MANIPAL UNIVERSITY

Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, JUNE 2017

SUBJECT: PHYSICAL CHEMISTRY [CHM 2201]

REVISED CREDIT SYSTEM

TIME: 3 HOURS DATE:21 -06-2017 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.
- Draw diagrams and write chemical equations wherever necessary

1A. Discuss the vapour pressure properties of two immiscible liquids. How are these facts utilized in determining molar mass of a liquid by steam distillation?

1B. Justify: Depression in freezing point depends only on the molality of the solution and is independent of the nature of the solute. The complex compound $K_4[Fe(CN)_6]$ is 45 % dissociated in 0.1 M aqueous solution of the complex at 27° C. What would be the osmotic pressure of the solution?

1C. Explain the effect of temperature and dielectric of the medium on the conductance of electrolyte. With a neat diagram explain the variation of conductance in titration of chlorides against standard silver nitrate.

[2+4+4]

2A. State Henry's law. Explain the effect of temperature on the solubility of a gas in a liquid.

2B. Explain with a graphical representation the distillation behavior of solution of type II. A solution of A and B with 30 mole percent of A is in equilibrium with its vapour which contains 60 mole percent of A. Assuming ideality of the solution and the vapour, calculate the ratio of the vapour pressure of pure A to that of pure B

2C. i) Explain how collision theory is useful in the determination of the rate constant of a reaction.

ii) A first order reaction is 40 % completed in 50min. Calculate the rate constant. In what time reaction will be 80 % complete.

[2+4+4]

3A. Calculate the molar mass of the solute if the vapour pressure of a solution of 5g of a nonelectrolyte in 100 g water at a particular temperature is 2950 Pa and that of pure water at the same temperature is 3000 Pa.

3B. Define the term congruent melting point. Draw and discuss the phase diagram for the Zinc- magnesium system.

3C. i) In the fermentation of sugar in an enzymation solution that is initially 0.12 M, the concentration of sugar is reduced to 0.06 M in 10 hours and 0.03 M in 20 hours. What is the order of reaction and what is the rate constant?

ii) Give reason for the following

a) A.C.source is used in conductance measurements but not D.C.

b) The half-life of a first order reaction is independent of initial concentration of reactant. **[2+4+4]**

4A. Justify the following statements:

i) Extent of adsorption decreases with increase in temperature.

ii) Adsorption is accompanied with decrease in entropy.

4B. Derive the relation between the boiling point elevation of a solution and the mole fraction of the dissolved solute. Describe the Landsberger's method of determination of boiling point elevation.

4C. i) The resistance of 0.01M solution of an electrolyte was found to be 210 ohm at 25° C. Calculate the molar conductance of the solution at 25° C, if the electrodes are 2.2cm^2 apart and have an area of 3.8cm^2.

ii)Explain with an example of the experimental procedure for obtaining a cyclic voltagram.

[2+4+4]

5A. The rate constant of a second order reaction is 5.7×10^{-5}dm^{3}mol^{-1}s^{-1} at 25° C and 1.64×10^{-4}dm^{3}mol^{-1}s^{-1} at 40° C. Calculate the activation energy and pre-exponential factor.

5B. Derive thermodynamically the Gibbs adsorption isotherm for the adsorption of a solute on the surface of a liquid.

5C. Discuss the variation of mutual miscibility of Phenol-water system. Explain the term tie line and conjugate solutions as applied to partially miscible liquids.

[2+4+4]

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