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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2011

COMMON TO ALL BRANCHES

SEMESTER – I

CY 171 – CHEMISTRY I

(REGULATIONS 2004)

Time: 3 hr

Max Mark: 100

Answer ALL Questions

Part – A (10 x 2 = 20 Mark)

1. Calculate the entropy change when 3 moles of an ideal gas expands isothermally and reversibly from a volume of 8 litres to a volume of 24 litres ($R = 8.314 \text{ J K}^{-1} \text{ mole}^{-1}$).
2. Define Clausius Statement.
3. Give any two differences between physisorption and chemisorption with suitable examples.
4. List any two applications of adsorption.
5. Define Steady state principle.
6. What is a parallel reaction? Give an example.
7. Define decomposition potential.
8. Calculate the emf of a concentration cell at 25°C consisting of two Zn electrodes immersed in solutions of Zn^{2+} ions of 0.1 M and 0.01 M concentrations.
9. Draw a neat energy level diagram and show rotational, vibrational and electronic energy levels in it.
10. Define Beer-Lambert's Law.

Part – B (5 x 16 = 80 Mark)

- 11.a(i) Derive Gibbs Helmholtz equation relating free energy and enthalpy. (8 Marks)
a(ii) Derive any one form of Maxwell's relation. (8 Marks)
- 12.a(i) Explain the preparation of adsorption column and separation of solutes by adsorption chromatography.(8 Marks)
a(ii) Derive Michaelis – Menten Equation for an enzyme catalysed reaction. (8 Marks)

or

- 12.b(i) State the postulates of Langmuir theory of adsorption. Derive Langmuir

- adsorption equation and explain the case of adsorption at low and high pressures.(8 Marks)
- b(ii) Explain the role of adsorption in catalytic reactions with suitable examples. (8 Marks)
- 13.a(i) Derive an expression for the kinetics of opposing reaction, first order in both the directions. (8 Marks)
- a(ii) Write short notes on theory of absolute reaction rates.(8 Marks)
- or
- 13.b(i) Derive an expression for the kinetics of a consecutive reaction (8 Marks)
- b(ii) In a second order reaction, where the initial concentration of the reactants is the same, half of the reactants are consumed in 60 minutes. If the specific reaction rate is $5.2 \times 10^{-3} \text{ mol}^{-1} \text{ L min}^{-1}$, what is the initial concentration of the reactants? (8 Marks)
- 14.a(i) Explain the measurement of pH of solution using glass electrode. Mention any two advantages of this electrode.(8 marks)
- a(ii) Derive Nernst Equation for single electrode potential and explain the terms involved in it. (8 marks)
- or
- 14.b(i) What are reference electrodes? Describe the construction of calomel electrode. (8 marks)
- b(ii) What is emf? How is it measured potentiometrically? (8 Marks)
- 15.a(i) What is Calorimetric Analysis? Explain with an example the estimation of concentration of a solution by calorimetric analysis. (8 Marks)
- a(ii) Explain the basic components in a flame photometer with a neat block diagram.(8 Marks)
- or
- 15.b(i) Discuss the applications of IR Spectroscopy. (8 Marks)
- b(ii) With a neat block diagram explain the basic components in a UV-Visible spectrophotometer. (8 Marks)
