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Total No. of Printed Pages: [01]

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B.Sc. (Hons.) Chemistry (Semester: 3rd)

PHYSICAL CHEMISTRY-III

Subject Code: BCHMS1302

Paper ID: [19131617]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

Q1. Attempt the following:

- a. Calculate no. of components and degrees of freedom for (i) an aqueous solution of sugar (ii) a mixture of N_2 , H_2 and NH_3
- b. Define true equilibrium and metastable equilibrium.
- c. What do you mean by congruent and incongruent melting points?
- d. What is steam distillation? Write its underlying principle.
- e. A 50% of a first order reaction gets completed in 16 minutes. What fraction of reaction would occur in 32 minutes?
- f. What are parallel reactions? Give one example.
- g. Differentiate between order and molecularity of a reaction.
- h. What is homogeneous and heterogeneous catalysis? Give one example of each.
- i. What do you mean by specificity and selectivity of a catalyst?
- j. What is acid base catalysis? Explain with examples.

Section – B

(5 marks each)

- Q2. What is Clausius-Clapeyron equation? Derive it and give its application to solid-liquid equilibrium.
- Q3. What is eutectic system? Draw and discuss phase diagram for Pb-Ag system.
- Q4. a) Write Arrhenius equation. Explain the various terms involved in it.
b) The activation energy of a non-catalyzed reaction at 310K is 83.68 kJ/mol and for same reaction catalysed by enzyme is 25.10 kJ/mol. Calculate the ratio of rate constants of enzyme catalysed and non-catalyzed reactions. (2, 3)
- Q5. Write the assumptions of Langmuir adsorption isotherm. Also give its derivation.
- Q6. a) Differentiate between Physical and Chemical adsorption.
b) Give a brief account of Lindemann mechanism. (3, 2)

Section – C

(10 marks each)

- Q7. a) Draw a well labelled phase diagram for sulphur system and discuss its salient features.
b) State Gibbs phase rule. Explain the terms involved in it. Discuss its derivation from thermodynamic considerations. (6, 4)
- Q8. a) State Nernst distribution law. Under what conditions the law is valid? Derive thermodynamically the Nernst distribution law.
b) Define critical solution temperature. Briefly discuss a system having upper CST. (6, 4)
- Q9. a) What is second order reaction? Give one example. Discuss the kinetics of second order reactions involving only one type of reactant. Also write units of second order rate constant.
b) Discuss the mechanism and kinetics of Enzyme-catalyzed reactions as proposed by Michaelis-Menten. (6, 4)