



QP CODE: 25022633



Reg No : .....

Name : .....

**M.Sc DEGREE (CSS) SPECIAL REAPPEARANCE EXAMINATION, APRIL 2025**

**Third Semester**

M.Sc INDUSTRIAL CHEMISTRY

**CORE - CH060302 - PHYSICAL CHEMISTRY - II**

2020 ADMISSION ONWARDS

06CBD432

Time: 3 Hours

Weightage: 30

**Part A (Short Answer Questions)**

*Answer any **eight** questions.*

*Weight **1** each.*

1. Explains the terms (a) microstates and (b) macrostates with suitable examples.
2. Prove that complete partition function for a system is the product of translational, rotational, vibrational and electronic partition function.
3. Derive the relation between thermodynamic probability and entropy.
4. Explain the significance of rate determining step in a multi step reaction.
5. Unimolecular gas phase reactions follow 1st order kinetics at high pressure and 2nd order kinetics at low pressures. Why?
6. Give the Bronsted Bjerrum equation and explain the terms involved.
7. Explain why the quantum yield for  $\text{H}_2\text{-Cl}_2$  reaction is very high.
8. Give a brief description of development of potential at electrode – electrolyte interface.
9. Distinguish between dissolution and deposition potential.
10. Describe over potential.

(8×1=8 weightage)

**Part B (Short Essay/Problems)**

*Answer any **six** questions.*

*Weight **2** each.*

11. Calculate the number 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?
12. Derive Bose-Einstein distribution law.
13. Derive Fermi-Dirac distribution law.





14. Discuss the Oregonator model of oscillating reactions.
15. Explain Drude and Nernst's electrostriction model and Born's model.
16. Distinguish between relaxation effect and electrophoretic effect.
17. Write a short note on Debye Falkenhagen effect and Wien effect.
18. Write down the Butler Volmer equation and Tafel equation and explain the terms. What are the applications of the equations?

(6×2=12 weightage)

**Part C (Essay Type Questions)**

*Answer any **two** questions.*

*Weight 5 each.*

19. Derive Maxwell-Boltzmann distribution law.
20. (a) How did Einstein explain the observed low heat capacities of atomic crystals at low temperature by the application of quantum theory to the problem? (b) What modification are given by Debye to Einstein theory of atomic crystals.
21. Derive the rate constant for the transition state theory. Show that it agrees with simple collision theory.
22. Derive DHO equation. What are the main drawbacks of DHO?

(2×5=10 weightage)

