K20P 0308

Reg. No. : .....

Name : .....

II Semester M.Sc. Degree (CBSS – Reg./Suppl./Imp.)
Examination, April 2020
(2014 Admission Onwards)
CHEMISTRY
CHE 2C.07 : PHYSICAL CHEMISTRY – II

Time : 3 Hours Max. Marks : 60

SECTION – A

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

1. Calculate the number of ways of distributing 20 identical objects with the arrangement 1, 0, 3, 5, 10, 1.
2. What do you mean by statistical equilibrium ?
3. What is thermionic emission ? Give example.
4. Differentiate between Fermions and Bosons.
5. Exemplify piezoelectricity.
6. What is the significance of perovskite structure ?
7. What is the difference between point group and space group ?
8. Give example for isomorphism in solids. **(8×1=8)**

SECTION – B

Answer **eight** questions. Answer may be in **two** or **three** sentences. **Each** question carries **two** marks.

9. What is the total partition function for a diatomic molecule ? Explain.
10. Calculate the ratio of the translation partition functions of D_2 and H_2 at the same temperature and pressure.

P.T.O.

11. Explain how the absolute entropy of a gas at 25°C can be determined using third law of thermodynamics.

12. What is a Bose-Einstein condensate ? Explain with example.

13. Briefly discuss the free Van der Waals theory of liquid state.

14. Exemplify the photoconductivity in liquid crystals.

15. What are the similarities and differences between ferrimagnetism and antiferromagnetism ?

16. Exemplify the formation of colour centres in solids.

17. Write a brief note on Hall effect.

18. Explain the basis for classification of lattices into seven crystal systems and fourteen Bravais lattices.

19. Nickel crystallizes in a cubic crystal system. The first reflection in the powder pattern of nickel is the 111. What is the Bravais lattice ?

20. Arrange the following atoms in order of their ability to scatter X-rays : Na, Co, Cd, H, T1, Pt, Cl, F, O. **(8×2=16)**

SECTION – C

Answer **four** questions **each** in a paragraph. **Each** question carries **3** marks.

21. Derive an expression for transnational partition function.

22. Calculate the standard molar entropy of Xenon gas at 100 K.

23. Sketch the Debye frequency spectrum for a solid.

24. Find the temperature at which 15% of the molecules will be in the first excited state, if it is 350 kJ/mol above the ground state. Both states are non-degenerate.

25. What is superconductivity and critical transition temperature ?

26. Write briefly on reciprocal lattice concept.

27. A certain crystal has lattice parameters of 4.24, 10 and 3.66 A° on X, Y and Z axes respectively. Determine the Miller indices of a plain having intercepts 2.12, 10 and 1.83 A° on X,Y and Z axes.

28. What is Laue equation ? How is it related to Bragg's law ? **(4×3=12)**

SECTION – D

Answer either **A** or **B** of **each** question. **Each** question carries **6** marks.

29. A) State the postulates of Maxwell – Boltzmann statistics and hence derive an expression for the most probable distribution.

OR

B) Explain heat capacity of gases. Discuss the classical and quantum theories associated with it.

30. A) Compare Einstein's theory of atomic crystal with Debye's theory.

OR

B) Briefly discuss the theories of liquid crystals.

31. A) Discuss band theory. How it explains the conductivity in metals ?

OR

B) What is Meissner effect ? Discuss about type I and type II superconductors.

32. A) Write an account on various laws of crystallography.

OR

B) Cu crystallizes with a cubic close-packed structure. The Bragg angles of the first two reflections in the powder pattern collected using Cu-kα radiation are 21.6° and 25.15°. Calculate the unit cell length a and estimate a radius for the Cu atom. **(4×6=24)**