B.Sc. (Part—I) Semester—I Examination

1S : CHEMISTRY

Time : Three Hours] [Maximum Marks : 80

Note :— (1) All questions are compulsory.

(2) Question No. 1 carries **8** marks, while each of the remaining **SIX** questions carry **12** marks.

(3) Draw diagrams and write equations wherever necessary.

(4) Use of calculator is allowed.

1. (A) Fill in the blanks :

(i) All non-cyclic alkanes have general formula _____.

(ii) In a group, from top to bottom the ionization energy goes on _____.

(iii) Replacement of hydrogen atom of benzene by alkyl group is called _____ of benzene.

(iv) Gibb's phase rule equation is _____. 2

(B) Choose the correct option from the given alternatives :

(i) The electronegativity values can be determined by :

(a) Mullikan scale (b) Pauling scale

(c) pH scale (d) Both (a) and (b)

(ii) Which of the following compound is antiaromatic ?

(a) Benzene (b) Cyclobutadiene

(c) Cyclodecapentene (d) Cyclooctatetraene

(iii) Cyclohexene is converted to 1,3-butadiene in presence of _____ alloy.

(a) Ni-Pt (b) Ni-Cr

(c) Pt-Pd (d) Ni-Pd

(iv) In sulphur system degree of freedom for triple point is :

(a) Zero (b) One

(c) Two (d) Three 2

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

(i) State Second Law of thermodynamics

(ii) Define Screening effect

(iii) Define Critical temperature

(iv) What is solvation energy ? 4

UNIT—I

2. (A) What is lattice energy ? Draw a neat labelled diagram of formation of ionic solid NaCl. 4

(B) Calculate the effective nuclear charge for 4S electron in Potassium (At. No. 19). 4

(C) What are S and P block elements ? Give two examples of each. 4

OR

3. (P) What is meant by ionization energy ? Explain the trend of ionization energy along period. 4

(Q) How will you determine electronegativity of an atom by using Pauling's scale ? 4

(R) Define :

(i) Covalent radii

(ii) van der Waal's radii. 4

UNIT—II

4. (A) How will you prepare diborane from (i) BCl_3 and (ii) B_2O_3. 4

(B) Write down the electronic configuration of II A group (alkaline earth metal) elements. 4

(C) Explain the structures of Diamond and Graphite. 4

OR

5. (P) Explain why alkaline earth metals are less reactive than alkali metals. 4

(Q) What are fullerenes ? Give their applications. 4

(R) What are Carbides ? How are they classified? 4

UNIT—III

6. (A) What are Free Radicals ? Give two methods of generation. 4

(B) Explain :

(i) Inductive effect

(ii) Hyperconjugation. 4

(C) What happens when :

(i) 1, 3-butadiene is treated with bromine in presence of CCl_4

(ii) Propane on treatment with chlorine in presence of U.V. light ? 4

OR

7. (P) Define carbocation. Explain its stability on the basis of inductive effect. 4

(Q) What are alkadienes ? Give their types with example. 4

(R) Explain the mechanism of addition of HBr to unsymmetrical alkene in the presence of organic peroxide. 4

UNIT—IV

8. (A) How does Benzene react with :

(i) H_2 in presence of nickel catalyst

(ii) Conc.HNO_3 and Conc.H_2SO_4 ? 4

(B) On the basis of modern electronic theory explain m-directing effect of $-NO_2$ group. 4

(C) Define with suitable example :

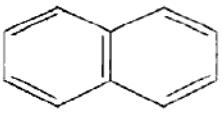
(i) Activating group and

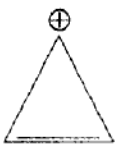
(ii) Deactivating group. 4

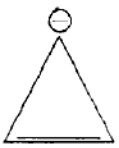
OR

9. (P) Identify which of the following compounds are aromatic and antiaromatic :

(i) 

(ii) 

(iii) 

(iv)  4

(Q) Discuss the mechanism of alkylation of Benzene. 4

(R) How will you obtain the following from Benzene :

(i) Chlorobenzene

(ii) Acetophenone ? 4

UNIT—V

10. (A) State FIRST Law of thermodynamics and give its limitations. 4

(B) Draw neat labelled Carnot cycle diagram and name the four steps involved in cycle. 4

(C) Calcuate the entropy change when 1 mole of an ideal gas expands reversibly from initial volume of 1 dm^3 to a final volume of 10 dm^3 at a constant temperature of 298 K. 4

OR

11. (P) Derive an expression for entropy change of an ideal gas in terms of temperature and volume. 4

(Q) Explain the terms :

(i) Isothermal Process

(ii) Efficiency of Heat engine. 4

(R) Explain the entropy change in following processes :

(i) Fusion Process

(ii) Vaporisation Process. 4

UNIT—VI

12. (A) Draw well labelled diagram of the sulphur system and explain the significance of curves. 4

(B) Define the following terms :

(i) Mean free path

(ii) Components. 4

(C) Explain the applicability of van der Waal's equation in terms of low pressure and high pressure. 4

OR

13. (P) Explain Maxwell-Boltzmann distribution law of molecular velocities. 4

(Q) Calculate mean velocity, root mean square velocity of methane molecule at 27°C. 4

(R) State and explain true equilibrium and metastable equilibrium. 4