

1m/CHE-100 (Th) Syllabus-2023

2024

(April)

FYUP : 1st Semester Examination

MINOR COURSE

CHEMISTRY : CHE-100

[Part—A (Introductory Chemistry—I)]

(Theory)

Marks : 56

Time : 3 hours

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

UNIT—I

(Inorganic Chemistry—I)

(Marks : 18)

1. (a) Write down the postulates of Bohr's atomic model. 3
- (b) What do you mean by dual nature of matter and radiation? Derive the de Broglie's equation for matter waves.

1+2=3

(2)

- (c) What is the variation of atomic radii in a periodic table? 2
- (d) Explain the term 'electronegativity'. On what factors the electronegativity of an atom depends? 2

OR

2. (a) Describe the shapes of the *s*- and *p*-orbitals with respect to the three coordinate axes. 3
- (b) Write down the Schrödinger wave equation. Explain the various terms involved in the wave equation. 3
- (c) Explain the variation of electron gain enthalpy across the period and down the group. 2
- (d) Give the appropriate reasons for the following observations : 2
- (i) Size of Na^+ is smaller than that of Na.
- (ii) Ionization potential of N is greater than O.
3. (a) According to the valence bond theory, what type of orbitals can overlap to form a covalent molecule? What are the limitations of the valence bond theory? 3

(3)

- (b) Using VSEPR theory, draw the geometries of the following molecules/ions : 3
- (i) NH_3
- (ii) BF_3
- (iii) H_3O^+
- (c) On the basis of molecular orbital theory, explain why O_2 is paramagnetic while C_2 is diamagnetic. 2

OR

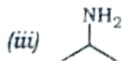
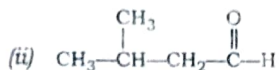
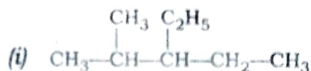
4. (a) Answer/Explain the following by giving reasons : $1\frac{1}{2} \times 2 = 3$
- (i) Out of NaCl and MgO, which has higher lattice energy?
- (ii) Dipole moment of NH_3 is higher than NF_3 .
- (b) What is ion polarization? Giving reasons write which cation in the following pairs will have greater polarizing power : $1\frac{1}{2} \times 2 = 3$
- (i) Na^+ and Cu^+
- (ii) Sn^{2+} and Sn^{4+}
- (c) Discuss the Born-Haber cycle for the formation of NaCl. 2

UNIT—II

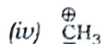
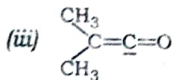
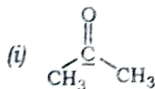
(Organic Chemistry—I)

(Marks : 19)

5. (a) Write the IUPAC names of the following compounds : 1×3=3



- (b) Draw the resonance structures of phenol. 2
- (c) Why are alcohols soluble in water under all proportions? 1
- (d) What is the hybridization of the underlined atoms in each of the following compounds? ½×4=2



- (e) How does cyclopropane react with chlorine? 1½

OR

6. (a) Draw the molecular orbital diagram of the following molecules and predict their hybridization and bond length : 1½×2=3

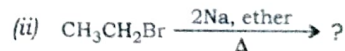
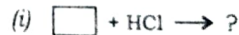


- (b) How does hydrogen bonding affect the boiling points of compounds? 2
- (c) Classify the following as electrophiles and nucleophiles : 1
- H_2O , EtO^\ominus , $\text{H}_3\text{O}^\oplus$, ZnCl_2

- (d) Draw the hyperconjugating structures of propene. 2
- (e) Write down the Wurtz-Fittig method for preparation of alkanes. 1½

7. (a) What are the postulates of Baeyer's strain theory? 2½

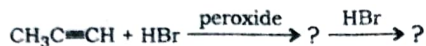
- (b) Complete the following reactions : ½×2=1



- (c) State Markovnikov's rule with suitable example. 1

(6)

- (d) Complete the following reactions : 2



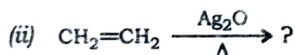
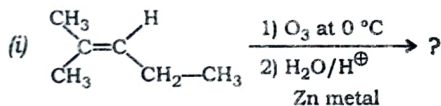
- (e) Write short notes on the following :
1½×2=3

- (i) Polymerization of ethene
(ii) Hydroxylation of alkene

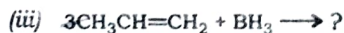
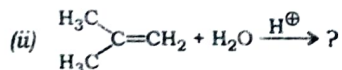
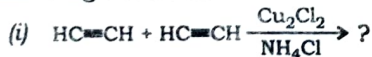
OR

8. (a) How will you prepare alkanes by Corey-House reaction? 2
(b) What is cracking? Explain taking suitable examples. 1½

- (c) Write the correct products of the following reactions : 2+1=3



- (d) Write down the missing products in the following reactions : 3



24D/799

(Continued)

(7)

UNIT—III

(Physical Chemistry—I)

(Marks : 19)

9. (a) What is compressibility factor of a gas? Show graphically the variation of compressibility factor with pressure at a constant temperature for real gases. 4
(b) Give the relationship between root-mean-square velocity and absolute temperature of a gas. 1
(c) Calculate the root-mean-square velocity of oxygen gas at 27 °C. 2
(d) Derive the Bragg's equation for X-ray diffraction of crystals. 3

OR

10. (a) Derive the following gas laws from kinetic gas equation : 2×2=4
(i) Boyle's law
(ii) Charles' law
(b) Explain the following : 1×3=3
(i) Primitive cubic lattice
(ii) Body-centred cubic lattice
(iii) Face-centred cubic lattice

24D/799

(Turn Over)

- (c) What are the causes of deviation of real gases from ideal behaviour? 3
11. (a) Discuss the effect of temperature on the reaction rate. 3
- (b) What are pseudo-first-order reactions? Give example. 2
- (c) Define the following terms : $1 \times 2 = 2$
- (i) Vapour pressure
- (ii) Viscosity of a liquid
- (d) Discuss the effect of additive (ethanol) on the surface tension of a liquid. 2

OR

12. (a) Write the Arrhenius equation and explain the terms involved. Why is the Arrhenius constant called the frequency factor? $2+1=3$
- (b) Define rate of reaction and rate constant. $1+1=2$
- (c) Give a qualitative description of the structure of liquids. 3
- (d) Define zero-order reaction. 1
