K22P 0158

Reg. No. : .....

Name : .....

II Semester M.Sc. Degree (C.B.S.S. – Reg./Supple./Imp.) Examination, April 2022
(2018 Admission Onwards)
CHEMISTRY
CHE2C.07 : Physical Chemistry – II

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **all** questions. **Each** question carries **1** mark. **(8×1=8)**

1. What is thermodynamic probability ?
2. Ortho-para ratio of molecular Hydrogen at ordinary temperature is 3 : 1. Justify the statement.
3. What are ensembles ?
4. Mention two applications of liquid crystals.
5. The intercepts with x, y and z axes are given as ½ ,1 and ¾, find out the corresponding Miller indices for the same.
6. What is antiferromagnetism ?
7. Write the general chemical formula of spinels.
8. What do you mean by 'k space' ?

P.T.O.

SECTION – B

Answer **eight** questions. Answers may be in **2** or **3** sentences. **Each** question carries **2** marks. **(8×2=16)**

9. What is residual entropy ?
10. Write a note on thermal de-Broglie wavelength.
11. What are nematic liquid crystals ?
12. Differentiate between bosons and fermions.
13. Hydrogen behaves as a monoatomic gas at low temperatures. Why ?
14. Differentiate plane and point defects in crystals.
15. Which type of imperfections imparts colour to compounds and give reasons for the phenomenon ?
16. Comment about the 'systematic absences' in X ray crystallography.
17. At what angle would the first order diffraction be observed in X ray diffraction of a set of crystal planes for which 'd' is 2.04×10^{-10} m, if the X rays used have a wavelength of 1.54×10^{-10} m ?
18. Some crystal defects show lowering of crystal density while others show no change at all. Why ?
19. Why only 14 Bravais lattices are possible in crystal structures ?
20. In CO, spacing between excited rotational states is 0.025 kJ mol^{-1}. If the degeneracy of the first excited state is 3, calculate the fraction of molecules in the first excited state at room temperature.

SECTION – C

Answer **four** questions **each** in a paragraph. **Each** question carries **3** marks. **(4×3=12)**

21. Derive Sackur-Tetrode equation.
22. Calculate the translational partition function of a molecule of Oxygen gas at 298 K moving in a vessel of volume 24.4 dm^3.
23. Using the Sackur-Tetrode equation, calculate the translational entropy of argon gas at 298 K and $1.013 \times 10^5 Nm^{-2}$ pressure. The atomic weight of argon in g mol^{-1} is 39.95.
24. Calculate the no. of ways of distributing distinguishable molecules a, b, c between three energy levels so as to obtain the following set of occupation number $N_0 = 1$, $N_1 = 1$, $N_2 = 1$. Also write the different configuration.
25. Show that 5-fold axis of symmetry is absent in solids.
26. Explain the principle of structure, elucidation using X ray crystallography.
27. Explain the 'BCS' theory of super conductivity.
28. What is Hall effect and list some of its applications.

SECTION – D

Essay type questions. Answer **four** questions. **Each** question carries **6** marks. **(4×6=24)**

29. A) Derive Bose-Einstein statistics .

OR

B) Write a note on theories of liquid state.

30. A) Apply Fermi-Dirac statistics to understand thermionic emission.

OR

B) a) Calculate the translational partition function for benzene in a volume of $1m^3$ at 25°C.

b) Calculate rotational partition function for F_2 at 25°C. Given I = 32.5×10^{-47} kg m^2.

31. A) Explain the Debye Sherrer method for the structure elucidation of crystals.

OR

B) Write a note on the different crystal defects and its effects on the properties of the compounds.

32. A) Discuss briefly electrical properties of semiconductors.

OR

B) Explain the terms :

a) piezoelectricity and ferro electricity and

b) isomorphism and polymorphism.

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