D 90929 (Pages : 3) Name.....

Reg. No.....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2015

(UG—CCSS)

Core Course—Chemistry

CH 5B 11—PHYSICAL CHEMISTRY—II

Time : Three Hours Maximum : 30 Weightage

I. Answer all the *twelve* questions. Each question carries a weightage of ¼.

1 In a f.c.c. arrangement the number of atoms in the unit cell is :

(a) 8. (b) 2.

(c) 1. (d) 4.

2 The unit cell with crystallographic dimension $a = b \# c$, $\alpha = \beta = \gamma = 90$ is :

(a) Cubic. (b) Tetragonal.

(c) Monoclinic. (d) Hexagonal.

3 SO_2 belongs to which point group ?

(a) C_{2v}. (b) C_{2h}.

(c) D_{2h}. (d) $D \infty h$.

4 Which of the following molecule has an inversion centre (centre of symmetry) ?

(a) SF_6. (b) SiH_4.

(c) CH_4. (d) PF_5.

5 What would be the splitting of the protons on the CH_2 groups of butane ?

(a) Doublet. (b) Sextet.

(c) Triplet. (d) Singlet.

6 Which of the following bonds will show an absorption band at the highest wave number ?

(a) C = O. (b) C = C.

(c) O – H. (d) C – H.

Turn over

7 0.5 M solution of urea is isotonic with :

(a) 0.5 M solution of NaCl.

(b) 0.5 M solution of sugar.

(c) 0.5 M solution of benzoic acid in benzene.

(d) 0.5 M solution of $BaCl_2$.

8 At high altitude the boiling point of water lowers because :

(a) Atmospheric pressure is low. (b) Temperature is low.

(c) Atmospheric pressure is high. (d) None of these.

9 For the study of distribution law the two solvents should be :

(a) Miscible. (b) Non-miscible.

(c) Volatile. (d) Reacting with each other.

10 For a three-phase system with one component, the degrees of freedom is :

(a) Zero. (b) One.

(c) Three. (d) Two.

11 In which of the following Tyndall effect is not observed :

(a) Suspension. (b) Emulsion.

(c) Sugar solution. (d) Gold sol.

12 Fog is a colloidal system in which the dispersed phase and dispersion medium respectively are :

(a) Gas, Liquid. (b) Liquid, Gas.

(c) Liquid, Liquid. (d) Solid, Liquid.

(12 × ¼ = 3 weightage)

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

13 What is the law of rational indices ?

14 Differentiate between isotropy and anisotropy.

15 Define centre of symmetry of a crystal.

16 What are the selection rules for the vibrational transition in a diatomic molecule ?

17 Differentiate between stokes and anti-stokes lines in Raman spectrum.

18 What do you mean by Van't Hoff factor ?

19 With the help of Clapeyron-Clausius equation predict the effect of pressure on the melting point of ice.

20 What do you mean by incongruent melting point ?

21 Write the B.E.T. equation and explain the terms involved in the equation.

(9 × 1 = 9 weightage)

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

22 Describe powder method used for the determination of structure of crystals.

23 Calculate the number of atoms contained in a primitive cubic unit cell, a body centred cube and a face centred cube.

24 Construct the group multiplication table for water molecule.

25 The force constant of CO is 1840 Nm^{-1}. Calculate the vibrational frequency in cm^{-1}. The atomic masses are $^{12}C = 19.9 \times 10^{-27}$kg ; $^{16}O = 26.6 \times 10^{-27}$ kg .

26 Which colligative property we will use to calculate the molecular mass of polymers ? Why ?

27 Draw phase diagram for two-component system in which the two components form a compound with congruent melting point. Apply phase rule to this diagram.

28 How will you prepare the colloidal solution of gold ?

(5 × 2 = 10 weightage)

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

29 (a) Explain phenol-water system.

(b) Derive Gibb's adsorption isotherm.

30 (a) Show that in a rigid diatomic rotator the moment of inertia is given by $I = \mu r^2$.

(b) Acetic acid (CH_3COOH) associates in benzene to form a dimer. 1.65 g of acetic acid when dissolved in 100g of benzene raised the boiling point by 0.36°C. Calculate the Van't Hoff factor ($K_b = 2.57$ K kg mol^{-1}).

31 Explain intrinsic and extrinsic semiconductors with examples.

(2 × 4 = 8 weightage)