Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal Academy of Higher Education)

I SEMESTER B.TECH. END SEMESTER EXAMINATIONS, DEC 2017

SUBJECT: ENGINEERING CHEMISTRY [CHM 1001]

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 23rd December 2017 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Write equations, examples or diagrams wherever necessary.

1A. Explain the preparation of nanomaterials by sol-gel process

1B. Write the balanced half-cell reactions and the cell representation of the galvanic cells constructed by using the following electrodes with theoretical emf of 0.53V, 1.53V and 1.97V at 298K. The standard electrode potential value of each electrode is given below.

Zn^{2+}	Cr^{3+}	Al^{3+}	Pb^{2+}	Cu^{2+}	Mg^{2+}	Ni^{2+}	Fe^{2+}
−0.76	−0.74	−1.66	−0.13	0.34	−2.38	−0.23	−0.41

1C. Describe the determination of decomposition potential of an electrolyte with a neat diagram. What are the characteristics of a good deposit? Explain the electroplating process of decorative chromium and electro-less plating of copper.

(2+3+5)

2A. (i) Why does the emf of a concentration cell become zero after some time?
(ii) Write the recharging reactions of Li ion batteries.

2B. A sample of polypropylene has the degree of polymerization of 400, 500 and 600 is found to have the composition of 25%, 35% and 40% respectively. Calculate number average and weight average molecular mass.

2C. Describe the galvanic corrosion and caustic embrittlement. Discuss any two primary factors affecting the corrosion.

(2+3+5)

3A Discuss the steps involved in the manufacture of glass.

3B The cell, SCE || (0.1M) HCl | AgCl(s), Ag gave an emf of 0.28 V and 0.36 V with buffer, pH = 2.8 and of test solution respectively. Calculate the pH value of test solution. Given E_{SCE} = 0.2422 V

3C Explain the discharging reactions and the consequences of overcharging of a lead acid battery. Discuss the construction and working of proton exchange membrane fuel cell.

(2+3+5)

4A. (i) What is the role of $ZnCl_2$ in a dry cell?
(ii) Why Ni-Cd batteries give a constant voltage throughout its life time?

4B. On burning 0.83g of a solid fuel in a bomb calorimeter, the temperature of 3500 g of water is increased from 26.5°C to 29.2°C and gave a gross calorific value of 12601 cal/g. By using the same bomb calorimeter, 0.69g of a test fuel raised the temperature of the same water from 25.0°C to 27.3°C on burning. If the test fuel contains 0.7% hydrogen, what are the gross and net calorific values of the test fuel? Given that the latent heat of steam is 587.0 cal/g.

4C. Explain the preparation of thin films by vacuum deposition and chemical vapor deposition techniques with schematic diagrams.

(2+3+5)

5A. Explain the determination of emf of a cell by Poggendorf's compensation method.

5B. (i) 1.256 g of the coal is Kjeldahlised and the ammonia thus evolved is absorbed in 50 mL of 0.1 N H_2SO_4. After absorption, the excess acid required 8.45 mL of 0.1 N NaOH for exact neutralization. Calculate the % of Nitrogen.

(ii) In a bomb calorimeter experiment, the residue obtained from 2.64 g of coal sample is treated with $BaCl_2$ and got a 0.1825 g of $BaSO_4$ precipitate. Calculate the % of Sulphur in the coal sample. The same amount of coal sample is burnt in a combustion apparatus. The evolved CO_2 is allowed to pass through KOH tubes and observed an increase in weight of 5.2 g. Calculate the % of 'C' present in the coal sample.

5C. Explain (i) the corrosion control by anodic and cathodic inhibitors and (ii) the anodic and cathodic coating processes.

(2+3+5)

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