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Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



I SEMESTER B.TECH END SEMESTER EXAMINATIONS, Dec 2015-Jan 2016

SUBJECT: ENGINEERING CHEMISTRY [CHM 1001]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX.MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- ✤ Draw diagrams and write chemical equations wherever necessary
- **1A.** What are concentration cells? When do you expect maximum and minimum potential in concentration cells?
- **1B.** The standard Emf of the cell Fe | Fe³⁺ (1M) || Ag⁺ (1M) || Ag is 1.24 V. Write the anode, cathode and overall cell reactions. Also, calculate the cell potential of the following variations at 298K.

| | $[Fe^{3+}]$ | $[Ag^+]$ |
|---|-------------|----------|
| 1 | 0.5 M | 0.75 M |
| 2 | 2 M | 1 M |
| 3 | 1 M | 2 M |

- **1C.** Explain the caustic embrittlement. Write any two prevention methods for the same. **2+3+5**
- 2A. Write any two differences between:(i) Electro and electro-less plating(ii) Galvanizing and tinning
- **2B.** Calculate ΔG , ΔH and ΔS at 30 °C, for the cell Al | Al³⁺ || Fe³⁺ | Fe from the following data. Emf of the cell at arbitrary concentration at 25 °C and 30 °C are 1.22 and 1.32 V respectively.
- **2C.** Write how the following method minimizes or prevents corrosion:
 - (i) Selection of proper material and proper design

2+3+5

- (ii) Inhibitors
- **3A.** With time-scale write the chemical reactions that takes place during setting of cement.

3B. Calculate number and weight average molecular weights of polypropylene sample from the following composition.

| Degree of polymerization | 200 | 400 | 600 | 750 |
|--------------------------|-----|-----|-----|-----|
| % of composition | 25 | 35 | 30 | 10 |

Given that atomic masses of C and H are 12 and 1 amu respectively.

- **3C.** Explain the batch melting process of manufacturing of glass. Discuss the applications of any two types of glass based on the property associated with it.
- **4A.** Give reason:
 - (i) We cannot use ordinary potentiometer while using glass electrode.
 - (ii) Pure silicon is a semiconductor whereas diamond is not.
- **4B.** Calculate the water-equivalent of the calorimeter from the following data. Also calculate GCV and NCV for the second and third fuel.

| Sample | Initial | Final | Sample | Weight of | hydrogen | GCV |
|--------|---------|---------|-----------|-------------|----------|----------------|
| number | temp in | temp in | weight in | water taken | content | |
| | Κ | Κ | g | in g | | |
| 1 | 323 | 344 | 0.455 | 400 | 0.8 % | 36.5 K cal / g |
| 2 | 360 | 380 | 0.344 | 450 | 0.7 % | |
| 3 | 360 | 380 | 0.344 | 450 | 2.1 % | |

4C. Explain the construction and working of alkaline fuel cell and PEM fuel cell. Explain the differences between these cells.

2+3+5

2+3+5

- **5A.** Explain concentration polarization. Write two methods of minimizing it.
- **5B.** The coal sample (0.92 g) was burnt in a combustion tube. The weight of CO₂ and water released were 2.372 g and 0.316 g respectively. Assuming no other element present in the sample, calculate percentage of C, H and O in the sample.
- **5C.** Write the construction and working reactions of Li ion cells. Write any two merits and demerits of lithium metal.

2+3+5
