AS–1349

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 diagrams and write equations wherever necessary.

(4) Use of calculator is allowed.

1. (A) Fill in the blanks :

(i) Alkaline earth metals exhibit only _____ oxidation state.

(ii) Diamond and graphite are allotropes of _____ .

(iii) Methyl amine is _____ basic than ammonia.

(iv) SI unit of entropy is _____ . 2

(B) Choose correct option from the given alternatives :

(i) The position of p-block in the periodic table is :

(a) On the left (b) On the right

(c) In the middle (d) At the bottom

(ii) Benzene on reduction with H_2/Ni catalyst gives mainly :

(a) Cyclohexane (b) 1, 4-cyclohexadiene

(c) n-hexane (d) Hexatriene

(iii) When solid melts :

(a) Entropy is constant (b) Entropy is zero

(c) Decrease in entropy (d) Increase in entropy

(iv) The compressibility factor z for an ideal gas is :

(a) Zero (b) Less than one

(c) More than one (d) Equal to one 2

(C) Answer the following in **one** sentence :

(i) Write the structural formula of picric acid.

(ii) Define fullerenes.

(iii) Write electronic configuration of calcium.

(iv) State first law of thermodynamics. 4

UNIT–I

2. (A) Define electron affinity. How does it vary in a period and a group ? 4

(B) Define the following terms :

(i) Metallic radius

(ii) Lattice energy. 4

(C) Define solvation energy. What are the factors affecting solvation energy ? 4

OR

3. (P) Explain the variation of atomic radii along a group and a period of periodic table. 4

(Q) Define ionic bond. What are the factors favouring ionic bond formation ? 4

(R) Calculate the effective nuclear charge for 3s electron of sodium atom (At. No. Na – 11). 4

UNIT–II

4. (A) Discuss the diagonal relationship between Be and Al. 4

(B) Define the following terms :

(i) Ionization energy

(ii) Inert pair effect. 4

(C) Discuss the oxidation states of carbon family elements. 4

OR

5. (P) Write the electronic configuration of IIIA group elements. 4

(Q) Draw hydrogen bridge structure of diborane. Mention the facts supporting the bridge structure. 4

(R) Explain anomalous behaviour of nitrogen. 4

UNIT–III

6. (A) Define the following terms with suitable example :

(i) Inductive effect

(ii) Carbonium ion. 4

(B) Complete the following reactions :

(i) $H-C\equiv C-H + H_2 \xrightarrow[\text{Quinoline}]{Pd/BaSO_4} ?$ 2

(ii) $CH_3-CH_2-Br + KOH \xrightarrow{\text{Alcohol}} ? + ? + ?$ 2

(C) Explain the mechanism of chlorination of methane. 4

OR

7. (P) Explain electrometric effect with suitable example. 4

(Q) Explain the mechanism of addition of HBr to propylene. 4

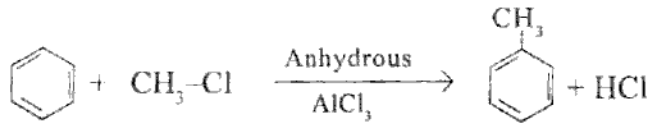
(R) What happens when :

(i) 1, 3 butadine is treated with chlorine ?

(ii) n-hexane heated with Cr_2O_3 supported over alumina ? 4

UNIT–IV

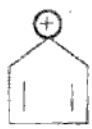
8. (A) Explain the mechanism of following reaction

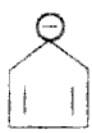


4

(B) Discuss the molecular orbital picture of benzene. 4

(C) Predict the following compounds as aromatic or antiaromatic with explanation :

(i) 

(ii) 

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OR

9. (P) What happens when :

(i) Benzene reacts with sodium is liquid NH_3 in presence of alcohol ?

(ii) Toluene reacts with chlorine in presence of UV light ? 4

(Q) Predict the following groups as ortho-para directing or meta directing :

(i) –Cl

(ii) –CHO

(iii) $-CH_3$

(iv) $-SO_3H$ 4

(R) On the basis of Modern Electronic Theory explain O, P-directing influence of –OH group. 4

UNIT–V

10. (A) Explain the entropy change during :

    (i) Vaporisation process

    (ii) Fusion process. 4

    (B) Give two statements of second law of thermodynamics. 4

    (C) A Carnot heat engine has an efficiency of 0.78 and takes up 276 Joule heat from source at 127°C. Calculate :

    (i) Work done

    (ii) Temperature of sink. 4

OR

11. (P) Derive the expression for work done in reversible isothermal expansion of a gas. 4

    (Q) Define the following terms :

    (i) Adiabatic process

    (ii) Entropy change. 4

    (R) Explain physical significance of entropy. 4

UNIT–VI

12. (A) State the fundamental assumptions of the Kinetic Theory of Gases. 4

    (B) Explain the terms :

    (i) Most probable velocity

    (ii) Degree of freedom. 4

    (C) Calculate RMS and most probable velocity of CH_4 molecule at 30°C (mol wt. of $CH_4 = 16 \times 10^{-3}$ kg and $R = 8.314\ Jk^{-1}\ mol^{-1}$) 4

OR

13. (P) State and explain law of corresponding states. 4

    (Q) Define the terms :

    (i) Collision diameter

    (ii) Critical temperature. 4

    (R) Explain the phase diagram of water system. 4