Reg. No.												

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

I SEMESTER B.TECH END SEMESTER EXAMINATIONS,

NOV/DEC 2015

SUBJECT: ENGINEERING CHEMISTRY [CHM 1001]

REVISED CREDIT SYSTEM

Time: 3 Hours 04-12-2015 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.
- Write equations, examples or diagrams wherever necessary.

1A. Give reasons for the following:
(i) p-nitrophenol has high boiling point than o-nitrophenol.
(ii) Kevlar composites are stronger than nylons **(2)**

1B. Write the balanced half-cell reactions and the cell representation for the galvanic cells with theoretical emf of 2.0 V, 0.63 V and 1.97 V at 298K, constructed by using the following electrodes. The 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

(3)

1C. What are the characteristics of a good deposit? Explain the bath compositions of decorative, hard chromium and electro less plating of Cu. **(5)**

2A. (i) Justify: Salt bridge minimizes the liquid junction potential.
(ii) Explain the Meissner effect in superconductors. **(2)**

2B. EMF of Weston-cadmium cell is 1.0183 V at 20°C and 1.0181 V at 25°C. Write the cell representation and calculate the ΔG, ΔH and ΔS of the cell at 30°C. **(3)**

2C. Define the terms, galvanizing and tinning. Explain the corrosion control by anodic and cathodic protection methods. **(5)**

3A. Give reasons for the following:
(i) Cathodic part of a metal does not undergo electrochemical corrosion
(ii) Anodic inhibitors should be added sufficient quantity to the medium **(2)**

3B. Why GCV is greater than NCV of a chemical fuel?
Calculate the GCV and NCV of a gaseous fuel from the following data obtained in Boy's experiment:
Volume of gaseous fuel burnt at STP = 0.08 m^3
Weight of water used for cooling = 24 kg
Temperature of inlet water = 26°C
Temperature of outlet water = 40°C
Weight of water produced by steam condensation = 0.03 kg **(3)**

3C. Explain the construction and discharging reactions of Ni-Cd cell. Discuss three limitations of Pb storage cell. **(5)**

4A. Deduce an expression for electrode potential of a glass electrode. **(2)**

4B. (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. **(3)**

4C. Describe the classes of biomaterials based on the materials used with suitable examples. Explain the preparation of nano materials by ball milling and sol-gel techniques. **(5)**

5A. Give reasons for the following:
(i) Non aqueous solvent is used in lithium batteries
(ii) Fuel cells are merely energy conversion devices and not energy storage devices **(2)**

5B. Why polyvinylchloride is more crystalline than polypropylene?
Calculate the number average and weight average molecular weight of a polymer sample in which 35% molecules have molecular mass of 22500, 25% have molecular mass of 32000 and rest have molecular mass of 28500. **(3)**

5C. What are the differences between dry and wet corrosions? Explain the pitting and inter granular corrosions. **(5)**