D 11569 (Pages : 3) Name.....

Reg. No.....

FIFTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT) EXAMINATION, NOVEMBER 2016

(UG—CCSS)

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 Which of the following defects if present will reduce the density of a crystal ?

(a) Frenkel. (b) Schottky.

(c) Edge dislocation. (d) All these.

2 Sodium chloride belongs to the crystal system :

(a) Cubic. (b) Hexagonal.

(c) Tetragonal. (d) Orthorhombic.

3 Which of the following belongs to C_{3v} point groups ?

(a) SO_3. (b) BBr_3.

(c) NH_3. (d) $AlCl_3$.

4 Which of the following molecule or ion has D_3h symmetry ?

(a) H_3O^+. (b) $CHCl_3$.

(c) CO_3^{2-}. (d) NF_3.

5 The electronic spectra lie within ———.

(a) Infrared region. (b) Visible or uv- region.

(c) Radio wave region. (d) Microwave region.

6 Which of the following compounds is frequently used as the internal reference in proton nmr spectroscopy :—

(a) TNS. (b) DMF.

(c) TMS. (d) DMSO.

Turn over

7 The sum of mole fractions of A and B in a system containing 0.2 moles each of A and B is :

(a) 0.6. (b) 0.2.

(c) 1. (d) Unpredictable.

8 Assuming complete dissociation, which of the following solution exhibits maximum elevation in boiling point ?

(a) 0.1 molar NaCl. (b) 0.1 molar $CaCl_2$.

(c) 0.1 molar $BaCl_2$. (d) 0.1 molar $FeCl_3$.

9 A mixture of *two* miscible liquids has the number of phases equal to :

(a) Zero. (b) One.

(c) Two. (d) Three.

10 For *one* component system, at triple point the number of degrees of freedom is :

(a) Zero. (b) One.

(c) Two. (d) Three.

11 The adsorption of hydrogen on charcoal is :

(a) Physical adsorption. (b) Chemical adsorption.

(c) Sorption. (d) Activated adsorption.

12 The efficiency of an adsorbent increases with increase in :

(a) Viscosity. (b) Surface tension.

(c) Surface area. (d) Number of ions.

(12 × ¼ = 3 weightage)

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

13 What do you mean by point defect in a crystal ?

14 Define centre of symmetry.

15 Calculate the Miller indices of a crystal plane which cuts through the crystal axes at (2a, 3b, c).

16 How many fundamental vibrational frequencies would you expect for CO_2 molecule ? How do you represent these modes ?

17 State mutual exclusion principle.

18 Draw schematically the phase diagram of water and apply phase rule on it.

19 What is a condensed system ? Write the reduced phase rule equation.

20 Calculate the osmotic pressure of an aqueous solution containing 20 g of glucose per litre of the solution at 25°C.

21 Write the difference between gel and emulsion.

(9 × 1 = 9 weightage)

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

22 The pure rotational spectrum of gaseous HCl consists of a series of equally spaced lines separated by 20.80 cm^{-1}. Calculate moment of inertia of the molecule.

23 Draw the diagrams to represent f.c.c, b.c.c. and simple cube lattices.

24 What are the different types of symmetry elements and symmetry operations of molecules ?

25 State with suitable potential energy curve diagrams the Frank condon principle in the vibrational spectrum of a diatomic molecule.

26 Equimolar solutions of sucrose and sodium chloride in water are not isotonic. Why ?

27 Write the principle of steam distillation.

28 Write any *two* methods for the purification of colloids.

(5 × 2 = 10 weightage)

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

29 What are liquid crystals ? Write a note on different types of liquid crystals.

30 (a) Draw a vapour pressure composition curve showing deviation from Raoult's law and explain it.

(b) The fundamental vibrational frequency of HCl is 2890 cm^{-1}. Calculate the force constant of the molecule. The atomic masses are $^{1}H = 1.673 \times 10^{-27}$ kg, $^{35}Cl = 58.06 \times 10^{-27}$.

31 (a) Derive the Gibbs adsorption isotherm for the adsorption of solute on the surface of a liquid.

(b) With the help of phase diagram explain Kl – H_2O system.

(2 × 4 = 8 weightage)