## Tutorial Sheet - I

**Course:** B.Tech **Year/Semester:I/II Session:** 2015-2016

**Subject Name & Code: Engineering Chemistry (AHC1001)**

**Max. Marks: Time allowed:**

**Q.1.** The following data is obtained for the hydrolysis of ester in the presence of HCl at 250C, show that it is first order reaction.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Vol of alkali(mL) | 19.2 | 24.2 | 26.6 | 29.5 | 42.1 |
| Time (min) | 0 | 25 | 40 | 60 | ∞ |

**Q.2**. Decomposition of a gas of the second order when the initial conc. of the gas is 5x10-4 m/L, it is decomposed in 50 min. What is the value of the velocity constant?

**Q.3.** The rate of a reaction triples when temperature changes from 20o to 50oC. Calculate the energy of activation for such a reaction.

**Q.4.** The half life time of a reaction is doubled when the initial concentration of the reactant isdoubled, find the order of reaction.

**Q.5**. A first order reaction has rate constant of 5000 s-1 at 25oC and activation energy of 6×104 J mole-1. At what temp, would rate constant be 10,000 s-1.

**Q. 6**. A second order reaction is 20% complete in 500 sec. How long will it take for the reaction to go to 60% completion?

**Q.7**. The half-life period of a first order reaction is 30 min. calculate the rate constant of the reaction. What fraction of the reactant remains after 70 minute?

**Q.8**. Show that in the case of first order reaction, the time required for 99.9% of the reaction to take place is almost about 10 times that required for half the reaction.

## Tutorial Sheet - II

**Course:** B.Tech **Year/Semester:I/II Session:** 2015-2016

**Subject Name & Code: Engineering Chemistry (AHC1001)**

**Max. Marks: Time allowed:**

**Q.1.** Calculate the pH and POH of the following-

(a) 0.001 M HCl (b) 0.04 M HNO3 (c) 3.2 x 10-3 M B9a(OH)2

**Q.2.** Calculate the pH of 1 x 10-7 solution of HCl at 250C.

**Q.3.** Calculate the pH of the solution obtained by mixing 50 ml of 0.2 M HCl with 50 ml of 0.1 M NaOH.

**Q.4.** Calculate the pH of solution obtained by mixing 25 ml of 0.2 M with 50 ml of 0.25 M NaOH.

**Q.5.** Calculate the pH and hydrogen and hydroxyl ion concentration of a 3.2 x 10-3 M solution of Ba(OH)2. at 250C.

**Q.6.** What would be the pH of the solution obtained by mixing 5 gram of acetic acid and 7.5 gram of sodium acetate and mixing the volume equal to 500 ml? Dissociation constant of acetic acid at 25 is 1.75 x 10-5.

**Q.7.** A buffer solution contains 0.2 mole of NH4OH and 0.25 mole of NH4Cl per litre. Calculate the pH of the solution. Dissociation constant of NH4OH at R.T. is 1.81 x 10-5.

**Q.8.** A buffer solution contains 0.2 mole of CH3COOH and 0.25 mole of CH3COOK per litre. Calculate the change the pH of the solution if 0.5 ml of 1M HCl is added to it. The dissociation constant of CH3COOH at RT is 1.75 x 10-5. (The volume change on the addition of HCl may be neglected).

**Q.9.** Calculate the pH before and after the addition of 0.01 M of NaOH to one litre of a buffer solution that is 0.1 M CH3COOH and 0.1 M CH3COONa. The dissociation constant of CH3COOH is 1.75 x 10-5.

## Tutorial Sheet - III

**Course:** B.Tech **Year/Semester:I/II Session:** 2015-2016

**Subject Name & Code: Engineering Chemistry (AHC1001)**

**Max. Marks: Time allowed:**

**Q.1.** CH2=CHCl will not have which type of electronic transition.

**Q2.** Calculate the λmax for the following.



**Q.3.** A compound having molecular formula C9H11Br shows following NMR data.

(i)Quintet (2.15 ),2H (ii) Triplet (2.75 ),2H

(iii) Triplet (3.38 ),2H (iv) singlet (7.25 ),5H

Assign the structure of the molecule with proper explanation.

**Q.4.** Which of them is not IR active? H2, HCl, CH4, Symmetric Stretching of CO2, H2O.

**Q.5.** Range of vacuum UV region is………………….

**Q.6.** How many types of proton is present in CH3CH=CH2.

**Q.7.** Calculate total fundamental vibrations, stretching vibrations and bending vibrations for water and toluene molecule.

**Q.8.** Theoretically how many 1H-NMR signals are observed in,

Phenol, Ethyl acetate, Ethylene, Propanol-2, Tetra methyl silane.

## Tutorial Sheet - IV

**Course:** B.Tech **Year/Semester:I/II Session:** 2015-2016

**Subject Name & Code: Engineering Chemistry (AHC1001)**

**Max. Marks: Time allowed:**

**Q.1** If the rate constant for a reaction at 27 OC is 2.3 X 10 -3 min-1and at 37 OC is 4.6 X 10 -3 min-1. Calculate activation energy for the reaction and also decide the order of reaction.

**Q.2** With the help of data given below, show that the decomposition of H2O2 in aqueous solution is of first order reaction.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (in min.) | 0 | 10 | 20 | 30 |
| Volume of KMnO4  (in ml) | 25 | 20 | 15.7 | 12.5 |

**Q4** Derive Henderson equation for acidic buffer solution.

**Q.5** Calculate pH of a litre of solution containing 0.1 M CH3COONa and 0.01 M CH3COOH solutions.Ka for CH3COOH is 1.8 X 10 -5.

**Q.6** Calculate pH of a litre of solution containing 0.2 M NH4OHand 0.01 M,0.1M NH4Cl nsolutions.Kbfor NH4OH is 1.8 X 10-5.

**Q.7** Calculate pH of 10-8 M HCl solution.