Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER B.TECH. END SEMESTER EXAMINATIONS, April/May 2017

SUBJECT: ENGINEERING CHEMISTRY [CHM 1001]

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 25/04/2017 MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Write chemical equations, reactions or diagrams wherever necessary.

1A.	Give reasons for the following; i) Refractory materials are subjected for firing process during fabrication. ii) Some of the hexasubstituted benzene derivatives form discotic liquid crystals.	2
1B.	Write cell reaction and calculate the potential of Ag-Zn ($E^0_{Ag} > E^0_{Zn}$) cell at 298K, if the concentration of Ag^+ and Zn^{2+} are 5.2×10^{-6} M and 1.3×10^{-3} M respectively. E^0 of the cell at 298 K is 1.56 V. Calculate the change in Gibb's free energy for the reduction of a mole of Ag^+.	3
1C.	Explain the determination of the decomposition potential of an electrolyte with a graph and write its significance. Describe the electroless plating process of copper on a polymer substrate.	5
2A.	Justify the statement; Liquid metal corrosion occurs only at higher temperatures. Explain why iron gets corroded in H_2S environment.	2
2B.	Write the anodic, cathodic reactions and calculate EMF of the following cell provided E^0 cell = 2.01 V, $[H^+]$ and $[SO_4^{2-}]$ are 0.1 M & 2.0 M respectively. $Pb/Pb^{2+}(H_2SO_4)//PbO_2(H_2SO_4)/Pb^{2+}$	3
2C.	Describe the construction and working of proton exchange membrane fuel cell. Write any two advantages and disadvantages of this fuel cell system.	5
3A.	Justify the following statements; i) Nylon-6,6 is flexible whereas Bakelite is rigid. ii) Nanomaterial has unique properties when compared with bulk materials.	2
3B.	The GCV of a bituminous coal is 36,000 kJ kg^{-1}. An experiment was conducted by burning 0.83 g of this coal in bomb calorimeter having 1.2 kg of water. After the complete combustion, the temperature of the water rose by 3.92 ^{0}C. Calculate the water equivalent of the calorimeter. Comment on the feasibility of calculating NCV from the data provided.	3
3C.	Describe the mechanism of caustic embrittlement of steel. Write salient features of pitting corrosion.	5

4A	Give reasons for the following; i) Polarization effect reduces the rate of corrosion. ii) Catalytic cracking is preferred over thermal cracking.	2
4B	Write the principles and calculation steps involved in the estimation of carbon, nitrogen and sulphur present in a coal sample.	3
4C	Describe the construction and working of Nicad and LiCuS cells. How are biomaterials classified based on materials used?	5
5A	Give reason for the following; i) Calomel electrodes do not work at higher temperatures. ii) Kevlar composites are hard and tougher materials.	2
5B	Calculate the number average and weight average molecular weights of $-[C_6H_5\text{-}CH\text{-}CH_2]_n$ from the following data; Degree of polymerization Number of molecules 100 30 130 40 150 60 Comment on the statement; Samples of polystyrene and poly(ethylene-styrene) copolymer had the same degree of polymerization, but differ in their molecular weights.	3
5C	Explain the process of CVD technique used for the formation of thin films. Describe the pultrusion technique used for composite fabrication.	5