MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

(A constituent unit of MAHE, Manipal)

B. TECH. END SEMESTER EXAMINATIONS, July 2020

ENGINEERING CHEMISTRY (CHM 1051)

Date:27.7.2020 **Time: 3 Hours** **Max. Marks: 50**

Note: Answer all the questions.

1A. Describe the classification of polymers based on their response to heat. In a polymer sample, 30 % molecules have a molecular mass 20000, 40 % have molecular mass 30000 and remaining have molecular mass of 60000. Calculate the number average and weight average molecular weight of polymer. Calculate the polydispersity index of the polymer.

1B. Name and explain the type of corrosion in the following examples

i) 18-8 stainless steel is heated at 700 ^{0}C.

ii) Steel boilers fed with alkaline water.

1C. Give reasons for the following:

(a) Water management is crucial for the efficiency of a proton exchange membrane fuel cell.

(b) Potentiometer is preferred over voltmeter to measure the EMF of a cell.

[5+3+2]

2A. (i) Explain the preparation of thin films by vacuum deposition technique with a diagram. Give two advantages of PVD technique.

(ii)Explain briefly the classification of ceramic materials based on their application.

2B. 4.0 g coal sample was weighed into a silica crucible and heated for one hour at 110 ^{0}C the residue weighed 3.875 g. The crucible was covered with a lid and heated at 950 ^{0}C for seven minutes. The residue weighed 2.662 g. The crucible was then heated without the lid until a constant weight was obtained. The last residue was 0.325 g. Calculate the % of moisture, volatile mater and ash content.

2C. Describe the construction and working of alkaline fuel cell.

[5+3+2]

3A. i) Write four essential conditions for any volumetric method of chemical analysis

ii) State Beer-Lambert's law. Write any two of its limitations. A solution of Tryptophan has an absorbance of 0.54 at 280 nm in a 0.5 cm cuvette. If the absorbance coefficient is 6.4 x 10^3 $Lmol^{-1}cm^{-1}$, calculate the concentration of the solution.

3B. i) Explain with an example the influence of relative anodic and cathodic areas on the rate of corrosion.

ii)Justify the statement: Galvanic series is used in corrosion studies rather than electrochemical series.

3C. i)Give reason: The addition of dibutyl phthalate decreases the T_g of PVC.

ii)Give any two applications of biomaterials.

[5+3+2]

4A. i) Explain why normal glass electrodes give erroneous result at very high as well as very low pH values.

ii) Describe the construction and charging reactions of NiCad battery. Give any two advantages.

4B. i) Differentiate between concentration and kinetic polarization (any two points).

ii)Define decomposition potential. Explain any two factors influencing it.

4C. Write four characteristic properties that should be satisfied by liquid crystals.

[5+3+2]

5A. i) Describe the sacrificial anode method of corrosion control with a neat diagram.

ii) Explain the mechanism of rusting of Iron.

5B. Calculate E.M.F. of the zinc – silver cell at 25 °C when $[Zn^{2+}] = 1.0$ M and $[Ag^{+}] = 10$ M Write the cell representation and cell reaction.[Given: $E^{0}_{Zn^{2+}/Zn} = -0.76$ V and $E^{0}_{Ag^{+}/Ag}$ is 0.80 V at 25°C]

5C. Give reason for the following:

i) *o*-nitrophenol is sparingly soluble in water, while *p*-nitrophenol is readily soluble in water

ii) At room temperature, chlorine (Cl_2) is a gas whereas bromine (Br_2) is a liquid.

[5+3+2]

****