MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

(A constitute unit of MAHE, Manipal)

I SEMESTER B. TECH. END SEMESTER EXAMINATIONS, NOV. 2018

ENGINEERING CHEMISTRY (CHM 1051)

Date: Time: 3 Hours   Max. Marks: 50

Note: Answer all the questions.

1A. Explain the construction and working of Calomel electrode. How is this electrode useful in the determination of pH of a solution? If the E^0 for calomel electrode is 0.2444 V, calculate its electrode potential at 298K when the concentration of KCl solution is 0.25M.

1B. Justify the statement: Polymer molecular weight is expressed in terms of an average. Calculatethe number average and weight average molecular weights of polymer molecules with different degrees of polymerization such as 300, 550, 750 and 900 that are mixed in a molecular ratio 1: 2: 3: 4 in a sample of high polymer of styrene(C_6H_5 - CH= CH_2).

1C. Write any four limitations of Beer-Lambert's law.   [5+3+2]

2A. (i) Explain the three classes of Fiber-reinforced composites.
(ii) Using a schematic diagram describe CVD technique of preparation of thin films.

2B. Calculate the potential of silver-zinc cell at 298 K, if the concentration of Ag^+ and Zn^{2+} are 5.2×10^{-6} M and 1.3×10^{-3} M respectively. E° of the cell at 298 K is 1.56 V. Write the cell representation and calculate the change in free energy for the reduction of 1 mole of Ag^+.

2C. 2.5 g of coal sample was kjeldahlised and ammonia gas released was absorbed in 50 mL of 0.1 N sulphuric acid. After absorption, the excess of acid required 4.8 mL of 0.1 N NaOH for neutralization. Calculate the % of nitrogen in the sample.

[5+3+2]

3A. (i)Outline briefly the steps involved in the gravimetric method of analysis.
(ii)Write the mathematical form of the Beer-lambert's law. Explain the terms involved.
An absorbance of 0.02 was recorded, with a metal-ligand complex having the concentration 4 mM and the path length of 1.7 cm. Calculate molar extinction coefficient (in dm^3 mol^{-1} cm^{-1}) for the complex. Calculate the concertation of the complex, if the absorbance is 0.5

3B. Derive an expression for the potential of glass electrode.

3C. Differentiate between single electrode potential and liquid junction potential. Explain the measurement of single electrode potential of zinc.   [5+3+2]

4A.   (i) Give reasons for the following:

a) Vacuum environment is used during physical vapour deposition technique of thin film formation.

b) The phase behaviour of lyotropic liquid crystals is dependent on the polarity of solvent.

(ii) Discuss about the requirements of biomaterials. Write any two applications of metals and alloys as biomaterials.

4B.   Explain how the following factors influence the rate of corrosion and suggest a method for the prevention.

i) Anodic and cathodic areas   ii) Electrode potential

4C.   What is cracking? Mention any two advantages of catalytic cracking.   [5+3+2]

5A.   Describe the anodic protection method with a neat labelled diagram. Write two advantages and limitations of it.

5B.   Explain the electrochemical theory of corrosion taking rusting of iron as an example.

5C.   Differentiate between the following: (any two points)

i)   Ionic bond and covalent bond
ii)   Dipole-dipole bond and London force of attraction

[5+3+2]

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