Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER B.TECH END SEMESTER EXAMINATIONS, JUNE 2017

SUBJECT: ENGINEERING CHEMISTRY [CHM 1001]

REVISED CREDIT SYSTEM

17-06-2017

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Draw diagrams and write equations wherever necessary

1A Justify the following statements:
(i) Electrical conductivity of the metals can be explained on the basis of electron sea model.
(ii) Polycatenar liquid crystals are considered as a hybrid class of thermotropic liquid crystals.

1B What is the consequence of too high % of nitrogen and too less % of ash content in the coal sample? 0.120 g of coal on combustion gave 0.3960 g of CO_2 and 0.0198 g of water. Calculate % of carbon and hydrogen in the sample.

1C Write the construction and working of a concentration cell. Derive an expression for its EMF and explain the condition under which its EMF becomes zero.

[2+3+5]

2A Justify the following statements:
(i) Stainless steels are susceptible to stress corrosion cracking in chloride environments, but not in ammonia environment
(ii) Pinholes on the tin coated iron are more prone to corrosion than pinholes on zinc coated iron

2B Define standard electrode potential. The EMF of cell, $Cd_{(s)} / Cd^{2+}_{(0.01M)} // Cu^{+2}_{(0.5M)} / Cu_{(s)}$ is 0.79V. Calculate reduction potential of Cd electrode, if the standard electrode potential of Cu is 0.34 V

2C Mention two outstanding features of lithium batteries in comparison with conventional batteries. Describe the construction and chemistry of working of a lead-storage battery.

[2+3+5]

3A Justify the following statements:

(i) To get a good quality cement, it is necessary to add proper amount of lime during its manufacture.

(ii) Physical and chemical properties of nanomaterials are different from that of bulk materials

3B Prove that free energy of the galvanic cell decreases during its function. The EMF of standard Weston cadmium cell at 278 K is 1.0185 V. Calculate change in enthalpy and entropy for the cell reaction at 278 K, if temperature coefficient of the cell is 5.00×10^{-5} V K^{-1}.(Given: Number of electrons involved in the cell reaction is 2)

3C Explain the cathodic reactions taking place during the corrosion of a metal in (i) acidic medium (ii) alkaline medium. Give an account of cathodic protection techniques for corrosion control.

[2+3+5]

4A Justify the following statements.

(i) Zn-MnO_2 dry cell is not suitable for use with a photo-flash unit of a camera, whereas Ni-Cd battery can be employed

(ii) Polymer membrane has dual role in PEFC.

4B 0.95g of coal containing 5 % hydrogen was tested in laboratory for its calorific value. The raise in temperature observed was 2.48 °C. If the mass of water taken was 700 g and water equivalent of bomb and calorimeter was 2,000 g, calculate gross calorific value and net calorific value. (Given: Latent heat of condensation of steam is 580 cal g^{-1}) Express your answer in SI unit.

4C Draw a neat diagram of calomel electrode and label the parts. Write electrode reaction when it acts as cathode. Explain the determination of EMF of a galvanic cell by Pogendroff compensation method.

[2+3+5]

5A Distinguish between the following (any two differences)

(i) Electroplating and electro-less plating

(ii) Electrolytic cell and Fuel cell

5B Differentiate between addition polymers and condensation polymers. A polymer sample contains an equimolar mixture of three molecules having molar masses 15.5, 13.7 and 17.2 kg/mol respectively. Calculate the number average and weight average molar masses of the polymer.

5C Explain any two factors that determines the quality of good electrodeposit. Discuss the conditions for electro-deposition of hard chromium

[2+3+5]

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