First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Chemistry

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, choosing at least two from each part.*

PART – A

1 a. Choose the correct answers for the following :
   i) The electrode with –ve sign for its SRP acts as,
       A) Anode with respect to SHE   B) Cathode with respect to SHE
       C) Act as both   D) None of these.
   ii) The emf of a concentration cell with 0.05m & 0.025m $AgNO_3$ solution is
       A) 0.178V   B) 0.0295V   C) 0.0178V   D) 0.125V
   iii) For a galvanic cell with spontaneous reaction, Ecell is assigned.
       A) +ve sign   B) – ve sign   C) Zero   D) None of these
   iv) Example of an ion selective electrode is
       A) S.H.E   B) Platinum electrode
       C) Glass electrode   D) Ag-AgCℓ electrode.   **(04 Marks)**

   b. What is single electrode potential? Derive Nernst equation for the same.   **(06 Marks)**

   c. A galvanic cell is constructed by immersing a Cu rod in $Cu(NO_3)_2$ solution of 0.01 M and a silver rod in $AgNO_3$ solution of 0.1M ionic concentrations. Given E^0 of the cell is 0.46V. Write the cell diagram cell reaction and calculate the emf of the cell.   **(04 Marks)**

   d. Explain the application of glass electrode in determination of pH of a solution.   **(06 Marks)**

2 a. Choose the correct answers for the following :
   i) The electrolyte used in Zn – Air battery is
       A) Aqueous H_2SO_4 B) Aqueous KOH   C) concentrate KCℓ   D) None of these.
   ii) Which of the followings is a modern battery?
       A) Zn – Air cell   B) Zn – MnO_2 cell   C) Lead – Acid cell   D) None.
   iii) Fuel cell is an electrochemical cell, which works,
       A) In absence of fuel   B) with continuous consumption of fuel
       C) Without an electrolyte   D) None of these.
   iv) The operation temperature of alkaline fuel cell is
       A) 600°C   B) 60 - 80°C   C) 1000°C   D) 250°C
                                                 (04 Marks)

   b. Discuss the following battery characteristics.
       i) Capacity   ii) Energy efficiency   iii) Shelf life.   **(06 Marks)**

   c. With a neat sketch, explain the construction and working of lead – Acid storage battery with discharging and recharging reactions.   **(06 Marks)**

   d. What are fuel cells? How it differ from battery?   **(04 Marks)**

3 a. Choose the correct answers for the following :
   i) Corrosion occurs in metal in a corrosive environment due to
       A) Deposition of metal   B) Oxidation of metal
       C) Reduction of metal   D) None of these.
   ii) In acidic medium, the corrosion reaction ends with
       A) Liberation of N_2 B) Absorption of O_2 C) Liberation of H_2 D) Absorption of H_2

iii) Coating of Zn on iron is known as
   A) Galvanization   B) tinning   C) Cathodic protection   D) None of these.
iv) Water line corrosion is an example of
   A) differential aeration cell   B) stress corrosion
   C) Galvanic corrosion   D) None of these.   (04 Marks)

b. What is electro chemical corrosion? Discuss the electro chemical theory of corrosion by taking the iron as example.   (06 Marks)

c. Discuss the effect of the following on rate of corrosion.
   i) Nature of oxide film   ii) polarization.   (06 Marks)

d. Explain the sacrificial anodic method of corrosion control.   (04 Marks)

4 a. Choose the correct answers for the following :
   i) The electro chemical cell used for electroplating is
      A) Fuel cell   B) Galvanic cell   C) Electrolytic cell   D) None.
   ii) The decomposition potential refers to,
      A) Minimum current a cell uses   B) Minimum voltage to be applied
      C) Minimum concentration to be maintained   D) None of these.
   iii) The reducing agent used in electroless plating of copper is
      A) Formaldehyde   B) sodium hypophosphite
      C) Acetic acid   D) Formic acid.
   iv) Electro less plating involves the deposition
      A) without the use of current   B) By using the current
      C) By applying voltage and current   D) None of the above.   (04 Marks)

b. What is metal finishing? Discuss the effect of over voltage and decomposition potential on electroplating.   (06 Marks)

c. Discuss the electroplating of chromium.   (05 Marks)

d. What is electroless plating? Discuss the electroless plating of copper. (05 Marks)

PART – B

5 a. Choose the correct answers for the following :
   i) The quantity of heat evolved by the complete combustion of unit quantity of fuel in air or oxygen is
      A) Calorific value   B) Enthalpy   C) Free energy   D) None.
   ii) The process of breaking down of high molecular mass hydrocarbon to low molecular mass hydrocarbon is
      A) Refining   B) Reforming   C) Cracking   D) None.
   iii) The octane number of fuel is measure of
      A) Ability to resist anti knocking   B) offers no resistance to knocking
      C) Ability to resist knocking   D) None of the above.
   iv) The device in which electricity is produced using solar energy is known as
      A) Fuel cell   B) Voltaic cell   C) Photovoltaic cells   D) None. (04 Marks)

b. Explain the Bomb calorimetric method of the determination of the calorific value of the fuel.
                                                                       (05 Marks)

c. Explain the fluidized bed catalytic cracking.   (06 Marks)

d. Calculate the G.C.V and NCV of a fuel from the following data :
   Mass of fuel burnt: 0.75g; Mass of water taken = 1150g; water equivalent of colorimeter: 350g, Increase in temp = 3.02°C percentage of hydrogen in fuel is 2.8.   (05 Marks)

6 a. Choose the correct answers for the following :
   i) The phase rule for heterogeneous system is
      A) $C = P+2 - F$ B) $P+F = C+2$ C) $C+F = P+2$ D) $C+P = F+2$
   ii) The number of components in water system is
      A) 1 B) 3 C) 2 D) 0
   iii) The composition of an eutectic of lead and silver is
      A) 5g Ag 95% pb B) 1.5g Ag 98.5g pb C) 2.67g Ag 97.33 pb D) None.
   iv) Mathematical expression of Beers and Lambert's law.
      A) $I_t = I_o . e^{-ect}$ B) $I_o = I_t . e^{-ect}$ C) $I_t = I_o . e^{-cc}$ D) $I_t = I_o . e^{Ect}$
      (04 Marks)

   b. Discuss the applications of phase rule to water system. (05 Marks)
   c. What is reduced phase rule? Describe the phase diagram of lead silver system. (05 Marks)
   d. Explain the conducto metric titrations. (06 Marks)

7 a. Choose the correct answers for the following :
   i) A polymer formed by direct addition of repeated monomers without elimination of bye product is
      A) condensation polymer B) Addition polymer
      C) conducting polymer D) Elastomer
   ii) An example of natural polymer is
      A) Plastic B) Rubber C) Nylon D) P.V.C.
   iii) Teflon is obtained by the polymerization of
      A) Tetra fluoro ethane B) Isoprene C) Butadiene D) None.
   iv) Phenol formaldehyde is a
      A) Thermosetting polymer B) Thermoplastic
      C) Co-polymer D) None of these. (04 Marks)

   b. Discuss the mechanism of addition polymerization by taking ethylene as example. (05 Marks)
   c. Give the synthesis, properties and uses of the followings:
      i) Neoprene ii) P.M.M.A (06 Marks)
   d. Explain the conduction mechanism in poly acetylene. (05 Marks)

8 a. Choose the correct answers for the following :
   i) The process of removing salts from sea water is called
      A) Desalination B) Sedimentation C) Precipitation D) None of these.
   ii) A treatment involving the removal of phosphate is
      A) Primary B) Secondary C) Tertiary D) All of these.
   iii) Permanent hardness of water is due to
      A) $CaCl_2$ and $MgCl_2$ B) $CaCO_3$ C) $MgCO_3$ D) None of these.
   iv) Potassium chromate is used as an indicator in determination.
      A) Hardness B) alkalinity C) Cl^- ions D) Fl^- ions.
      (04 Marks)

   b. Explain the estimation of alkalinity of water. (05 Marks)
   c. Calculate COD of effluent of sample when $25cm^3$ of effluents requires $8.3cm^3$ of 0.001 M $K_2Cr_2O_7$ for complete oxidation. (05 Marks)
   d. Discuss the reverse osmosis method of water purification. (06 Marks)

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