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B.TECH
CY-101

Second Semester Examination – 2015

ENGINEERING CHEMISTRY

BRANCH: CSE/IT

Time: 3 Hours

Max marks: 50

Answer any five.

The figures in the right hand margin indicate marks.

1.

(a) Define phase, component, & degrees of freedom with suitable example. [3]

(b) Draw and discuss phase diagram of water system. [5]

(c) Differentiate between stable and metastable triple points. [2]

2.

(a) State and explain Heisenberg's uncertainty principle. [2]

(b) Draw the Molecular orbital diagram for CN- and N_2 molecule. Calculate the bond order and predict their magnetic character. [6]

(c) Electromagnetic radiation of 242nm is sufficient to ionize sodium atom. Calculate the ionization potential of the atom. [2]

3.

(a) The cell EMF of the following cell is 0.67V at 298K [6]

$Pt,H_2(1atm) \mid H^+ (pH = ?) \parallel 1N\ KCl\ Hg_2Cl_2(s) \mid Hg(l)$

Given: E^0calomel = 0.28V

i. Write the full cell reaction

ii. Calculate the pH of the given cell

iii. Calculate the maximum work that can be obtained from the cell

(b) Discuss the construction (with diagram) & working of a dry cell. [4]

4. (a) Explain the term 'catalytic poisoning with an example. [2]

(b) The rate constant of a second order reaction is $5.70\times10^{-5}dm^3mol^{-1}s^{-1}$ at 25c & $1.64\times10^{-4}dm^3mol^{-1}s^{-1}$ at 40c. Calculate the activation energy and Arrhenius pre-exponential factor. [4]

(c) Discuss any two methods of determination order of a reaction. [4]

5.

(a) In a second order reaction, the initial concentration of the reactant is 0.2 moles/lit. The reaction is 30% completed in 50min. calculate

i. The rate constant

ii. Half life period

iii. Time required for complete 65% of the reaction. [5]

(b) Calculate the solubility product of AgBr in water at 25c from the cell

Ag , Ag^+Br^- (satd) / AgBr(s), Ag.

Given $E^o_{AgBr,Ag}=0.07V$, $E^o_{Ag+/Ag}=-0.80V$ [3]

(c) What do you mean by oxidation-reduction electrode? Explain with an example. [2]

6.

(a) The EMF of the following cell is 0.675V at 25c and 0.691V at 0C [4]

$Cd/CdCl_2$. 5/2 H_2O(satd)//AgCl(s)/Ag & the cell reaction is given by

$Cd(s)+AgCl(s)+aq.\rightarrow CdCl_2$. 5/2 $H_2O+2Ag(s)$, Calculate the

i. change in free energy(ΔG),

ii. change in enthalpy (ΔH),

iii. change in entropy (Δs) of the cell reaction at 25c.

(b) Calculate the pH of a solution obtained by mixing 25ml of 0.2M HCl with 50 ml of 0.25M NaOH. [3]

(c)Show that $(\delta S/\delta P)_T = -(\delta V/\delta T)_P$ [3]

7. (a) Write short notes on any two [4×2]

i. Born –Haber cycle

ii. Transition state theory

iii. Fuel cell

(b)Define 'calorific value' of a fuel. Give example of a primary and a secondary fuel. [2]