USN ☐☐☐☐☐☐☐☐☐☐   **15CHE12/22**

First/Second Semester B.E. Degree Examination, June/July 2017
Engineering Chemistry

Time: 3 hrs.   Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1   a.   Write Electrode reactions and Net cell reaction of
         i) Nickel – Metal hydride battery   ii)   Methanol – oxygen fuel cell.   **(06 Marks)**
    b.   Describe the construction and working of Lithium ion battery.   **(05 Marks)**
    c.   Derive Nernst equation for Single Electrode Potential.   **(05 Marks)**

OR

2   a.   What are Concentration Cells? Calculate the cell potential of the following cell at 298K.
         Ag/Ag Cℓ (0.005M) // Ag Cℓ (0.5M)/ Ag   **(06 Marks)**
    b.   Explain the measurement of electrode potential using Calomel electrode as secondary
         reference electrode.   **(05 Marks)**
    c.   Define Fuel Cell. What are the differences between Fuel cell and Conventional cell?   **(05 Marks)**

Module-2

3   a.   What is Galvanisation and Tinning? Explain Galvanisation process by Hot dipping method.   **(06 Marks)**
    b.   Explain Electrochemical theory of corrosion with an example.   **(05 Marks)**
    c.   What is Electroplating? What are the differences between Electroplating and Electroless
         plating?   **(05 Marks)**

OR

4   a.   Explain Electroless plating of copper with suitable reactions.   **(06 Marks)**
    b.   Describe Electroplating of Nickel using Watt's bath.   **(05 Marks)**
    c.   Explain the following factors affecting the rate of corrosion : i) Nature of corrosion product
         ii) Ratio of Anodic to Cathodic area   iii) Conductivity.   **(05 Marks)**

Module-3

5   a.   Define Gross calorific and Net calorific value of a fuel. Calculate the gross and net calorific
         value of a sample of coal from following data :   **(06 Marks)**
         Weight of coal = 0.95g   ;   Weight of water = 2500g   ;
         Water equivalent of calorimeter = 400g   ;   Specific heat of water = 4.187 J/g / K   ;
         Rise in temperature = 3K   ; % of Hydrogen in coal = 6
         Latent heat of steam = 2454 J/g/K.
    b.   Write a short note on Power Alcohol and Biodiesel.   **(05 Marks)**
    c.   Explain Modules, Panels and Arrays of photovoltaic cells.   **(05 Marks)**

OR

6   a.   Explain the production of solar grade silicon by Union Carbide process.   **(06 Marks)**
    b.   Explain Doping of silicon by diffusion technique to produce n – type and p – type
         semiconductors.   **(05 Marks)**
    c.   Describe Synthesis of petrol by Fischer – Tropsch process.   **(05 Marks)**

Module-4

7 a. Explain Free Radical mechanism of addition polymerisation taking vinyl chloride as an example. **(06 Marks)**

   b. What are Elastomers? Explain synthesis, properties and applications of silicone rubber. **(05 Marks)**

   c. What is Glass Transition Temperature? Explain any two factors affecting glass transition temperature. **(05 Marks)**

OR

8 a. A polymer is found to contain the following composition : **(06 Marks)**
   200 molecules of molecular mass 2000 g/mol ,
   300 molecules of molecular mass 3000 g/mol ,
   500 molecules of molecular mass 5000 g/mol. Calculate number average molecular weight and weight average molecular weight of polymer.

   b. Discuss Structure property relationship of polymers with respect to **(05 Marks)**
   i) Elasticity   ii) Chemical resistivity.

   c. Explain the Mechanism of conduction in polyaniline. **(05 Marks)**

Module-5

9 a. Write a note on Nanocomposites. Mention its applications. **(05 Marks)**

   b. Discuss the synthesis of nanomaterials by Sol – gel process and by precipitation method. **(06 Marks)**

   c. Explain the Activated Sludge treatment of sewage water. **(05 Marks)**

OR

10 a. Define BOD. Discuss the experimental determination of BOD of waste water. **(06 Marks)**

   b. 50cm^3 of sewage water was refluxed with 20cm^3 of 0.1N acidified $K_2Cr_2O_7$. The unreacted acidified $K_2Cr_2O_7$ consumed 10.2cm^3 of 0.1NFAS. 20cm^3 of 0.1N $K_2Cr_2O_7$ when titrated under identical condition consumed 31.1cm^3 of 0.1NFAS. Calculate the COD of sewage water. **(05 Marks)**

   c. Write a note on Carbon nanotubes. **(05 Marks)**

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