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10CHE12/22

# First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014
# 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) A metal rod is dipped in a solution of its ions. Its electrode potential is independent of:
A) temperature of solution B) concentration of solution
C) area of the metal exposed D) nature of metal.

ii) The emf of a cell consisting of a SHE and a metal is found to be 0.74V. The SHE is the positive electrode in the combination. Then the potential of the metal electrode is:
A) +0.74V B) +1.74V C) +0.37V D) -0.74V

iii) Electrode potential of a metal in a dilute solution is:
A) same as that in a concentrated solution
B) lower than that in concentrated solution
C) higher than that in a concentrated solution
D) none of these.

iv) The potential of the two metal electrodes used in a cell are 0.35V and 0.85V. The emf of the cell formed by combining them is:
A) 1.20V B) 0.5V C) -0.50V D) -1.20V.

b. What are concentration cell? Explain the working of a concentration cell by taking suitable example. **(05 Marks)**

c. Explain a method for the determination of single electrode potential. **(05 Marks)**

d. An electrochemical cell consists of magnesium electrode in 0.042m $mg(NO_3)_2$ solution and silver electrode in 0.35m $AgNO_3$ solution. The SEP of Mg and Ag are -2.363V and +0.80V respectively. Represent the cell, write the cell reaction and calculate the emf of the cell. **(06 Marks)**

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

i) In lead acid battery the product formed on both anode and cathode is:
A) $PbO_2$ B) PbO C) $PbSO_4$ D) Pb.

ii) A battery in which a key component is separated from the battery prior to its activation is called:
A) Primary battery B) Secondary battery C) Tertiary battery D) Reserve battery

iii) In which of these batteries aqueous KOH is used as an electrolyte?
A) Ni-cd B) Ni-MH C) Zn-air D) All of these

iv) In which of the following battery the cell reaction is not reversible?
A) Pb-$PbO_2$ B) Li-$MnO_2$ C) Ni-MH D) Ni-Cd

b. Explain the construction and working of Zn-$MnO_2$ battery. **(05 Marks)**

c. What are fuel cells? How it differ from battery? Explain the construction and working of $CH_3OH$-$O_2$ fuel cell. **(07 Marks)**

d. Write the discharging and charging reactions in the following batteries:
i) Ni-Cd battery; ii) Ni-MH battery. **(04 Marks)**

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

i) When a buried pipeline is protected from corrosion by connecting to magnesium block it is called:

A) Impressed voltage protection B) Sacrificial cathodic protection
C) Sacrificial anodic protection D) None of these.

ii) During galvanic corrosion the move noble metal act as:

A) anode B) cathode
C) anode as well as cathode D) None of these

iii) In water line corrosion, the maximum amount of corrosion take place:

A) along a line just above the level of water meniscus
B) along a line at the level of water meniscus
C) along a line just below the level of water meniscus
D) at the bottom of the vessel.

iv) During differential aeration type corrosion. the corrosion:

A) occurs at more oxygenated part B) occurs at less oxygenated part
C) occurs uniform throughout D) none of these.

b. What is metallic corrosion? Explain electrochemical theory of corrosion by taking iron as example. **(06 Marks)**

c. Explain the corrosion control technique by cathodic protection. **(06 Marks)**

d. Explain galvanization process. **(04 Marks)**

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

i) In chromium plating electrolyte used in the bath solution:

A) $H_2CrO_4 + H_2SO_4$ B) $K_2CrO_4 + H_2SO_4$
C) $HClO_4 + H_2CrO_4$ D) None of these

ii) Printed circuit boards are prepared by the process of:

A) Electroplating B) Electro polishing
C) Electroless plating D) Electroforming

iii) The ability of the plating bath to develop uniform coating on the entire surface of the object is measured by its:

A) Current density B) Decomposition potential
C) Plating power D) Throwing power

iv) Polarization effect can be minimized by using:

A) Large electrode surface B) Highly conducting solution
C) Low electrolyte concentration D) All of these

b. Explain the following terms:

i) Polarization
ii) Decomposition potential. **(06 Marks)**

c. Explain how the following plating variables affect the nature of electro deposit:

i) Current density
ii) pH
iii) Complexing agent. **(06 Marks)**

d. What is electroless plating? Explain electroless plating of copper. **(04 Marks)**

## PART – B

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

i) A knocking sound is produced in the internal combustion engine when the fuel:
A) burns slowly B) burns fact
C) contains rain water D) None of these

ii) For good performance, the hydrocarbon molecules in a diesel fuel should be:
A) Straight chained B) Branched chain
C) Side chained D) Aromatic

iii) Catalytic cracking of heavy oil is carried out to get better quality:
A) Kerosene B) Diesel
C) Gasoline D) Lubricating oil

iv) Suitability of diesel fuel is determined by:
A) octane number B) propane number
C) cetane number D) butane number.

b. Define calorific value. Explain how calorific value of solid fuel is determined by bomb calorimeter. **(07 Marks)**

c. 0.78g of coal containing 1.9% hydrogen, when burnt in a bomb calorimeter, increased the temperature of 2.7kg water from 27.2°C to 29.7°C. If the water equivalent of calorimeter is 1.2kg. Calculate gross and net calorific value (specific neat of water 4.187 kJ/kg/°C, latent heat of steam 2457 kJ/kg. **(05 Marks)**

d. Explain the purification of silicon by zone refining process. **(04 Marks)**

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

i) For water system the maximum number of degrees of freedom:
A) 0 B) 3
C) 2 D) 4

ii) When lead is progressively added to molten silver, the melting point of the resultant alloy is:
A) raised B) lowered
C) unaltered D) unpredictable

iii) The colorimetric analysis is based on:
A) Faraday's law B) Beer-Lambert's law
C) Ohm's law D) Kohlrauen's law

iv) In potentiometric titration platinum electrode act as:
A) reference electrode B) standard electrode
C) reduction electrode D) indicator electrode.

b. Draw phase diagram of Fe-C system. Explain eutectic and eutectoid point. **(06 Marks)**

c. Explain Pattinson's process of desilverization of read. **(04 Marks)**

d. Discuss the theory and instrumentation of potentiometric titration. **(06 Marks)**

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

i) A plastic which can be softened in heating and hardened on cooling is called:
A) thermoplastic B) thermosetting
C) thermoelastic D) thermite

ii) Which of the following is an elastomer:
A) PVC B) Bakelite
C) Nylon D) Neoprene

iii) Chloroprene is the repeating unit in:
A) Polystyrene B) Neoprene
C) PVC D) Polythene

iv) The process of vulcanization makes rubber:
A) Soluble in water B) Soft
C) Hard D) More elastic.

b. What is glass transition temperature? Explain any three factors that influence the glass transition temperature. **(04 Marks)**

c. Explain the manufacture of plastic by compression moulding and injection moulding technique. **(06 Marks)**

d. Give the synthesis of i) Teflon: ii) Neoprene: iii) Polyurethane. **(06 Marks)**

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

i) Total alkalinity in water is the sum of:
A) $OH^-$ and $CO_3^{2-}$ ions B) $OH^-$ ions only
C) $CO_3^{2-}$ ions only D) $OH^-$, $HCO_3^{2-}$ and $CO_3^{2-}$ ions.

ii) The indicator used in the determination of chloride context in water sample by argentometric method is:
A) $K_3$ [Fe(CN)$_6$] B) $K_2CrO_4$
C) $K_2$[Fe(CN)$_6$] D) $K_2CN_2O_7$

iii) Primary treatment of sewage is used to remove:
A) Suspended and floating solids B) Soluble inorganic solids
C) Pathogenic bacteria D) All of these

iv) The reagent used in the estimation of sulphate by gravimetric method is:
A) Phenol-di-sulphonic acid B) Barium chloride
C) 2-SPADANS D) Barium sulphate.

b. Discuss the determination of chloride in water by argentometric method. **(06 Marks)**

c. How is alkalinity of water caused? Explain the determination of alkalinity by phenolphthalein indicator. **(06 Marks)**

d. Define COD. Explain the sewage treatment of activated sludge process. **(04 Marks)**

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