FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2013

(UG-CCSS)

Chemistry—Core Course

CH5 B11—PHYSICAL CHEMISTRY—II

(Common for Industrial Chemistry)

Time : Three Hours   Maximum : 30 Weightage

I. Answer *all* the *twelve* questions. Each question carries a **weightage** of $\frac{1}{4}$. This section contains **Multiple Choice, Fill in the blank and One word answer questions** :

1 If the constituents of a crystal are regarded as perfect sphere of radius *r* **and edge length of the unit cell a, then for a body centred cube** :

(a) $r = \dfrac{a}{2}$.

(b) $r = \dfrac{}{4} a$.

(c) $r = \dfrac{}{4} a$.

(d) $r = \dfrac{4}{} a$.

2 The number of formula units per unit cell is one, is :

(a) CsCl.   (b) NaCl.

(c) ZnS.   (d) CaF_2.

3 **The point group to which** BF_3 **belongs is** :

(a) D_2h.   (b) D_3h.

(c) C_{2v}.   (d) C_{3v}.

4 IR spectrum is also called :

(a) U.V spectrum.   (b) Vibrational spectrum.

(c) Rotational spectrum.   (d) Vibrational rotational spectrum.

5 The number of line into which the ESR peak of CH_3 group splits is :

(a) 3.   (b) 1.

(c) 4.   (d) 5.

6 Temperature independent concentration term among the following is :

(a) Normality.   (b) Molality.

(c) Molarity.   (d) Volume percentage.

Turn over

7 Acetic acid undergoes **dimerisation** in benzene. The approximate molecular mass of acetic acid in benzene, when determined by measuring colligative property is :

    (a) 60.   (b) 30.

    (c) 120.   (d) 15.

8 In a colloidal system the size of the dispersed particles will be :

    (a) Less than 1 nm.   (b) Higher than 100 nm.

    (c) Above 50000 nm.   (d) Between 1 nm and 100 nm.

9 Adsorption of a gas on the surface of a solid adsorbent at a particular temperature is associated with

    (a) Decrease in enthalpy.   **(b)** Decrease in entropy.

    (c) Decrease in free energy.   (d) All these.

10 The total number of elements of a group is called _____ of the group.

11 An element in a group which commutes with all the other elements in the group and leaves them unchanged is known as _____

12 Name one optical property of colloid.

$$(12 \text{ x } \quad = 3 \text{ weightage})$$

II. Answer **all the nine** questions. Each question carries a **weightage** 1 :

13 Define co-ordination number of a particle in a crystal. What is the CN of Ca in CaF_2 ?

14 Define improper axis of rotation of a molecule.

15 Write the point group to which NH_3 molecule belongs and mention the symmetry elements.

16 State the Frank Condon principle.

17 What are colligative properties ? Give examples.

18 What is the **signficance** of **van't** Hoff factor ?

19 Write the mathematical formulation of phase rule and explain the terms.

20 Distinguish between Physical adsorption and Chemical adsorption.

21 Explain **Bredigs** method for the preparation of gold sol.

$$(9 \text{ x } 1 = 9 \text{ weightage})$$

III. Answer any *five* questions. Each question carries a **weightage** 2 :

22 Derive the Bragg's equation.

23 When a metal crystallises in **fcc,** the edge length of the unit cell is found to be 4A and when crystallised in **bcc,** the edge length is 3A. Calculate the ratio of the densities of the metal in **fcc and bcc** forms.

24 Give the group multiplication table of symmetry operations in H_2O molecule.

25 Write any *four* advantages of Raman **specra** over **IR** spectra.

26 Calculate the ESR frequency of an unpaired electron in a magnetic field of 0.333 T. (g_e = 2 and μ_B = 9.27 x 10^{-24} J1^{1-1}).

27 At a particular temperature, the vapour pressure of pure water is 25 mm of Hg and that of a dilute solution of urea in water is 24.5 mm of Hg. Calculate the molality of the solution.

28 State and explain Nernst distribution law. Write any two applications of the law.

(5 x 2 = 10 weightage)

IV. Answer any *two* questions. Each question carries a weightage 4 :

29 (a) What are liquid crystals ? How are they classified ? Mention any *two* applications of liquid-crystals.

(b) Write briefly on stoichiometric point defects.

30 Discuss the principle of NMR spectroscopy. Mention the important informations that can be obtained from NMR spectrum.

31 (a) Explain the phase diagram of water system.

(b) What are protective colloids ? How will you measure the protective power of a protective colloids ?

(**2 x 4** = 8 weightage)