

B.Sc. Part—I Semester—I Examination
CHEMISTRY

Time : Three Hours]

[Maximum Marks : 80

N.B. :— (1) **All** questions are compulsory.(2) Question No. **1** carries **8** marks, while each of the remaining **SIX** questions carries **12** marks.

(3) Draw diagram and write equations wherever necessary.

(4) Use of scientific calculator is allowed.

1. (A) Fill in the blanks :

(i) The species containing odd electron is called _____.

(ii) Benzene is aromatic while cyclooctatetraene is _____.

(iii) The process is carried out at constant temperature during each step is called as _____ process.

(iv) Entropy is a measure of _____.

 $\frac{1}{2} \times 4 = 2$

(B) Choose the correct alternative :

(i) Which of the following is O, P directing group ?

(a) $-\text{NH}_2$ (b) $-\text{CN}$ (c) $-\text{NO}_2$ (d) $-\text{CHO}$

(ii) The electronegativity values can be determined by :

(a) Mulliken scale

(b) Pauling scale

(c) pH Scale

(d) Both (a) and (b)

(iii) In water system the degree of freedom at triple point is :

(a) One

(b) Two

(c) Zero

(d) Three

(iv) Valence shell electronic configuration of alkali metal is :

(a) ns^2 (b) $ns^2 np^2$ (c) $ns^2 np^3$ (d) ns^1 $\frac{1}{2} \times 4 = 2$ (C) Answer the following in **one** sentence each :

(i) Define carbanion.

(ii) Define screening effect.

(iii) Define covalent radius.

(iv) Define adiabatic process.

 $1 \times 4 = 4$

UNIT—I

2. (A) Define ionisation potential. Explain the periodic variation of ionisation potential along a period and a group of periodic table. 4
- (B) Explain how lattice energy is calculated by Born-Haber's cycle. 4
- (C) Explain any two factors favouring ionic bond formation. 4

OR

3. (P) Define : 4
- (i) van der Waal's radii
- (ii) Metallic Radius. 4
- (Q) How will you determine electronegativity of an atom by using Pauling scale ? 4
- (R) Calculate effective nuclear charge on 4s electron in Potassium. (K – at. No. 19). 4

UNIT—II

4. (A) Write the electronic configuration of II A group elements. 4
- (B) Discuss the oxidation states of carbon family elements. 4
- (C) Discuss the diagonal relationship between Be and Al. 4

OR

5. (P) What are fullerenes ? Give their applications. 4
- (Q) Explain the structure of Diamond and Graphite. 4
- (R) How will you prepare diborane from :
- (i) B_2O_3
- (ii) $NaBH_4$. 4

UNIT—III

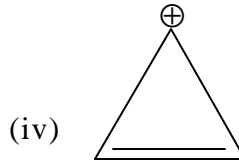
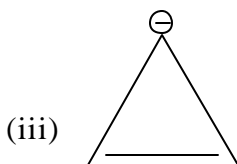
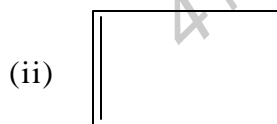
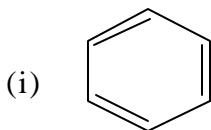
6. (A) What happens when :
- (i) Ethyl bromide reacts with sodium metal in presence of dry ether, and
- (ii) Methane reacts with chlorine in presence of UV light ? 4
- (B) Explain the stability of carbocation on the basis of :
- (i) Inductive effect
- (ii) Resonance effect. 4
- (C) Explain the mechanism for addition of hydrogen bromide to propylene in absence of organic peroxide. 4

OR

7. (P) How will you prepare the following ?
- (i) Acetylene from ethylene dibromide
- (ii) Ethane from Acetylene. 4
- (Q) What are carbocations ? Give their method of generation. 4
- (R) Define electromeric effect. Explain its types. 4

UNIT—IV

8. (A) Discuss the Kekule's structure determination of benzene. 4
- (B) How does benzene reacts with :
- (i) Conc. HNO_3 and Conc. H_2SO_4
- (ii) Acetylene Chloride in presence of AlCl_3 . 4
- (C) Identify which of the following compounds are aromatic and antiaromatic :



OR

9. (P) Explain the following terms with suitable examples :
- (i) Ortho-para directing group
- (ii) Meta-directing group. 4
- (Q) Discuss the mechanism of nitration of benzene. 4
- (R) What are the characteristics of antiaromatic compounds ? 4

UNIT—V

10. (A) Distinguish between isothermal and adiabatic process. 4
- (B) Describe the four steps of Carnot cycle. 4
- (C) Define the term entropy and give physical significance of it. 4

OR

11. (P) Calculate the entropy change when 0.02 moles of an ideal gas at 298 K and allowed to expand from 0.5 dm^3 to double its volume and simultaneously heated to 373 K. (Given $V = 12.6 \text{ JK}^{-1} \text{ mol}^{-1}$). 4
- (Q) Explain the terms :
- (i) Isothermal process
- (ii) Efficiency of Heat engine. 4
- (R) Show that entropy change for reversible and isothermal process taken together is zero. 4

UNIT—VI

12. (A) Draw well labelled diagram of the sulphur system and explain the significance of curves. 4
- (B) Derive the relationship between critical constant in terms of van der Waal's constant. 4
- (C) Calculate mean velocity and root mean square velocity of methane molecule at 27°C. 4

OR

13. (P) Define the following terms with examples : 4
- (i) Components
- (ii) Phase.
- (Q) Explain Maxwell-Boltzmann Distribution Law. 4
- (R) Calculate the pressure exerted by 2 mole of water vapour in 20 liters at 100°C, using (a) the ideal gas law and (b) van der Waals equation. 4
- (Given : $a = 5.52 \ell^2 \text{ atm mol}^{-2}$ and $b = 0.0304 \ell \text{ mol}^{-1}$, $R = 0.082 \text{ lit atm K}^{-1} \text{ mol}^{-1}$)