Reg. No. : ....

Name : ....

Fifth Semester B.Sc. Degree Examination, December 2018
(First Degree Programme under CBCSS)
CHEMISTRY
Core Course – V
CH 1541 : Physical Chemistry – I
(2013 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** question carries **1** mark.

1. Define mean free path.

2. Arrange most probable velocity, average velocity and RMS velocity in the increasing order of magnitude.

3. The total number of Bravais lattices is _____

4. A plane cuts the a, b and c axes at 2a, 3b and c. Find the Miller indices of the plane.

5. Solutions having same osmotic pressure are called _____

6. One mole of an ideal gas at 0°C (volume 22.4 l) undergoes expansion against a constant pressure of 1 atm. The final volume is 224 l. The work done is _____ l atm.

7. During Joule-Thomson expansion, _____ remains constant.

8. According to Maxwell's relation $\left(\dfrac{\partial P}{\partial T}\right)_v = $ _____.

9. BF_3 belongs to _____ point group.

10. The two planes in water molecule are _____ (vertical, horizontal, one vertical and one horizontal)

(10×1=10 Marks)

P.T.O.

SECTION – B

Answer **any eight** questions. **Each** question carries 2 marks.

11. Write Maxwell's distribution of molecular velocity. Represent it graphically. What is the effect of temperature on the distribution ? Explain.

12. Calculate most probable velocity for O_2 at 0°C.

13. What are the Bravais lattices under cubic system ? Find the number of atoms per unit cell in each of them.

14. KCl belongs to fcc. But XRD pattern of KCl resembles simple cubic. Why ?

15. 54.18 g of glucose (M = 180 g) is dissolved in water and made up to 1000 ml. Find the osmotic pressure of the solution T = 298 K.

16. Define inversion temperature. Explain its significance.

17. What is the effect of temperature on the viscosity of liquids ? Explain.

18. State and explain Hess's law.

19. Free energy functions are better criteria than entropy in predicting spontaneity. Why ?

20. What is the effect of

    a) P

    b) T on Gibb's free energy ? Explain.

21. Explain with example improper rotation axis.

22. Define liquid crystals. How are they classified ? **(8×2=16 Marks)**

SECTION – C

Answer **any six** questions. **Each** question carries **4** marks.

23. Calculate the number of collisions per m^3 per sec. for O_2 at 0°C and 1 bar pressure. Diameter of O_2 is 0.36 nm.

24. Define critical constants. Show that $T_c = \dfrac{8a}{27Rb}$ (a, b – Vander Waals constants).

25. The diffraction patterns of a cubic system are shown in $\sin\theta$ values of 0.1461, 0.1690, 0.2801, 0.2935 and 0.3697. Find the lattice type. Justify your answer.

26. Derive Poiseuille's equation. Discuss.

27. Show that $\bar{C}_p - \bar{C}_v = R$ for ideal gas.

28. Derive Kirchhoff's equation.

29. Derive Gibb's Helmholtz equation.

30. Define partial molal volume. How is it determined ? Discuss with the help of one example.

31. Discuss Swarm theory of liquid crystals.

(6×4=24 Marks)

SECTION – D

Answer **any two** questions. **Each** question carries **15** marks.

32. a) Define fugacity. How is it determined ? Discuss.

 b) Derive Gibbs-Duhem equation.

33. a) Define Vant Hoff's factor. How is it determined in cryoscopy ?

 b) Derive equations for Δu, ΔH, ΔS, ΔA and ΔG for adiabatic expansion.

34. Write a brief account of

 a) rotating crystal method

 b) powder method in crystallography.

35. Discuss briefly

 a) Virial equation of state

 b) Non-stoichiometric defect

 c) Joule Thomson effect.

(2×15=30 Marks)