Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

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

SUBJECT: ENGINEERING CHEMISTRY [CHM 1001]

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 20.11.2017 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Give reason for the following;
(i) The product of oxidation corrosion of molybdenum enhances the corrosion while that of aluminum does not.
(ii) Polymer nanoparticles cannot be prepared by ball milling method.

1B. Why is the molecular weight of a polymer expressed in terms of an average value? Calculate number average and weight average molecular mass of polypropylene mixed in molecular ratio 1:2:3:4 with different degree of polymerization such as 350, 500, 750 and 900.

1C. Mention any two differences between galvanic and electrochemical series. Describe the following corrosion prevention methods
(i) Anodic protection
(ii) Use of cathodic inhibitors

2+3+5

2A. Justify the following;
(i) The physical and chemical properties of nanomaterials differ significantly from those of the bulk materials.
(ii) Kevlar possesses good structural properties than nylon 6,6.

2B. Define emf of a cell and mention any two factors affecting it. Calculate the concentration of $AgNO_3$ solution and ΔG for the following cell at 298K
Ag /$AgNO_3$ (0.018M)//$AgNO_3$(x) /Ag, if the emf of the cell is 0.1078 V.

2C. Define the terms decomposition potential and overvoltage. Write the redox reactions involved in electro-less plating of copper. Why is an undercoat of Ni required on the substrate for decorative chromium coating?

2+3+5

3A. Give reason for the following;
(i) KCl is used in a salt bridge, but not NaCl.
(ii) The glass electrode should be stored in an aqueous medium when not in use.

3B. Write the discharging reactions of Ni-Cd battery. Describe the construction and working of alkaline fuel cell.

3C. Write any two differences between the proximate and ultimate analysis of coal. Describe the fluidized bed catalytic cracking of gasoline. On burning 0.83 g of a solid fuel in a bomb calorimeter, the temperature of 3500 g of water raised from 26.5 to 29.2°C. Water equivalent of calorimeter and latent heat of steam are 385 g and 587 cal/g respectively. If the fuel contains 0.7% hydrogen, calculate the gross and net calorific value of the fuel in cal/g.

2+3+5

4A. Justify the following;

(i) Water gas is produced by passing steam and air alternately through a bed of red hot coke.

(ii) 18-8 stainless steel with carbon content of 0.08 % undergoes intergranular corrosion.

4B. Define shelf life and cycle life of a battery. A glass electrode dipped in a solution of pH = 4 offered an emf of 0.2066 V with SCE at 298 K. When dipped in a solution of unknown pH at same temperature, the recorded emf was 0.1076 V. Calculate the pH of the solution. [E_{SCE} = 0.2422 V]

4C. Explain the type of forces responsible for liquefaction of gases. Mention any two distinguishing features of fiber reinforced composite from particle reinforced composite. With a schematic diagram describe the chemical vapour deposition technique of fabrication of thin film of Ti over a substrate.

2+3+5

5A. Give reason for the following;

(ii) Gypsum is added during the manufacture of Portland cement.

(ii) Lead acid battery is not efficient in cold climate.

5B. Why are the ash forming constituents in a sample of coal undesirable? 1.56 g of the coal was kjeldahlized and NH_3 gas thus evolved was absorbed in 50 mL of 0.1 N H_2SO_4. After absorption, the excess acid requires 6.25 mL of 0.2 N NaOH for neutralization. Calculate the percentage of nitrogen in the sample. If 2.60 g of the coal sample in a quantitative analysis gave 0.1755 g of $BaSO_4$, calculate the percentage of sulphur.

5C. Mention any two desirable characteristics of biomaterials. Explain the Meissner effect and outline the types of superconductors. Write any two differences between nematic and smectic phases of liquid crystals.

2+3+5

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