SUBJECT: CHEMISTRY - CLASS: XII ASSIGNMENT -3

CHEMICAL KINETICS

Q1) Define a) rate of a reaction b) activation energy

Q2) The decomposition of PH_3 follows the following reaction

$$4PH_3 \rightarrow P_4 + 6H_2$$

Rate equation is → Rate = k $[PH_3]$. The Half life of PH_3 is 37.9 sec at 120°C

a) How much time is required for $3/4^{th}$ of PH_3 to decompose? Ans[75.82 sec]
b) What fraction of the original sample of PH_3 remains behind after one minute? Ans[2.995]

Q3) Define a) order of reaction b) molecularity of a reaction

Q4) the rate of a reaction increases four times when the temperature changes from 300K to 320K. Find the activation energy. (R=8.314 J/K/mol) Ans [35.34 KJ/mol]

Q5) A reaction is of first order in reactant A and of second order in reactant B. How is the rate of this reaction affected when a) conc. Of B alone is increased to 3 times? b) the conc. A as well as B are doubled? Ans [9 times, 8 times]

Q6) The rate constant for a reaction of zero order in A is 0.0030 mol/L/s. How long will it take for the initial conc. Of A to fall from 0.1 → 0M to 0.75M? Ans [8.3sec]

Q7) Identify the order from units →L/mol/s

Q8) What are elementary reactions? Give examples.

Q9) A first order reaction has a rate constant of 0.0051 min^{-1}. If we begin with 0.10M conc. Of reactant, what conc. of reactant will remain in the solution after 3 hours? Ans [0.04M]

Q10) H_2O_2 (aq) decomposes to H_2O (l) and O_2 (g) in a reaction that is of first order in H_2O_2 and has a rate constant $k=1.06 \times 10^{-3}$ min^{-1}. a) How long will it take 15% of a sample of H_2O_2 to decompose? Ans [153.4 min]

b) How long will it take 85% of sample of H_2O_2 to decompose? Ans [1790 min]

Q11) Why does the rate of a reaction not remain constant throughout the reaction process?

Q12) Show that for first order reaction half life is independent of initial conc.?

Q13) A first order decomposition reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$.

Q14) The decomposition of NH_3 on Pt surface is zero order reaction. What are the rates of production of N_2 and H_2 if K= 2.5×10^{-4} mol/L/s.

Q15) For a first order reaction, it takes for the initial conc. Of 0.6 mol/L to become 0.4 mol/L. How long will it take for the initial conc. To become 0.3 mol/L? Ans [8.55 min]

Q16) A first order reaction takes 100 min for completion of 60% of the reaction. Find the time when 90% of the reaction will be completed? Ans [251.3 min]

Q17) The slope of the line for the graph of LogK v/s 1/T for the reaction $N_2O_5 \rightarrow 2NO_2 + ½\ O_2$ is -5000. Find activation energy. Ans [95.7 KJ/mol]

Q18) For a reaction, activation energy is zero. What is the value of the rate constant at 300K if K= 1.6×10^{6} sec^{-1} at 280K.

Q19) Find $t_{2/3}$ of a first order reaction in which K=5.4×10^{-14} sec^{-1}? Ans [0.2005×10^{14} sec]

Q20) The decomposition of phosphine: $4PH_3 \rightarrow P_4 + 6H_2$ has the rate law expression, Rate=K $[PH_3]$. The rate constant is 6.0×10^{-4} sec^{-1} at 300K and activation energy = 3.05×10^{5} J/mol. Find rate constant at 310K. R= 8.314 J/K/mol. Ans [3.1×10^{-2} sec^{-1}]

Q21) Show that the time required for the completion of ¾ of first order reaction is twice the time required for the completion of half of the reaction.

Q22) The reaction $SO_2Cl_2 \rightarrow SO_2 + Cl_2$ is a first order reaction with K=2.2×10^{-5} sec^{-1} at 320°C. Find the percentage of SO_2Cl_2 that is decomposed on heating this gas for 30 minutes. Ans [3.84%]