USN

10CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019

Engineering Chemistry

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, choosing at least two from each part.***

PART - A

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

i) The free energy change for a spontaneous reaction of an electrochemical cell is negative. The sign of the anode is
A) no sign B) + ve C) - ve D) None of these

ii) At lab temperature, the potential of calomel reference electrode depends on
A) conc of Hg^{2+} ions B) conc of Hg_2^{2+} ions
C) Hg_2Cl_2 (s) D) conc of Cl^- ions

iii) In a concentration cell, if the concentrations of the electrolytes at anode and cathode are equal, the potential of the cell is
A) 0.0 V B) 10 V C) 1.0 V D) None of these

iv) The standard cell potential arising from combination of electrodes of potentials – 0.44 V and – 1.66 V is
A) - 1.22 V B) + 1.22 V C) + 2.10 V D) - 2.10 V

b. Define Standard Electrode potential. Explain the origin of single electrode potential. **(06 Marks)**

c. What are Ion – Selective Electrodes? Explain the determination of pH using glass electrode. **(06 Marks)**

d. A cell is formed by placing two copper rods in 0.1M and 1M $CuSO_4$ solutions separately.
i) Give the electro chemical representation of the cell.
ii) Calculate the potential of the cell at 303 K.
Given R = 8.314 J/K/mol ; F = 96,500 J/V/mol. **(04 Marks)**

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

i) To derive maximum voltage from a battery
A) The difference in electrode potentials must be low
B) Internal resistance must be high
C) The over potential at the electrodes must be high
D) None of the above.

ii) Which of the following battery gives the same product during discharge at both anode and cathode?
A) Zn – MnO_2 cell B) Pb - H_2SO_4 cell
C) Ni – MH cell D) Daniell cell

iii) In Nickel – Metal Hydride cell, the anode of the cell consists of
A) Ni metal B) An alloy of iron
C) An alloy of La and Ni D) Cd

iv) One of the salient features of the fuel cell is
A) No charging is needed B) Charging is desired
C) External power source is needed D) None of these

b. Write a note on the following battery characteristics i) Cycle life ii) Voltage. **(04 Marks)**

c. Explain the construction and working of Zinc – Air battery. **(06 Marks)**

d. What are fuel cells? Explain the construction and working of $H_2 – O_2$ fuel cell. **(06 Marks)**

ii) Flame Photometric analysis is used to determine
A) Boron B) Titanium C) Zinc D) Sodium

iii) Curves on either side of eutectic point of a two component system are
A) Bivariant B) Univariant C) Invariant D) None of the above

iv) The two thermodynamic variables needed to explain condensed phase rule is
A) Mass and temperature B) Temperature and Composition
C) Volume and Composition D) Composition and pressure

b. State Phase rule. Explain the phase diagram of Lead – Silver system. **(06 Marks)**

c. Explain in brief the estimation of copper by colorimetric method. **(05 Marks)**

d. Explain the theory and instrumentation in potentiometric titrations. **(05 Marks)**

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

i) Conjugated polymers are
A) Organic semiconductors B) Inorganic semiconductors
C) Physical semiconductors D) None

ii) Glass transition temperature is highest in
A) PVC B) Polyethylene C) Poly propylene D) Polystyrene

iii) As the crystallinity of a polymer increases
A) Solubility decreases B) Permeability decreases
C) Stiffness increases D) All the above

iv) In carbon fibre the structure of carbon is
A) That of graphite B) That of diamond C) Straight chain D) None of these

b. Give the synthesis and applications of PMMA and Silicon rubber. **(06 Marks)**

c. What are the differences between addition polymerization and condensation polymerisation? **(04 Marks)**

d. What are conducting polymers? Discuss the mechanism of oxidative doping of polyacetylene. **(06 Marks)**

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

i) If for a given effluent sample BOD and COD have the same value, the effluent has
A) No inorganic oxidizable impurities
B) Equal amount of inorganic and organic impurities
C) No organic oxidizable impurities D) None of the above.

ii) Potable water is totally devoid of
A) Pathogenic bacteria B) Calcium and Magnesium salts
C) Chlorides D) Nitrates

iii) Winkler's method in alkaline medium, dissolved oxygen oxidizes
A) Mn^{2+} to Mn^{4+} B) Mn^{7+} to Mn^{4+}
C) Mn^{2+} to Mn^{7+} D) Mn^{4+} to Mn^{7+}

iv) A process that uses electrodes to remove dissolved salt in water is known as
A) Osmosis B) Reverse osmosis C) Electrodialysis D) Electrolysis

b. Explain the determination of fluoride by Z – SPADNS method. **(06 Marks)**

c. Explain the activated sludge treatment of sewage water. **(04 Marks)**

d. Explain Winkler's method of determining dissolved oxygen. Give the reactions involved. **(06 Marks)**

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