UNIT VI

12. (A) Define :—

(i) Unit cell.

(ii) Center of symmetry. 4

(B) Derive Bragg's equation $2d \sin\theta = n\lambda$. 4

(C) Draw the diagrams for Bravais lattices of cubic system and calculate the number of atoms per unit cell in F.C.C. 4

OR

13. (P) State law of rational indices. What are Miller indices ? 4

(Q) Explain the following with suitable diagram :—

(i) Plane of symmetry.

(ii) Axis of symmetry. 4

(R) Interplanar distance for 100 planes of SCC was 0.282 nm. The glancing angle for first order x-ray reflection from 100 planes was found to be 5.9^0. Calculate the wavelength of x-rays. 4

Fourth Semester B. Sc. (Part - II) Examination

(New Course)

4S CHEMISTRY

P. Pages : 8

Time : Three Hours] [Max. Marks : 80

Note : (1) Question number **One** is compulsory.
(2) Solve **One** question from each unit.
(3) Draw diagrams and give equations wherever necessary.
(4) Use of scientific calculator is allowed.

1. (A) Fill in the blanks :—

(i) Actinides beyond atomic number 92 are called as ——— elements.

(ii) Depression of freezing point is a ——— property.

(iii) Transition metal salts are coloured due to the presence of partially filled——— orbitals.

(iv) Aniline is a ——— base than methyl amine. 2

(B) Select the correct alternative :—

(i) Number of elements in 4f series are:

(a) 10 (b) 14

(c) 15 (d) 18

(ii) Magnetic moment of a diamagnetic substance is :

(a) +ve (b) –ve

(c) zero (d) None of these.

(iii) The number of atoms per unit cell in body centred cubic lattic (bcc) is

(a) 1 (b) 2

(c) 3 (d) 4

(iv) Sucrose is a ———

(a) Monosaccharide

(b) Disaccharide

(c) Trisaccharide

(d) Polysaccharide. 2

(C) Answer in **one** sentence :—

(i) What is an ore ?

(ii) Why cobalt is transition element ?

(iii) What is the structural formula of benzene diazonium chloride ?

(iv) State the law of symmetry in crystals. 4

(C) A solution cantaining 0.01 kg of sodium chloride in 1 kg of water freezes at 272.396K. The molal depression constant of water is 1.85 k kg mol^{-1}. Calculate the degree of dissociation of sodium chloride in the solution (molar mass of NaCl = 58.5 x 10^{-3} kg mol^{-1}). 4

OR

11. (P) Define following :—

(i) Molal elevation constant.

(ii) Colligative properties. 4

(Q) Describe Rast's method to determine depression of freezing point and molecular weight of solute. 4

(R) Calculate the molal depression constant for water :

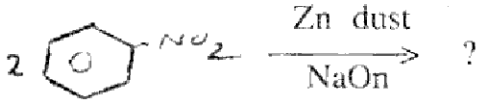
Given :

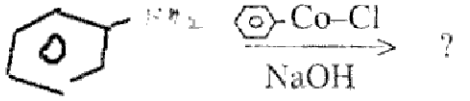
(i) Latent heat of fusion of ice at 0^0 C = 6.024 kJ mol^{-1}

(ii) R = 8.314 Jk^{-1} mol^{-1}

(iii) Molar mass of water = 18 x 10^{-3} kg mol^{-1} 4

9. (P) Complete the following reactions :—

(i)  ?

(ii)  ? 4

(Q) Explain why :—

(i) Methyl amine is much stronger base than aniline.

(ii) P–Nitroaniline is much weaker base than aniline. 4

(R) (i) How will you convert :—

Aniline to benzene diazonium chloride.

(ii) Define Zwitter ion. 4

UNIT V

10. (A) Describe Cottrell's method for determination of elevation of boiling point. 4

(B) Derive an equation for the determination of degree of association from Van't Hoff's factor. 4

UNIT I

2. (A) Which of the following transition metal ions are expected to be coloured and why ?

Sc^{3+}, Ni^{2+}, Co^{2+}, Zn^{2+} 4

(B) Explain the variable oxidation state shown by the following outer electronic configuration.

$3d^54s^2$, $3d^54s^1$, $3d^34s^2$, $3d^94s^2$ 4

(C) Use Ellingham diagram to explain :

(i) Why all the lines slope upward from left to right ?

(ii) What happens when a line crosses the $\Delta G = 0$ axis ? $2 \times 2 = 4$

OR

3. (p) Write electronic configuration of 3d series transition elements. 4

(Q) Discuss the catalytic activity of first transition series elements. 4

(R) Define Mineral. How it differs from ore ? 4

UNIT II

4. (A) Discuss the magnetic properties of lanthanides. 4

(B) In what respect lanthanides differ from actinides. 4

(C) Explain the froath floatation process of concentration ore. 4

OR

5. (P) What is lanthanide contraction ? Explain. 4

(Q) Discuss the electronic configuration of actinides. 4

(R) Discuss the electrolytic refining of metals. 4

UNIT III

6. (A) Discuss the molecular orbital picture of naphthalene. 4

(B) What is a reactive methylene group ? How is ethyl acetoacetate prepared ? 4

(C) Discuss the open chain structure of glycose. 4

OR

7. (P) What are polynuclear hydrocarbans ? Discuss Haworth synthesis of Naphthalene. 4

(Q) Starting from acetoacetic ester how would you synthesise following ?

(i) Acetyl acetone

(ii) Acetic acid. 4

(R) How will you bring about following Conversions ?

(i) Glucose to fructose.

(ii) Fructose to Glucose. 4

UNIT IV

8. (A) How will you prepare :—

(i) Nitrobenzene from benzene. 2

(ii) Phenol from Benzene diazonium chloride. 2

(B) How does aniline react with the following:

(i) Carbonyl chloride.

(ii) Carbon disulphide. 4

(C) (i) Give the laboratory preparation of benzene diazonium chloride.

(ii) How alanine is prepared by Strecker's synthesis. 4