) 32674 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.Sc. (CBCSS) REGULAR/SUPPLEMENTARY DEGREE EXAMINATION, NOVEMBER 2022

Chemistry

CHE 1C 04—THERMODYNAMICS, KINETICS AND CATALYSIS

(2019 Admission onwards)

Time : Three Hours Maximum Weightage : 30

Section A

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

1. State and explain third law of thermodynamics.
2. Explain with example positive and negative deviation from Raoult's law.
3. Distinguish between equilibrium and steady state with reference to irrevertible processes.
4. Explain the term microscopic reversibility.
5. Account for the first and second explosion limits in H_2–O_2 reaction.
6. Explain the term temperature jump method, in relaxation spectroscopy.
7. Explain the term 'transmission co-efficient'.
8. Define threshold energy. How is it related to Arrhenius activation energy ?
9. Explain the term 'surface heterogeneity'.
10. Define Michaelis Menten constant. Explain its significance.

(8 × 1 = 8 weightage)

Section B

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

11. Define chemical potential. How does it vary with temperature and pressure ? Derive corresponding equations.
12. What are the methods for the determination of activity co-efficient of nonelectrolytes in solution ? Discuss.
13. Define phenomenological co-efficient. Show that direct co-efficients always dominate indirect co-efficent.

Turn over

14. Decomposition of NO_2Cl takes place according to the following mechanism. Find the rate law :

$$NO_2Cl \xrightarrow{k_1} NO_2 + Cl$$
$$NO_2 + Cl \xrightarrow{k_2} NO_2 + Cl_2$$

(Assume steady-state for Cl. concentration).

15. Compare kinetics of reactions in solution with that of reactions in gas phase.

16. Briefly discuss a crossed molecular beam experiment.

17. What are the methods of determination of surface area of solids ? Discuss.

18. Briefly discuss sol-gel method of preparing high surface area material.

(6 × 2 = 12 marks)

Section C

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

19. Write mechanism of thermal decomposition of ethane. Derive the rate law. What is the apparent activation energy ?

20. Briefly discuss Lindmann's theory of unimolecular reaction. What are its drawbacks ? How are they modified ? Discuss.

21. Derive Langmuir adsorption isotherm by statistical method.

22. Discuss the importance of nano materials in catalysis.

(2 × 5 = 10 weightage)