding electron ()
- (c) empty orbital ()
- (d) None of the above ()

13. The oxidation number of S in H_2SO_4 is

- (a) +5 ()
- (b) +4 ()
- (c) +6 ()
- (d) +2 ()

14. The standard electrode potential of H^+ / H_2 electrode is

(a) + 0.15 ()

(b) 0.00 ()

(c) -0.25 ()

(d) -0.44 ()

15. The equivalent weight of KMnO_4 is

(a) 152 ()

(b) 45 ()

(c) 31.6 ()

(d) 63 ()

SECTION—II

(Marks : 10)

Answer the following questions in brief :

2×5=10

1. What do you mean by exclusion in Pauli's exclusion principle?

2. Define ionization potential and electronegativity of an element.

(10)

3. Define lattice energy. Give its importance.

4. What is Bent's rule?

5. Define normality of a solution.
