



**K24P 0838**

Reg. No. : .....

Name : .....

**Second Semester M.Sc. Degree (C.B.S.S. – Supple. (One Time Mercy chance) / Imp.) Examination, April 2024**

**(2014 to 2022 Admissions)**

**CHEMISTRY**

**CHE2C.07 : Physical Chemistry – II**

Time : 3 Hours

Max. Marks : 60

**SECTION – A**

Answer **all** questions in **one** word or **one** sentence. **Each** question carries **1** mark.

1. Draw the direction of nuclear spins of ortho-hydrogen.
2. Write the expression for thermal de Broglie wavelength.
3. What are Fermions ?
4. The heat capacity at constant volume of a monoatomic gas,  $C_v =$
5. Define Hall effect.
6. Give one example for antiferromagnetic substance.
7. What is the law of rational indices in crystallography ?
8. Compute the Miller Indices for a plane intersecting at  $x = \frac{1}{2}$ ,  $y = 1$  and  $z = \frac{1}{4}$ .

**(8×1=8)**

**SECTION – B**

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

9. Why does hydrogen have such a high heat capacity ?
10. What is phase space density in statistical mechanics ?

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**K24P 0838**

-2-



- 11 . What is permutation in statistics and probability ?
12. What are the key difference between Debye and Einstein models ?
13. Electrons gas obeys which statistics and why ?
14. What are liquid crystalline photoconductors ? Give example.
15. What is the principle of piezo electric effect ?
16. What is phase problem in crystallography ?
17. What is Brillouin zone in semiconductors ?
18. What do you understand about Cooper pair ?
19. Why X-rays are used to study crystal structure ?
20. What are the different types of solids ?

**(8×2=16)**

#### SECTION – C

Answer **any four** questions. **Each** question carries **3** marks.

21. Deduce the relation between equilibrium constant and the partition function.
22. Express thermodynamic functions using partition function.
23. Explain theory of liquid crystals.
24. Apply Bose-Einstein statistics to liquid helium.
25. Explain briefly on Magnetic properties of solids.
26. Write a short note on BCS theory.
27. Write Laue equation. What are its applications in crystallography ?
28. How unit cells can be identified from systematic absence in diffraction pattern ?  
Explain.

**(4×3=12)**



SECTION – D

Answer **four** questions. **Each** question carries **6** marks.

29. a) Formulate the third law of thermodynamics statistically. 3  
b) Explain how entropy of a monoatomic gas can be obtained from Sackur tetrode equation. 3

OR

Derive the expression for partition function for distinguishable and indistinguishable particles.

30. Apply Fermi Dirac statistics for thermionic emission.

OR

Explain the X-ray diffraction studies of simple liquids and their structure.

31. Explain :  
i) Characterization methods of solids.  
ii) Miller indices.

OR

Explain the term structure factor. Which are the factors influencing the intensity of scattered X-rays.

32. Explain briefly on :  
i) different crystal structures of transition metal oxides.  
ii) Refinement of simple band theory.

OR

Explain the phenomena super conductivity. How super conductors are classified ?  
**(4×6=24)**

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