

Roll No.

Total Pages : 4

239103

December, 2019

M.Sc. (Chemistry)- I SEMESTER

Physical Chemistry-I (CH-103 A)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

- 1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
- 2. Answer any four questions from Part-B in detail.*
- 3. Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) Define catalytic poison. (1.5)

(b) State Joule's law. (1.5)

(c) Differentiate the terms molecularity and order of reaction. (1.5)

(d) Elaborate the term BET. (1.5)

(e) What are the necessary condition of entropy change and free energy change for an equilibrium state? (1.5)

- (f) What do you understand by the term ionic strength? (1.5)
- (g) Formulate efficiency of an engine. (1.5)
- (h) What is the effect of ion association on conductivity? (1.5)
- (i) Compare dissociative and non-dissociative adsorption. (1.5)
- (j) What is steric parameter? (1.5)

PART - B

2. (a) A Carnot cycle uses 1 mole of an ideal gas as the working substance and operates from a most compressed stage of 10^6 Nm^{-2} and 327°C . It expands isothermally to a pressure of 10^5 Nm^{-2} and then adiabatically to a most expanded stage at temperature of 27°C . Calculate ΔE , q and w for each step. ($C_{V,m}$ for the gas is $25 \text{ JK}^{-1} \text{ mol}^{-1}$). Calculate the net work done and efficiency of the cycle. (10)
- (b) State and explain Gibbs - Duhem equation. (5)
3. (a) Compare the Collision and Activated complex theory for linear and non-linear molecules. (5)
- (b) Discuss the kinetics of hydrogen-chlorine reaction. (10)

4. Derive Debye-Huckel limiting law of activity coefficient. What are its triumphs and limitations? (15)
5. (a) What are the advantages of SEM and TEM? (5)
- (b) (i) Derive an expression for Gibbs Adsorption equation. (7)
- (ii) Shortlist the application of adsorption in industry and in everyday life. (3)
6. (a) Define relaxation and electrophoretic effect. (5)
- (b) (i) Comment on the statement "Entropy of the universe is always increasing". (4)
- (ii) Describe Lindemann theory of uni-molecular reactions. (6)
7. (i) The activation energy of a non-catalysed reaction at 37°C is $83.68 \text{ KJ mol}^{-1}$ and the activation energy of the same reaction catalysed by an enzyme is $25.10 \text{ KJ mol}^{-1}$. Calculate the ratio of the rate constants of the enzyme catalysed and the non-catalysed reactions. (5)

- (ii) Briefly explain surface heterogeneity. (4)
- (iii) Write a short note on ion size parameter. (4)
- (iv) What are the physical significance of partial molar quantities? (2)
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