Chemical kinetics. (Numerical)

Q. N. 1.

The Rate of reaction $A + B \longrightarrow$ Product is given below as a function of difference concentration of A and B.

Exp.	[A] mol L^{-1}	B mol L^{-1}	Initial rate mol L^{-1} min^{-1}
1	0.01	0.01	0.005
2.	0.02	0.01	0.010
3.	0.01	0.02	0.005

(I) Determine the order of reaction with respect to A and B.

(II) what is the overall order of rxn?

(III) write rate law equation

(IV) find the value of rate constant.

(V) What is the half life of A in the reaction?

Q. N. 2. For a rxn $2x + y \longrightarrow x_2 y$, the following data were obtained. (2070 BS) asked.

Experiment	[X] mol L^{-1}	(y) mol L^{-1}	Rate mol L^{-1} s^{-1}
1.	0.10	0.10	1.3×10^{-4}
2.	0.10	0.20	2.6×10^{-4}
3.	0.20	0.20	1.04×10^{-3}

(I) Find the order with respect to X, Y and overall reaction.

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ड. २. ह्रि वाइड question,

(III) Find the value of rate constant with it's units.

(IV) What is the initial rate of reaction when the initial concentration of X and y are 1M and 0.5M.

Ans. →

→ $K = 0.13 \, mol^{-2} L^2 s^{-1}$

→ Initial rate = $0.065 \, mol \, L^{-1} s^{-1}$

Q.N.3. What is instantaneous rate of reaction? A first order reaction will take 100 min to complete 60% of reactant into product. what time will take to complete 90% of reactant into product.

Ans →   (2071).

$(t = 251.4 \, minutes)$

Q.N.4. The half life of a first order rxn is 3 hours. Find the time required to complete 87.5% of reaction

Ans. $t = 3.25 \times 10^6$ sec.

Q.N.5. calculate the two-3rd life of first order rxn having rate constant $5.48 \times 10^{-4} s^{-1}$

Ans = 2.005×10^{13} sec

Q.N.6

A first order reaction, when 40% of reactant is complete in 50 min.

① Find the rate constant and half life.

② Calculate time to convert 80% of reactant into product.

~~③ calculate rate of reaction after 10 min if initial concentration of is 1.0 M.~~

Ans- $K = 0.0100216\ min^{-1}$ [2073]

$t = 157.58\ min$.

Q.N.7 What will be the initial rate of reaction if its rate constant is $1 \times 10^{-3}\ min^{-1}$ and the initial concentration of the reactant is $0.2\ mol\ L^{-1}$? How much reactant will be converted into the product in 500 minute? (2071)

Ans. ~~little~~, concentration of reactant converted into product is $0.078\ mol\ L^{-1}$.

Q.N.8 A first order reaction is 90% completed in 30 minutes. How long would it take to be complete 99%?

Ans $t = 60\ minute$.