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10CHE12/22

First/Second Semester B.E. Degree Examination, June 2012
Engineering Chemistry

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Choose your answers for the following : **(04 Marks)**

i) The standard reduction potential of Mn and Fe are – 1.18 V and – 0.44 V respectively. The standard emf of cell formed by combining the above two electrodes will be
A) + 0.74 V B) – 0.74 V
C) + 1.62 V D) – 1.62 V.

ii) Primary reference electrode used to measure the electrode potential of other electrodes is
A) SHE B) Calomel electrode
C) Glass electrode D) Silver – silver chloride electrode

iii) Reference electrode used in potentiometric determinations is
A) Glass electrode B) Pt-electrode
C) Calomel electrode D) Ion selective electrode

iv) If the direction of flow of electrons in electrochemical cell is right to left then the cell reaction is
A) Non spontaneous B) Spontaneous
C) Reversible D) Irreversible.

b. An electrochemical cell consists of metallic zinc immersed in 0.1 M $Zn(NO_3)_2$ solution and metallic copper immersed in 0.2 M $CuSO_4$ solution. Calculate emf of the cell at 25°C and change in free energy of the cell reaction E° cell = 1.1 V. **(05 Marks)**

c. Emf of the cell $Ag/AgNO_3(C_1)$ // $(C_2 = 0.2)$ $AgNO_3$ /Ag is 0.8 V. Calculate C_1 of the cell. **(03 Marks)**

d. What are ion selective electrodes? Discuss the construction of glass electrode and derive an expression relating glass electrode potential and pH. **(08 Marks)**

2 a. Choose your answers for the following : **(04 Marks)**

i) The electrolyte used in alkaline fuel cell is
A) H_2SO_4 B) KOH
C) KCL D) NH_4Cl

ii) Hydrogen absorbing negative electrode is used in
A) Ni – Cd – battery B) Ni – MH battery
C) Li – MnO_2 battery D) Zn – MnO_2 battery

iii) In hydrogen – oxygen fuel cell the electrolyte used is
A) KOH B) H_2SO_4
C) LiCl D) None of these.

iv) In which of the following battery the overall cell reaction is note reversible?
A) Ni – Cd B) Ni - MH
C) Pb – Acid D) Zn – MnO_2

b. What are rechargeable and reserve batteries? **(04 Marks)**

c. Explain the construction and working of nickel – metalhydride battery. **(06 Marks)**

d. What are fuel cells? Explain the construction and working of methanol oxygen fuel cell. **(06 Marks)**

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3 a. Choose your answers for the following : **(04 Marks)**

i) In galvanic corrosion the less active metal always acts as
A) Anode B) Cathode
C) Both anode and cathode D) none of these

ii) Caustic embrittlement of boilers is due to presence of excess of
A) Na_2CO_3 B) $Ca(OH)_2$
C) $CaSO_4$ D) $CaCO_3$

iii) In differential aeration corrosion the area more accessible to air acts as
A) Cathode B) Anode
C) Anode and Cathode D) None of these

iv) Electrolyte used in anodizing of aluminium is
A) H_2SO_4 B) KOH
C) $NH_4C\ell$ D) $HC\ell$

b. Explain the following types of corrosion i) Galvanic corrosion ii) Stress corrosion. **(06 Marks)**

c. What is anodizing? Explain the anodizing of aluminum. **(05 Marks)**

d. What are corrosion inhibitors? Explain how corrosion is controlled by inhibitors. **(05 Marks)**

4 a. Choose your answers for the following : **(04 Marks)**

i) The process in which the metal ions are deposited on catalytically active surface in presence of reducing agent is
A) Electroplating B) Electroless plating
C) Immersion plating D) Electrophoretic painting

ii) In electroplating of chromium the anode used is
A) Achromium B) Pb – Sb alloy
C) Nickel D) Copper

iii) Concentration of metal ions in plating bath is reduced by addition of
A) Brighteners B) Levellers
C) Complexing agent D) All the above.

iv) Reducing agent used in electroless Nickel plating is
A) Formaldehyde B) Sodium Acetate
C) Sodium hypophosphite D) Sodium succinate.

b. What is electroplating? What are the advantages of electorless plating over electroplating? **(04 Marks)**

c. Explain the process of electroless plating of Nickel on aluminum. **(06 Marks)**

d. Discuss the chromium plating process. **(06 Marks)**

PART – B

5 a. Choose your answers for the following : **(04 Marks)**

i) Quality of Gasoline is expressed in terms of its
A) Octane number B) Cetane number
C) Compression ratio D) Compression number

ii) In fluidized bed catalytic cracking process, the cracking of heavy oil takes place at
A) 200 - 300°C B) 500 - 600°C
C) 1000 - 1200°C D) 1500°C

iii) Methyl tertiary butyl ether is added to petrol which acts as
A) Inhibitor B) Accelerator
C) Ant knocking agent D) Catalyst

iv) Catalysts used in catalytic converter is
A) Pt, Pd and Rh B) Ni, Co and Cr
C) SiO_2 and $A\ell_2O_3$ D) Zeolite

b. What is knocking? Explain its mechanism. **(06 Marks)**

c. Explain the construction and working of photovoltaic cell. **(04 Marks)**

d. What is biodiesel? Explain the biodiesel production by transesterification of triqulyceride. **(06 Marks)**

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6 a. Choose your answers for the following : **(04 Marks)**

i) In potentiometric redox titrations platinum electrode is used in combination with
A) SHE B) Calomel electrode
C) NHE D) None of these

ii) Condensed phase rule is applied for a system consisting of :
A) Two component B) One component
C) Multi component D) Three component

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

iv) In flame atomic emission spectroscopy the emitted radiation lies in
A) Visible range B) IR range
C) UV range D) None of these

b. Define the terms phase, component and degree of freedom and explain the application of phase rule to water system. **(08 Marks)**

c. What is the principle of flame photometry? What are the processes that occur in the flame? Explain the various components of flame photometer. **(08 Marks)**

7 a. Choose your answers for the following : **(04 Marks)**

i) Addition polymerization is also called
A) Step polymerization B) Chain polymerization
C) Condensation polymerization D) none of these

ii) Natural rubber is polymerized form of
A) Isoprene B) Propene
C) Butene D) Styrene

iii) Free radicals are reactive species having
A) Paired electrons B) Unpaired electrons
C) Anions D) Cations

iv) Glass transition temperature of polymer is
A) First order transition B) Second order transition
C) Third order transition D) Multiorder transition

b. Explain the free radical mechanism of addition polymerization taking ethylene as a monomer. **(05 Marks)**

c. Explain the manufacture of plastics by injection moulding process. **(05 Marks)**

d. What are polymer composites? Write a note on Kevlar fibre. **(06 Marks)**

8 a. Choose your answers for the following : **(04 Marks)**

i) Temporary hardness of water is due to
A) $Ca(HCO_3)_2$ and $Mg(HCO_3)_2$ B) $CaCl_2$
C) $CaSO_4$ D) $MgSO_4$

ii) Potassium chromate is used as an indicator in analysis of water
A) Hardness B) Alkalinity C) Chloride D) Fluoride

iii) Brackish water can be desalinated by
A) Electrodialysis B) Reverse Osmosis C) Filtration D) both A and B

iv) The method adopted to analyze dissolved oxygen in water is
A) Volhards B) Winkers C) Argentometric D) Dumas

b. What is alkalinity of water? Explain the determination of alkalinity of water. **(06 Marks)**

c. 20 ml of sample of COD analysis was reacted with 10 ml of 0.25 N $K_2Cr_2O_7$ and the unreacted dichromate required 6.5 ml of 0.10 N Ferrous ammonium sulphate. 10 ml of same $K_2Cr_2O_7$ and 20 ml of distilled water under the same conditions as the sample required 26.0 ml of 0.10 NFAS. What is the COD of the sample? **(04 Marks)**

d. What is desalination? Explain the desalination of water by electrodialysis. **(06 Marks)**

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