



Reg. No. : .....

Name : .....

**Fifth Semester B.Sc. Degree Examination, November 2014**  
**First Degree Programme Under CBCSS**  
**Core Course**  
**CH 1541 : PHYSICAL CHEMISTRY – I**

Time : 3 Hours

Max. Weight : 30

SECTION – A

Answer **all** questions. (Weightage : 1)

- I. 1) The distance between the centers of two gas molecules at the point of closest approach to each other is called the \_\_\_\_\_
- 2) For an ideal gas, compressibility factor is equal to \_\_\_\_\_
- 3)  $a=b=c$  ;  $\alpha = \beta = 90^\circ$   $\gamma = 120^\circ$  represent \_\_\_\_\_ crystal system.
- 4) The number of Bravais lattices pertaining to the cubic system is \_\_\_\_\_
- II. 5)  $K_f$  of water =  $1.86 \text{ K kg mol}^{-1}$ . An aqueous solution of glucose (molar mass = 180) freezes at 272.628 K. The molality of the solution is \_\_\_\_\_
- 6) Solutions with the same osmotic pressure at a given temperature are called \_\_\_\_\_
- 7) A system which can exchange energy but not matter with its surrounding is called \_\_\_\_\_ system.
- 8) An isobaric process is one in which the \_\_\_\_\_ of the system is kept constant.



III. 9) The relation between  $C_p$  and  $C_v$  is \_\_\_\_\_

- 10) The temperature at which the Joule Thomson coefficient becomes zero is called \_\_\_\_\_
- 11) The \_\_\_\_\_ of the universe always increase in the course of every spontaneous change.
- 12) When 5 KJ of work is done on a system and 1 KJ heat is given out by the system  $\Delta E =$  \_\_\_\_\_

IV. 13) The order of the  $C_{2v}$  point group is \_\_\_\_\_

- 14) The number of vertical mirror planes that ammonia molecule has is \_\_\_\_\_
- 15) An example for a Smectic liquid crystal is \_\_\_\_\_
- 16) In \_\_\_\_\_ Liquid crystals, the color of the material is very sensitive to temperature changes.

#### SECTION – B

#### (Short Answer Type)

Answer **any 8** from the following : (Weightage : 1)

17. What is meant by Collision frequency ?
18. Give the Maxwell – Boltzmann Law of Distribution of Molecular Velocities and explain the terms.
19. Sketch the (220) planes of a face centered cubic lattice.
20. Define Normality of a solution.
21. What will be the nature of the value for van't Hoff factors when a solute undergoes association and dissociation in solution ?
22. How is molar refraction of a liquid related to its refractive index and density ?



23. Explain the term closure rule with regard to a point group.
24. What does the term proper rotation mean ?
25. Distinguish between the terms isothermal process and adiabatic process.
26. Define Fugacity.
27. Give the Gibbs – Helmholtz equation and explain the terms.
28. Calculate the work of reversible expansion of 1 mole of ideal gas at  $25^{\circ}\text{C}$  from 10 L to 20 L.

#### SECTION – C

#### (Short Essay Type)

Answer **any 5** from the following : (Weightage : 2)

29. Discuss Andrews experiments on the isotherms of a real gas.
30. The first order reflection of a beam of X-rays of wave length  $1.54\text{ \AA}$  from the (100) plane of NaCl occurs at an angle of  $15.9^{\circ}$ . Calculate the edge length of the unit cell.
31. Using Carnot's cycle derive an expression for the efficiency of heat engine.
32. Describe with theory the Capillary rise method of determining surface tension of a liquid.
33. Give the group multiplication table for the point group  $C_{2v}$ .
34. Derive the Gibbs – Duhem equation.
35. How are the liquid crystals classified ? Explain the structural features of each class.
36. Calculate the entropy change produced when 5 moles of an ideal gas expand reversibly from a volume  $120\text{ dm}^3$  at  $300\text{K}$  to a volume of  $150\text{ dm}^3$  at  $400\text{K}$ . ( $C_v=1.5R$ ).



SECTION – D  
(Long Essay Type)

Answer **any 2** from the following : (Weightage : 4)

37. Discuss the powder method for the X-ray diffraction studies of crystals and the analysis of the diffraction patterns for the cubic lattices.
38. a) Describe any one process for the liquefaction of gases making use of Joule Thomson effect.
- b) What is chemical potential ? Obtain an expression for the chemical potential of an ideal gas in a mixture of ideal gases.
39. Derive Kirchhoff's equation relating to the variation of enthalpy of a reaction with temperature. Write down the integrated form of the equation. Mention its applications.
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