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10CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 : (04 Marks)
- The free energy change for a spontaneous reaction of an electrochemical cell is negative. The sign of the anode is
 A) no sign B) + ve C) - ve D) None of these
 - At lab temperature, the potential of calomel reference electrode depends on
 A) conc of Hg^{2+} ions B) conc of Hg_2^{2+} ions
 C) Hg_2Cl_2 (s) D) conc of Cl^- ions
 - In a concentration cell, if the concentrations of the electrolytes at anode and cathode are equal, the potential of the cell is
 A) 0.0 V B) 10 V C) 1.0 V D) None of these
 - The standard cell potential arising from combination of electrodes of potentials -0.44 V and -1.66 V is
 A) -1.22 V B) $+1.22$ V C) $+2.10$ V D) -2.10 V
- b. Define Standard Electrode potential. Explain the origin of single electrode potential. (06 Marks)
- c. What are Ion – Selective Electrodes? Explain the determination of pH using glass electrode. (06 Marks)
- d. A cell is formed by placing two copper rods in 0.1M and 1M CuSO_4 solutions separately.
 i) Give the electro chemical representation of the cell.
 ii) Calculate the potential of the cell at 303 K.
 Given $R = 8.314$ J/K/mol ; $F = 96,500$ J/V/mol. (04 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- To derive maximum voltage from a battery
 A) The difference in electrode potentials must be low
 B) Internal resistance must be high
 C) The over potential at the electrodes must be high
 D) None of the above.
 - Which of the following battery gives the same product during discharge at both anode and cathode?
 A) Zn – MnO_2 cell B) Pb - H_2SO_4 cell
 C) Ni – MH cell D) Daniell cell
 - In Nickel – Metal Hydride cell, the anode of the cell consists of
 A) Ni metal B) An alloy of iron
 C) An alloy of La and Ni D) Cd
 - One of the salient features of the fuel cell is
 A) No charging is needed B) Charging is desired
 C) External power source is needed D) None of these
- b. Write a note on the following battery characteristics i) Cycle life ii) Voltage. (04 Marks)
- c. Explain the construction and working of Zinc – Air battery. (06 Marks)
- d. What are fuel cells? Explain the construction and working of $\text{H}_2 - \text{O}_2$ fuel cell. (06 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- ii) 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
- ii) The coating used for iron container used to store food is
 A) Zinc
 B) Tin
 C) Lead
 D) Aluminium
- iii) Anodizing is applicable to
 A) Al
 B) Fe
 C) Both Al and Fe
 D) Neither Al nor Fe
- iv) Which of the following is less corroded?
 A) Pure metal
 B) Impure metal
 C) Impure alloy
 D) All of these
- b. Explain the following : i) Water line corrosion ii) Pitting corrosion. (06 Marks)
- c. Write a note on Tinning. (04 Marks)
- d. Explain the affect of following factors on the rate of corrosion :
 i) Nature of corrosion product ii) The ratio of anodic to cathodic region. (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- i) For an electrolytic mixture containing Zn^{+2} , Cu^{+2} , Ag^{+1} the ion which is going to be discharged first is
 A) Zn^{+2}
 B) Cu^{+2}
 C) Ag^{+1}
 D) None
- ii) In which of the following methods of plating, autocatalytic reaction takes place?
 A) Electroplating
 B) Electroless plating
 C) Electro forming
 D) Electro refining
- iii) In Electroplating at decomposition potential, the following is decomposed.
 A) Anode
 B) Cathode
 C) Electrolyte
 D) Electro deposit
- iv) Conductors and insulators can be plated by,
 A) Electroplating
 B) Electroless plating
 C) Electropolishing
 D) None of these
- b. What is Electroplating? Explain the process of electroplating of gold. (06 Marks)
- c. Explain decomposition potential and polarization. (06 Marks)
- d. Differentiate between Electroplating and Electroless plating. (04 Marks)

PART - B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) The tendency of knocking in gasoline engines is lowest in
 A) Aromatics
 B) Olefins
 C) Straight chain hydrocarbons
 D) Cycloparaffins.
- ii) Which of the following will not increase the octane number of Petrol?
 A) Refining
 B) Reforming
 C) Addition of tetraethyl lead
 D) Addition of MTBE
- iii) If the percentage of hydrogen in a Fuel sample is high, its net calorific value is
 A) High
 B) Low
 C) Constant
 D) Cannot be predicted
- iv) Dopins of silicon with Boron gives
 A) n - type silicon semiconductor
 B) p - type silicon semiconductor
 C) n - p type semiconductor
 D) Insulator
- b. Define Petroleum Cracking. Explain the fluidized bed catalytic cracking process. (05 Marks)
- c. What is Knocking in IC engines? Explain the mechanism with chemical reactions. (05 Marks)
- d. What is PV cell? Explain Construction and Working PV cell. (06 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) If a monochromatic beam of light passes through a colored solution, then the absorbance of the solution is
 A) $A = + \log_{10} \frac{I_0}{I_t}$
 B) $A = \log_{10} T$
 C) $A = B - \log_{10} \frac{I_0}{I_t}$
 D) $A = - \log_{10} \frac{I_0}{I_t}$

- ii) Flame Photometric analysis is used to determine
 A) Boron B) Titanium C) Zinc D) Sodium
- iii) Curves on either side of eutectic point of a two component system are
 A) Bivariant B) Univariant C) Invariant D) None of the above
- iv) The two thermodynamic variables needed to explain condensed phase rule is
 A) Mass and temperature B) Temperature and Composition
 C) Volume and Composition D) Composition and pressure
- b. State Phase rule. Explain the phase diagram of Lead – Silver system. (06 Marks)
- c. Explain in brief the estimation of copper by colorimetric method. (05 Marks)
- d. Explain the theory and instrumentation in potentiometric titrations. (05 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- i) Conjugated polymers are
 A) Organic semiconductors B) Inorganic semiconductors
 C) Physical semiconductors D) None
- ii) Glass transition temperature is highest in
 A) PVC B) Polyethylene C) Poly propylene D) Polystyrene
- iii) As the crystallinity of a polymer increases
 A) Solubility decreases B) Permeability decreases
 C) Stiffness increases D) All the above
- iv) In carbon fibre the structure of carbon is
 A) That of graphite B) That of diamond C) Straight chain D) None of these
- b. Give the synthesis and applications of PMMA and Silicon rubber. (06 Marks)
- c. What are the differences between addition polymerization and condensation polymerisation? (04 Marks)
- d. What are conducting polymers? Discuss the mechanism of oxidative doping of polyacetylene. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- i) If for a given effluent sample BOD and COD have the same value, the effluent has
 A) No inorganic oxidizable impurities
 B) Equal amount of inorganic and organic impurities
 C) No organic oxidizable impurities D) None of the above.
- ii) Potable water is totally devoid of
 A) Pathogenic bacteria B) Calcium and Magnesium salts
 C) Chlorides D) Nitrates
- iii) Winkler's method in alkaline medium, dissolved oxygen oxidizes
 A) Mn^{2+} to Mn^{4+} B) Mn^{7+} to Mn^{4+}
 C) Mn^{2+} to Mn^{7+} D) Mn^{4+} to Mn^{7+}
- iv) A process that uses electrodes to remove dissolved salt in water is known as
 A) Osmosis B) Reverse osmosis C) Electrodialysis D) Electrolysis
- b. Explain the determination of fluoride by Z – SPADNS method. (06 Marks)
- c. Explain the activated sludge treatment of sewage water. (04 Marks)
- d. Explain Winkler's method of determining dissolved oxygen. Give the reactions involved. (06 Marks)
