

**FIFTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION
NOVEMBER 2017**

(UG-CCSS)

CH 5B 11 – PHYSICAL CHEMISTRY – II

(Common For Industrial Chemistry)

Time : Three Hours

Maximum : 30 Weightage

I. Answer *all* the *twelve* questions. Each question carries a weightage $\frac{1}{4}$. This section contains multiple choice. Fill in the blanks and one word answer questions :

1. Ionic compound of A^+ and \bar{B} ions crystallise in cubic lattice with \bar{B} ions in fcc and A^+ ions in all the octahedral voids. Then the empirical formula of the compound is :
 - (a) $A_4 B_3$
 - (b) $A_3 B_4$
 - (c) AB
 - (d) $A B_4$
2. The number of Bravais lattices is maximum for the crystal system :
 - (a) Orthorhombic.
 - (b) Tetragonal.
 - (c) Cubic.
 - (d) Rhombohedral.
3. NH_3 molecule belongs to the point group :
 - (a) C_{2v}
 - (b) D_{3h}
 - (c) C_{3v}
 - (d) C_{2h}
4. The ESR spectrum is observed in the :
 - (a) Visible region.
 - (b) Microwave region.
 - (c) U.V. region.
 - (d) U.V. and visible region.
5. Which among the following molecules is not IR active ?
 - (a) HCl
 - (b) CO
 - (c) NO
 - (d) N_2
6. Which among the following is not a colligative property ?
 - (a) Osmotic pressure.
 - (b) Vapour pressure.
 - (c) Elevation of B.P.
 - (d) Depression of F.P.

7. Molecular mass of NaCl is determined by colligative property measurement of an aqueous solution of it. The approximate value obtained will be :
- (a) 58.5 (b) 29
(c) 117 (d) 15
8. Gel is a colloidal system in which :
- (a) Dispersed phase and dispersion medium are liquids
(b) Dispersion medium is liquid and dispersed phase is solid
(c) Dispersed phase is liquid and dispersion medium is solid
(d) Dispersed phase and dispersion medium are solids.
9. A group in which all elements commute is called _____.
10. Improper axis of rotation is also called _____.
11. Brownian movement is an example of _____ property of colloid.
12. Suggest any one method for the purification of a colloid.

(12 × ¼ = 3 weightage)

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

13. Deduce the Miller indices of a plane whose intercepts are 2a, 3b and c.
14. Write any *two* rules that are to be obeyed by elements of a group.
15. Mention the symmetry elements in H₂O molecule and identify the point group to which it belongs.
16. IR spectrum is also called vibrational rotational spectrum. Why ?
17. State Henry's law.
18. Molality is considered to be a better concentration term than molarity. Justify.
19. State and formulate Gibb's phase rule.
20. What are lyophilic and lyophobic colloids ? Give examples.
21. Write the Langmuir adsorption isotherm and explain the terms.

(9 × 1 = 9 weightage)

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

22. Aluminium (M = 27) crystallises in cubic system with edge length of the cube 405 pm. If the density of Al is 2.7 g cm⁻³, identify the type of unit cell in which Al crystallises.
23. What are liquid crystals ? Write any *two* applications of liquid crystals.
24. Differentiate between symmetry operation and symmetry element.
25. The force constant of CO is 1840 Nm⁻¹. Calculate the vibrational frequency. Given the atomic masses of ¹²C and ¹⁶O as 1.99 × 10⁻²⁶ kg and 2.66 × 10⁻²⁶ kg respectively.

26. Write briefly on the theory of ESR spectroscopy.
27. The degree of dissociation of a weak acid HX in its 0.2 molal aqueous solution is 0.3. Calculate the freezing point of the solution. The K_f value of water is given as 1.85.
28. Define critical solution temperature. Give two examples each for solutions showing upper CST and Lower CST.

(5 × 2 = 10 weightage)

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

29. (a) Derive Bragg's equation.
(b) Write notes on : (i) Schottky defect (ii) Frenkel defect.
30. Write briefly on : (i) Chemical shift (ii) Spin-Spin coupling.
31. (a) State and explain Nernst distribution law. Mention any *two* applications of the law.
(b) What is Donnan membrane equilibrium. Give any two applications of the effect.

(2 × 4 = 8 weightage)