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06CHE12/22

First / Second Semester B.E. Degree Examination, Dec.08/Jan.09
Engineering Chemistry

Time: 3 hrs. Max. Marks:100

Note:1. ***Answer any FIVE full questions selecting at least two questions from each part.***
2. Answer all objective type questions only in first and second writing pages.
3. Answer for Objective type questions shall not be repeated.

Part A

1 a. i) Bomb calorimeter is used for determining the calorific value of,
A) Solid fuel B) Liquid fuel C) Gaseous fuel D) Both solid fuel and liquid fuel

ii) Octane number is related to the petroleum product
A) Diesel B) Kerosine C) Petrol D) Lubricating oil

iii) The process by which the higher hydrocarbons are broken into lower hydrocarbons by the application of heat by,
A) Combustion B) Cracking C) Sparking D) Jetting

iv) Quality of diesel fuel is determined by,
A) Octane rating B) Percentage of carbon
C) Length of hydrocarbon chain D) Cetane number **(04 Marks)**

b. What is meant by cracking? Describe with a neat diagram fluidized bed catalytic cracking. **(06 Marks)**

c. What is knocking? What are its ill-effects? Give the mechanism of knocking. **(05 Marks)**

d. What are chemical fuels? Give the classification of fuels with examples. **(05 Marks)**

2 a. i) Calomel electrode is reversible with respect to
A) Mercury ion B) Chloride ion C) Both ions D) None of these

ii) A metal rod is dipped in a solution of its ions. Its electrode potential is independent of,
A) Temperature of the solution B) Concentration of the solution
C) Area of the metal exposed D) Nature of the metal

iii) A galvanic cell converts
A) Electrical energy into chemical energy B) Chemical energy into electrical energy
C) Electrical energy into heat energy D) Chemical energy into heat energy

iv) The potential of the standard Hydrogen electrode is taken as
A) 1 volt B) 0 volt C) 10 volt D) None of these **(04 Marks)**

b. Define single electrode potential and standard electrode potential and explain the origin of electrode potential. **(06 Marks)**

c. Explain the determination of electrode potential copper electrode dipped in 0.5 m $CuSO_4$ using standard hydrogen electrode. What would be the measured emf? ($E^{\circ}cu/cu^{++} = +0.34$ V) **(06 Marks)**

d. Write the cell reaction and calculate the emf of the following cell at 298 K, given $E^{\circ}_{cell} = 0.46V$

$Cu_{(s)} | Cu^{+2}(0.01M) \| Ag^{+}(0.1M) | Ag_{(s)}$ **(04 Marks)**

3 a. i) In which battery, a key component is separated from the rest of the battery prior to activation

A) Primary battery B) Secondary battery C) Reserve battery D) None of these

ii) In hydrogen-oxygen fuel cell, which of the following electrolyte is used,

A) KOH B) NH_4OH C) CH_3COOH D) None of these

iii) The reaction that lakes place at anode of a battery,

C) Reduction B) Oxidation C) Neutralisation D) Addition

iv) Which of the following is a rechargeable battery

A) Zn-MnO2 battery B) Li – MnO_2 battery

C) Lead – acid battery D) None of these **(04 Marks)**

b. Describe the construction and working of Zn-air battery. **(06 Marks)**

c. Describe the construction and working of methanol-oxygen fuel cell. **(06 Marks)**

d. Explain the following battery characteristics: i) Voltage ii) Power density **(04 Marks)**

4 a. i) Corrosion process is an example of ,

A) Oxidation B) Reduction C) Electrolysis D) Both A and B

ii) Caustic embrittlement is a classical example of ,

A) Differential aeration corrosion B) Stress corrosion

C) Differential metal corrosion D) None of these

iii) Galvanising is the process of coating iron with

A) Tin B) Zinc C) Copper D) Nickel

iv) Water-line corrosion is an example of

A) Differential aeration corrosion B) Stress corrosion

C) Differential metal corrosion D) None of these **(04 Marks)**

b. Define the term corrosion. Explain the rusting of iron based on electrochemical theory of corrosion. **(06 Marks)**

c. Discuss the anodic protection as a method of corrosion control. **(06 Marks)**

d. Write a note on Galvanisation. **(04 Marks)**

Part B

5 a. i) Conductors and insulators can be plated by,

A) Electroplating B) Electroless plating C) Electropolishing D) None

ii) The phenomenon in which the back emf produced due to the products of electrolysis is

A) Electroplating B) Electroless plating C) Polarisation D) None of these.

iii) When the metal structure to plated is irregular, the process employed is,

A) Electroplating B) Electropolishing C) Electrolessplating D) None of these

iv) Addition of complexing agent to the plating bath is to,

A) Increase the rate of electro deposition B) Increase the metal ion concentration

C) Decrease the metal ion concentration D) None of these **(04 Marks)**

b. Explain the process of electroless plating of copper. **(06 Marks)**

c. Mention the differences between electroplating and electroless plating. **(06 Marks)**

d. Explain the following factors that affect the nature of electrodeposit,

i) Throwing power ii) Current density iii) Metal ion concentration **(04 Marks)**

6 a. i) An ion selective electrode used in the determination of pH is

A) Calomel electrode B) Silver – Silver chloride electrode

C) Glass electrode D) None of these

ii) The class of compounds that exhibit liquid crystalline behaviour on variation of temperature alone are referred to as,

A) Lyotropic liquid crystals B) Thermotropic liquid crystals

C) Isotropic liquids D) None of these

6 iii) Instrumental methods of analysis are widely adopted when compared to classical methods of analysis because,
A) The methods are much faster B) Applicable at concentrations
C) The analytical process can be automated D) All the above
iv) Colorimetry involves measurement of absorbance using monochromatic light in the,
A) UV range B) IR range C) Visible range D) All the above **(04 Marks)**

b. What are potentiometric titrations? Discuss the application of potentiometry in the estimation of FAS using standard $K_2Cr_2O_7$ solution. **(06 Marks)**

c. Explain, Nematic phase, Cholesteric phae and Smectic phase. **(06 Marks)**

d. Discuss the application of condctometry in the determination of the amount of hydrochloric acid using standard NaOH solution. **(04 Marks)**

7 a. i) Tettrafluoro ethylene is the monomer of,
A) Nylon – 66 B) Neoprene C) Teflon D) PVC
ii) Phenol-formaldehyde resin is commercially,
A) PVC B) Bakelite C) Elastomer D) Nylon
iii) Suphur is used particularly in,
A) Manufacture of Buna – S B) Compounding of plastics
C) Corrosion control D) Vulcanisation of raw rubber
iv) Isoprene is a monomer of,
A) Natural rubber B) Synthetic rubber C) Starch D) PVC **(04 Marks)**

b. Explain the free radical mechanism of addition polymerization, taking ethylene as an example. **(06 Marks)**

c. Differentiate between thermoplastics and thermosettings. Give one example each. **(04 Marks)**

d. Give the synthesis and uses of, i) Plexi glass ii) Butyl rubber. **(06 Marks)**

8 a. i) The indicator used for the estimation of total hardness of a given water sample by EDTA method,
A) Starch B) Erichrome balck – T C) Ferroin D) Methyl orange
ii) Temporary hardness of water is caused due to the presence of
A) CaCO3 B) $CaCl_2$ C) $Mg(HCO_3)_2$ D) None of these
iii) The method used for desalination of water is,
A) Zeolite process B) Lime-soda process
C) Ion-Exchange process D) Electrodialysis
iv) The indicator used in the determination of chloride content of water sample by Mohr's method,
A) Phenolpthalein B) K_2CrO_4 C) Starch D) Ferroin **(04 Marks)**

b. Define COD and explain the method of determining COD. **(06 Marks)**

c. What is hard water? Explain the estimation of total hardness of water by EDTA method. **(06 Marks)**

d. What is potable water? Give the characteristics of potable water. **(04 Marks)**

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