

D 91697

(Pages : 2)

Name.....04.....

Reg. No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2015

(CUCSS)

Chemistry

CH 3C 07—PHYSICAL CHEMISTRY—II

(2010 Admissions)

Time : Three Hours

Maximum : 36 Weightage

Part A

Answer all questions.

Each question carries a weightage of 1.

1. Define thermodynamic probability. How does it differ from mathematical probability.
2. Arrange translational, rotational, vibrational and electronic partition functions in the increasing order of magnitude. Justify your answer.
3. Account for the 3 : 1 ratio of Ortho-para-hydrogens.
4. Define characteristic temperature. Explain its significance.
5. Electrons never follow Maxwell-Boltzman Statistics. Why ?
6. Explain the term 'communal entropy'.
7. What do you mean by 'local equilibrium' ?
8. State and explain Onsagar Reciprocal relation.
9. For the reaction $A \xrightarrow{k_1} B \xrightarrow{k_2} C$, derive an equation for the steady-state concentration of B.
10. What is secondary salt effect ?
11. Distinguish between diffusion controlled and activation controlled reactions.
12. Unimolecular gas phase reactions follow first order kinetics at high pressures and second order kinetics at low pressures. Why ?
13. Define isosteric heat of adsorption.
14. What is Michaelis Menton constant ? Explain its significance.

(14 × 1 = 14 weightage)

Turn over

Part B

Answer **seven** questions.

Each question carries a weightage of 2.

15. Calculate residual entropy of H_2O .
16. Calculate heat capacity of diamond at 1000 K. Characteristic temperature is 1860 K.
17. Derive Bose-Einstein distribution law.
18. Derive an equation for the rate of entropy production for one component system with heat and matter transport.
19. Briefly discuss relaxation method of studying fast reactions.
20. Show that for a rigid sphere model of bimolecular reaction. Absolute Rate theory agrees with simple collision theory.
21. Derive an equation for the surface coverage for dissociative chemisorption of the type $\text{A}_2(\text{g}) \xrightleftharpoons[k_2]{k_1} 2\text{A}(\text{ads})$ in terms of the pressure of A_2 . (p)
22. Briefly discuss Lotka-Volterra model of oscillating chemical reactions.
23. How do you calculate equilibrium constant of a chemical reaction from molecular parameters? Discuss.
24. Calculate rotational partition function for CO at 300 K. Bond length is 1.13 \AA .

(7 × 2 = 14 weightage)

Part C

Answer **any two** questions.

Each question carries a weightage of 4.

25. Discuss briefly Debye's theory of heat capacity of solids.
26. Apply Fermi-Dirac Statistics for electrons in metals. Discuss.
27. Discuss briefly molecular beam methods of evaluating reaction cross-section.
28. Derive Langmuir adsorption isotherm from statistical point of view.

(2 × 4 = 8 weightage)