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10CHE12/22

First/Second Semester B.E. Degree Examination, January 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) When the concentration of chloride ion in calomel increases, the reduction potential of the electrode
A) Increases B) Decreases C) Will not alter D) None of these

ii) Electrode potential of a metal electrode in dilute solution is
A) Same as in concentrated solution B) Higher than that in concentrated solution
C) Lower than that in concentrated solution D) Cannot be predicted

iii) When current is drawn from the Daniel cell, potential at cathode
A) Increases B) Decreases C) Remains constant D) Becomes zero

iv) In a concentration cell, the electrode in contact with a solution of higher concentration acts as
A) Anode B) Cathode C) Both anode and cathode D) None of these

b. Define single electrode potential. Derive Nernst equation for single electrode potential. (07 Marks)

c. What are Reference electrodes? Explain the construction and working of calomel electrode? (06 Marks)

d. Calculate emf of the following cell Fe/Fe^{2} (0.013M)//Ag (0.15M) Ag at STP, if the standard electrode potentials of iron and silver electrodes are -0.44V and 0.80V respectively. (03 Marks)

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

i) In which of the following the net cell reaction is irreversible
A) Dry cell B) Lead-Acid battery C) Nicad battery D) Lithium ion battery

ii) During discharging of lead-acid battery, the concentration of sulphuric acid
A) Increases B) Decreases C) Becomes zero D) Remains constant

iii) Super capacitor stores
A) Electrical energy B) Chemical energy
C) Heat energy D) Both chemical and electrical energy

iv) In a fuel cell, electricity is produced by
A) Combustion B) Electrolysis C) Knocking D) None of these

b. Explain the construction and working of acid storage battery. (07 Marks)

c. Explain the working of lithium ion battery. Write the advantages of li battery. (06 Marks)

d. Mention any three advantages of fuel cell. (03 Marks)

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

i) The reaction that takes place during corrosion of a metal is
A) Reduction B) Redox C) Oxidation D) Precipitation

ii) Corrosion of steel boiler along the riveted portions is an example of
A) Differential metal corrosion B) Differential aeration corrosion
C) Stress corrosion D) Grain boundary corrosion

iii) During electrochemical corrosion in a dearated acidic medium
A) Oxygen is evolved at anode B) Oxygen is reduced at anode
C) Hydrogen is evolved at cathode D) Hydrogen is oxidized at cathode

iv) Galvanizing is an example of
A) Cathodic metal coating B) Anodizing
C) Anodic metal coating D) None of these

b. Define the term corrosion. Explain the electrochemical theory of corrosion with respect to iron. (07 Marks)

c. What is cathodic protection? How a metal is cathodically protected by sacrificial anode method. (06 Marks)

d. Write a note on galvanization. (03 Marks)

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

i) In electroplating process, the overvoltage depends on
A) Temperature B) Current density C) Electrolyte D) All the above

ii) The anode used in electroplating of chromium is
A) Chromium B) Copper C) Graphite D) Pb-Sb

iii) Which of the following is essential in electroless plating?
A) Oxidizing agent B) Complexing agent C) Buffering agent D) Reducing agent

iv) In electroplating, throwing power is said to be good if the deposit is
A) Fast B) Slow C) Thick D) Uniform

b. Define the term metal finishing. Mention any three technological importance of metal finishing. (05 Marks)

c. Explain the process of electroplating of chromium. (05 Marks)
d. What is electroless plating? Explain the electroless plating of nickel. (06 Marks)

PART – B

3 a. Choose the correct answers for the following: (04 Marks)
i) If its GCV and NCV are equal, the fuel has
A) No hydrogen content B) Low hydrogen content
C) High hydrogen content D) High carbon content
ii) The knocking characteristics of petrol is expressed in terms of
A) Octane number B) Cetane number C) Calorific value D) Power number
iii) Photovoltaic cell is
A) Energy conversion device B) Storage cell
C) Rechargeable cell D) Fuel cell
iv) Synthesis of biodiesel involves
A) Transesterification B) Hydrolysis C) Redox reaction D) Condensation
b. Define the term fuel. Explain the determination of calorific value of solid fuel. (07 Marks)
c. Define the term octane number. Describe any two methods of improving the octane number. (06 Marks)
d. What are photovoltaic cells? List out its advantages. (03 Marks)

6 a. Choose the correct answers for the following: (04 Marks)
i) Gibb's phase rule is applicable to
A) Heterogeneous systems B) Heterogeneous systems in equilibrium
C) Homogeneous systems D) All of these
ii) The phases in equilibrium along the freezing line in phase diagram for water system is
A) Water and vapour B) Water and Ice C) Vapour and Ice D) Only Ice
iii) The conductometric cell consists of
A) Platinum electrode and calomel electrode
B) Two platinum electrodes kept at $1cm^2$ area and 1cm apart
C) Glass electrode and standard hydrogen electrode
D) Platinum electrode and glass electrode
iv) In a flame photometer, the light emitted is in
A) IR region B) Visible region C) UV region D) All of these
b. State Gibb's phase rule. Draw and explain the phase diagrams of water. (07 Marks)
c. State Beer's law and Lambert's law. (04 Marks)
d. Draw and explain the conductometric titration for
i) Strong acid with strong base; ii) Strong acid and weak base. (08 Marks)

7 a. Choose the correct answers for the following: (04 Marks)
i) Polymethyl methacrylate is commercially called
A) Teflon B) Bakelite C) Plexiglass D) Araldite
ii) Which of the following is an adhesive?
A) Neoprene B) Buna-S C) Epoxy resin D) Polystyrene
iii) Below its glass transition temperature, a polymer is
A) Viscofluid B) Soft and rubbery C) Hard and brittle D) Soft and brittle
iv) Polymer composites consists of
A) Matrix and plasticizer B) Fibre and plasticizer C) Fibre and matrix D) None of these
b. Explain the mechanism of addition polymerization with respect to ethylene. (06 Marks)
c. Explain the term glass transition temperature. Mention the factors that influence the T_g. (05 Marks)
d. Describe the manufacture of the following polymers: i) Teflon ; ii) Bakelite. (05 Marks)

8 a. Choose the correct answers for the following: (04 Marks)
i) Alkalinity in water is not due to
A) Hydroxyl ions B) Carbonate ions C) Bicarbonate ions D) Hydrogen ions
ii) COD of waste water is expressed in
A) ppm of oxygen B) ppm of $CaCO_3$ C) mg of $CaCO_3$ D) mg of oxygen per liter
iii) Desalination is
A) Removal of hardness from water B) Addition of salts to water
C) Destruction of salts in water D) Removal of salts from water
iv) The reagent used in colorimetric estimation of nitrate in water is
A) Zr-SPADNA B) Ammonia
C) Barium chloride D) Phenol disulphonic acid
b. Explain the determination of hardness by complexometric method. (06 Marks)
c. Define BOD and COD. Why COD is always greater than BOD? (05 Marks)
d. Explain reverse osmosis process. (05 Marks)

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