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06CHE12/22

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

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 the correct answers for the following : **(04 Marks)**

i) Photovoltaic cell converts
A) Heat energy to kinetic energy
B) Electric energy to sound energy
C) Chemical energy to mechanical energy
D) Light energy into electrical energy

ii) Knocking characteristic of petrol is determined with reference to
A) centane & n-heptane B) centane & iso-octane
C) iso-octane & n-heptane D) n-heptane & n-hexane

iii) Silicon doped with arsenic semiconductors is
A) extrinsic B) P-type C) n-Type D) Both A and B.

iv) Which of the following is a secondary fuel?
A) Wood B) Lignite C) Coke D) Peat

b. What is synthetic petrol? Explain Fischer-Tropsch process. **(07 Marks)**

c. Write a note on octane and centane number. **(04 Marks)**

d. 0.935 g of a solid fuel was burnt in Bomb calorimeter. Calculate the gross calorific and net calorific value of the fuel if the temperature of 1060g of water in the calorimeter raised by 2.35°C. Given specific heat of water 4.187 $kJkg^{-1}$ and water equivalent of calorimeter 135g. Latent heat = 2457 kJ/kg, % of hydrogen the fuel sample = 2.5. **(05 Marks)**

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

i) The potential of two metal electrodes used in a cell are +0.35V and +0.85V. The emf formed by combining them is
A) 1.20 V B) 0.50 V C) -0.50 V D) -1.20V

ii) Emf of a concentration cell depends on
A) standard electrode potential
B) Ionic concentration at the anode and cathode
C) Both A and B
D) None of these.

iii) The concentration of H^+ ions in SHE is
A) 1 M B) 0.1 M C) 0.05 M D) None of these.

iv) In a galvanic cell oxidation reaction occurs at
A) Cathode B) Anode C) Both A and B D) None of these.

b. Define standard electrode potential. Discuss the origin of single electrode potential. **(04 Marks)**

c. Explain how electrode potential copper electrode dopped is determined in 0.5M $CuSO_4$ using Calomel electrode with an example. **(04 Marks)**

d. Write short notes on: i) Ag/AgCl electrode ii) Ion-Selective electrode. **(08 Marks)**

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

i) Lead-acid battery function

A) PbO_2 B) PbO_4 C) H_2SO_4 D) All of these.

ii) The voltage available from a battery does not depend upon

A) emf of the cell B) free energy change of the cell reaction

C)Temperature D) Size of the electrodes

iii) The electrolyte used in zinc-Air battery is

A) H_2SO_4 B) KOH C) NH_4OH D) NaOH

iv) In Ni-Cd battery which species is oxidized during discharging

A) Ni^{3+} B) Ni^{2+} C) Cd^{2+} D) Cd

b. Explain the construction, working and application of i) Nickel-metal hydride battery and ii) H_2-O_2 Fuel cells. **(08 Marks)**

c. Write short notes on: i) Cycle life; ii) Self life; iii) Energy efficiency; iv) Voltage. **(08 Marks)**

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

i) In electro-chemical corrosion in acidic environment

A) oxygen evolution occurs B) hydrogen evolution occurs

C) oxygen absorption occurs D) hydrogen absorption occurs.

ii) Galvanizing is a process of coating iron with

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

iii) Corrosion process is

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

iv) In Galvanic corrosion more noble metal acts as

A) cathode B) anode C) sacrificial anode D) None of these.

b. Explain the following: i) Pitting corrosion ii) Cathodic protection **(08 Marks)**

c. Discuss the effect of the following factors on the rate of corrosion

i) Nature of corrosion product ii) Temperature **(04 Marks)**

d. Discuss the corrosion control by cathodic inhibitors. **(04 Marks)**

PART – B

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

i) Over voltage means

A) high voltage

B) voltage just sufficient to overcome polarization

C) Voltage above the theoretical voltage

D) All of these.

ii) Anode used in Chromium plating is

A) Pure chromium B) Chromium+copper alloy

C) insoluble Pb-Sb alloy D) None of these.

iii) In electroless plating of copper on PCB the reducing agent used is

A) Copper sulphate B) Sodium hydroxide

C) Formaldehyde D) EDTA.

iv) Addition of wetting agents in plating bath is to

A) obtain bright deposit B) release gas entrapped

C) modify the structure D) All of these.

b. What is meant by electroplating? Explain the electroplating of gold. **(06 Marks)**

c. What is metal finishing? What are the technological importance of metal finishing? **(06 Marks)**

d. Distinguish between electroplating and electroless plating. **(04 Marks)**

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

i) MBBA is an example for

A) Nematic B) Smectic C) Cholesteric D) Columnar

ii) Liquid crystals are

A) isotropic B) anisotropic

C) optically anisotropic D) None of these.

iii) Conductance depends on

A) nature of ions B) mobility of ions C) number of ions D) All of these.

iv) In colorimetric estimation involves light in the rage

A) U-V B) Visible C) IR D) far IR

b. Discuss thermotropic and lyotropic liquid crystals with examples. **(06 Marks)**

c. Explain liquid crystalline behaviour in homologues of PAA. **(04 Marks)**

d. Explain the theory, instrumentation and application of potentiometry. **(06 Marks)**

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

i) Which of the following is an example for natural polymer?

A) PVC B) PMMA C) Nylon D) Silk

ii) Stabilizers are added during compounding of resins to

A) reduce cost B) increase workability

C) retard degradation D) All of these.

iii) Navolacs are phenol-formaldehyde resins formed when

A) P/F > 1 B) P/F < 1 C) P/F = 1 D) none of these

iv) An example of conducting polymer is

A) PVC B) Poly acetylene C) Epoxy resin D) All of these.

b. Explain solution and suspension polymerization methods. **(06 Marks)**

c. Give the synthesis and applications of (i) PMMA (ii) Neoprene **(06 Marks)**

d. What are conducting polymers? Give the applications of conducting polyaniline. **(04 Marks)**

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

i) Hardness in water is caused by the presence of

A) Sodium chloride B) Sodium carbonate

C) Calcium Chloride D) Potassium Nitrate

ii) The process of removing extra common salt from water is called

A) Desalination B) Disinfection C) Deionization D) Softening.

iii) In the determination of Chloride by Argentometric method the indicator used in

A) Potassium dichromate B) Potassium chromate

C) Potassium sulphate D) Potassium Nitrate

iv) BOD determination of waste water measures

A) biodegrable B) non-biodegrable

C) Both organic & inorganic D) None of these.

b. Describe the SPADNS method of determination of fluoride in the sample of water. **(06 Marks)**

c. What is desalination? Explain electrodialysis for converting saline water into potable water. **(06 Marks)**

d. Calculate the COD of the effluent when 25 cm^3 of the effluent requires 10.5 cm^3 of 0.005 N $K_2Cr_2O_7$ for complete oxidation. **(04 Marks)**

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