10CHE12/22

First/Second Semester B.E. Degree Examination, June / July 2013
Engineering Chemistry

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer FIVE full questions choosing at least two from each part.*
2. Answer all objective type questions only in OMR sheet page 5 of the Answer Booklet.
3. Answers to objective type questions on sheets other than OMR will not be valued.

PART - A

1 a. Choose the correct answer :   **(04 Marks)**
   i) The driving force for a red - ox reaction in a galvanic cell is due to
      (A) $\Delta G = -nEF$ (B) $\Delta G = nEF$ (C) $\Delta G = 0$ (D) None of these
   ii) The standard reduction potential of Zn and Fe are -0.76V and -0.44V respectively. The emf of cell formed by combining the above two electrodes will have
      (A) 0.32V   (B) - 0.32V   (C) -1.2V   (D) 1.2V
   iii) When the concentration of chloride ion is silver – silver chloride electrode increases, the reduction potential of the electorde
      (A) increases   (B) decreases   (C) does not alter   (D) None of these
   iv) Calomel is the commercial name of
      (A) Mercuric chloride   (B) Mercurous chloride
      (C) Mercuric sulphate   (D) Mercurous sulphate

   b. Define single electrode potential. Derive Nerst's equation for single electrode potential.
         (06 Marks)

   c. Describe the construction and working of calomel electrode. Write its advantages. **(06 Marks)**

   d. The emf of the cell $Cu/CuSO_4$ (0.01M) 11 $CuSo_4$ (x M) / Cu is 0.0295V at 25^0C. Find the value of x.   **(04 Marks)**

2 a. Choose the correct answer :   **(04 Marks)**
   i) Which of the following is a reserve battery
      (A) Zn – Air battery (B) Ni – MH battery (C) Zn – Ag_2O (D) Li – MnO_2
   ii) Which of the following is used in cellular phones
      (A) Zn – MnO_2 (B) Zn- air   (C) Pb - acid   (D) Ni- MH
   iii) The fuel cells are more superior than the conventional batteries because
      (A) They are light in weight   (B) They are not eco friendly
      (C) They produce direct current at low cost
      (D) They are easily fabricated
   iv) In Zn – Air battery, the cathode of the cell is
      (A) Graphite   (B) Air / C   (C) Zn / Air   (D) Air / KOH

   b. Describe the construction and working of lead acid battery.   **(06 Marks)**

   c. What are fuel cells? Describe the construction and working of a CH_3OH O_2 fuel cell.
         (06 Marks)

   d. Explain the following battery characteristics i) Energy efficiency   ii) Cycle life.
         (04 Marks)

3   a. Choose the correct answer :   (04 Marks)
        i) Insoluble corrosion product formed during corrosion process leads
            (A) To prevent further corrosion   (B) Has no effect on corrosion
            (C) To enhance further corrosion   (D) None of these

        ii) At high hydrogen over voltage, the rate of corrosion
            (A) Increases   (B) Decreases
            (C) Increases initially and then decreases (D) Remains the same.

        iii) Which of the following factors accounts for lower corrosion rate
            (A) Large anodic area and small cathodic area
            (B) Small anodic area and large cathodic area
            (C) High temperature
            (D) High humidity

        iv) Caustic embrittlement is a classic example of
            (A) Differential aeration corrosion   (B) Stress corrosion
            (C) Differential metal corrosion   (D) None of these

     b. What is corrosion? Explain the electrochemical theory of corrosion with respect to iron.
                                                                                                        (06 Marks)
     c. Explain the type of corrosion occurring in the following cases.
        i) Presence of small dust particles on iron surface for a long time.
        ii) Copper nut is contact with iron bolt.   (06 Marks)

     d. What is anodizing? Explain the anodizing of Aluminium.   (04 Marks)

4   a. Choose the correct answer :   (04 Marks)
        i) The experimentally determined discharge potential of an electrode is 2.57V and its
            theoretical discharge potential is 1.53V, then over voltage is
            (A) 3.345V   (B) - 1.04V   (C) 4.10V   (D) 1.04V

        ii) Electroless plating process is possible only on
            (A) Catalytically active surface   (B) Inactive surface
            (C) Any surface   (D) None of these

        iii) Which of the following is essential in electroless plating
            (A) Oxidising agent   (B) Reducing agent
            (C) Anode   (D) Electrical energy

        iv) Driving force in electroless plating process is
            (A) Power supply   (B) Oxidising agent
            (C) Auto catalytic red-ox reaction   (D) None of these

     b. Explain the following factors influencing the rate of electro deposit.
        i) Current density   ii) Wetting agent   iii) pH   (06 Marks)

     c. Discuss the process of electroless plating of copper.   (04 Marks)

     d. Explain the terms : i) Decomposition potential   ii) Over voltage.   (06 Marks)

PART – B

5 a. Choose the correct answer : **(04 Marks)**

   i) Zone refining technique for purification of solar grade silicon is based on
      (A) Henry's law   (B) Newton's law (C) Partition law   (D) Phase rule

   ii) Which of the following is not a secondary fuel?
      (A) Coal gas   (B) Water gas   (C) Producer gas   (D) Natural gas

   iii) Methyl tertiary butyl ether is added to the gasoline to
      (A) Increase the octane number   (B) Minimizing knocking
      (C) Increase the efficiency of IC engine   (D) All the above

   iv) Catalysts used in catalytic converters are
      (A) Pt, Pd and Rh   (B) Ni, Co and Cr   (C) Al_2O_3 and SiO_2 (D) Zeolite

b. What is knocking in IC engines? Explain its mechanism with chemical reaction. Mention its ill effects. **(06 Marks)**

c. What is meant by cracking? Describe the fluidized bed catalytic cracking process. **(06 Marks)**

d. Calculate the calorific value of a sample of coal from the following data: **(04 Marks)**

Mass of coal	= 0.95g
Mass of water in copper calorimeter	= 2000g
Water equivalent of calorimeter	= 700g
Rise in temperature	= 2.8°C
Sp. heat of water	= 4.187 kJ/kg/°C

6 a. Choose the correct answers : **(04 Marks)**

   i) In flame photometry, the emitted radiation lies in
      (A) IR range   (B) uv range   (C) Visible range   (D) None of these

   ii) In the estimation of FAS by potentiometry the indicator electrode used is
      (A) Silver-silver chloride electrode   (B) Platinum electrode
      (C) Calomel electrode   (D) Glass electrode

   iii) Lambert's law states that intensity of monochromatic light decrease exponentially with
      (A) Concentration   (B) Path length   (C) Time   (D) Density

   iv) Gibb's phase rule is applicable to
      (A) Heterogeneous systems   (B) Heterogeneous systems is equilibrium
      (C) Homogeneous systems   (D) All of these

b. State the phase rule and explain the terms involved with examples. **(06 Marks)**

c. Draw the phase diagram for water system and explain the salient features. **(06 Marks)**

d. Write brief note on conduct metric titrations. **(04 Marks)**

7   a.   Choose the correct answers :   (04 Marks)
        i)   Natural rubber is the polymerized form of
             (A) Chloroprene   (B) Isoprene   (C) Propene   (D) Styrene

        ii)   A polymer of high optical clarity used in preparation of lenses is
             (A) Teflon   (B) Phenol formaldehyde   (C) Neoprene   (D) PMMA

        iii)   Which one among is a conducting polymer
             (A) Aniline   (B) Pyrrole   (C) Polyacetylene (D) Acetylene

        iv)   Very high molecular weight polymers will have,
             (A) low Tg   (B) High Tg   (C) Moderate Tg   (D) No Tg

    b.   What are polymers? Discuss the free radical mechanism of polymerization of ethylene.
                                                                                         (06 Marks)
    c.   Give the synthesis and an application of, i) Butyl rubber   ii) PMMA.   (06 Marks)
    d.   Describe the synthesis and applications of Kevlar fibre.   (04 Marks)

8   a.   Choose the correct answers :   (04 Marks)
        i)   Secondary treatment of sewage is carried out to reduce,
             (A) Organic load   (B) Inorganic load   (C) Destroy microorganisms (D) None of these

        ii)   Complexing agent for spectrometric analysis of nitrates is,
             (A) SPADNS   (B) Ammonia
             (C) Phenol Sulphonic acid   (D) Phenol disulphonic acid

        iii)   The method used for desalination of water is,
             (A) Zeolite process   (B) Lime-soda process
             (C) Ion-exchange process   (D) Reverse osmosis process

        iv)   The indicator used for the estimation of total hardness of a given water sample by
              EDTA method.
             (A) Starch   (B) Eriochrome black-T   (C) Ferroin   (D) Methyle orange

    b.   What is desalination? Explain the desalination of water by electrodialysis   (06 Marks)
    c.   Explain the argentometric method of determination of chloride in water. Write the reactions
         involved.   (06 Marks)
    d.   Explain the terms: i) BOD   ii) COD.   (04 Marks)

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