

20P113

(Pages: 2)

Name:

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2020

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC19P CHE1 C04 – THERMODYNAMICS, KINETICS AND CATALYSIS

(Chemistry)

(2019 Admission onwards)

Time: Three Hours

Maximum: 30 Weightage

Section A

Answer any *eight* questions. Each question carries 1 weightage.

1. How will you determine the absolute entropies of gases?
2. Define thermomolecular pressure difference.
3. Express thermal diffusion in terms of phenomenological relations.
4. Suppose a dimer, A_2 , reacts by first dissociating into monomers, then it is transformed into B. $A_2 \rightleftharpoons 2A \rightleftharpoons B$.
Assume that a steady-state concentration of A is maintained. Give the expressions for the rate of disappearance of A_2 .
5. Give the physical significance of the critical energy in unimolecular reactions.
6. Enumerate the importance of saddle point in kinetic studies.
7. What is the significance of BET equation in adsorption studies?
8. Give the expression to calculate the heat of adsorption in an adsorption process.
9. Illustrate the mechanism of reduction in presence of metal catalyst.
10. How zeolites support catalytic action?

(8 x 1 = 8 Weightage)

Section B

Answer any *six* questions. Each question carries 2 weightage.

11. Describe the causes of deviation of non-ideal solutions from Raoult's law.
12. Explain the principle of minimum entropy production. Illustrate entropy production during diffusion of gases.
13. Following the Rice-Herzfeld mechanism, determine the rate of decomposition of acetaldehyde.
14. Explain how the Bronsted-Bjerrum equation accounts for the influence of ionic strength on reaction rates.

15. Illustrate using H_2-O_2 reaction, how branched chain explosions occur? What are the explosion limits?
16. Describe Langmuir's unimolecular theory of adsorption. Derive Langmuir's adsorption isotherm.
17. Give an account of phase transfer catalysis. Explain with the help of an example.
18. What are oscillating reactions? Explain the brusselator mechanism of oscillating reactions.

(6 x 2 = 12 Weightage)

Section C

Answer any *two* questions. Each question carries 5 weightage.

19. a) Explain how the small perturbations in temperature, pressure and electric field help in studying the kinetics of fast reactions.
b) Describe the flash photolysis method of studying the kinetics of fast reactions.
20. Define fugacity. Explain any two methods to determine the fugacity of gases.
21. Derive Duhem-Margules equation and discuss its application.
22. Explain how the surface area and pore structure of adsorbents could be determined by
 - physical adsorption methods
 - X-ray methods
 - chemisorptions methods

(2 x 5 = 10 Weightage)
