

✓ c) Hydrogen-3 (tritium, $H-3$) is found in primary coolant water of a nuclear reactor. Tritium is a beta emitter w/ a $t_{1/2}$ of 12.3 years. For a given sample containing tritium, after how many years will only 12.5% of sample remain

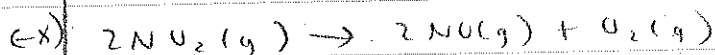
36.9 years



$$3 \times 12.3 = 36.9$$

Kinetics - how fast chemical rxns occur

$$\text{rate} = \frac{\text{change in molarity}}{\text{change in time}}$$



$$\text{rxn rate} = -\frac{\Delta[\text{NO}_2]}{2\Delta t} = \frac{\Delta[\text{NO}]}{2\Delta t} = \frac{\Delta[\text{O}_2]}{\Delta t}$$

$$2 \text{ mol NO}_2 = 1 \text{ mol rxn}$$

$$1 \text{ mol O}_2 = 1 \text{ mol rxn}$$

$$\text{Avg rate} = \frac{[\text{NO}_2]_f - \Delta[\text{NO}_2]_i}{t_f - t_i}$$

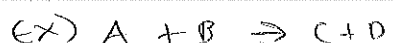
$$\text{Instantaneous rate} = \text{slope of tangent} \\ \text{the deriv of time} \\ = \frac{d[\text{NO}_2]}{dt}$$

Initial rate is rate at time = 0 best to define

- More molecules will collide more, so rxn rate will be faster

empirical rate law - relationship between rate and concentration is called

- rate of rxn depends on concentration

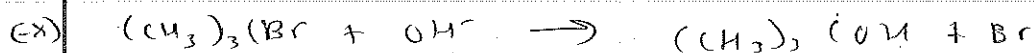


$$\text{rate} = k[A]^x[B]^y$$

k = rate constant

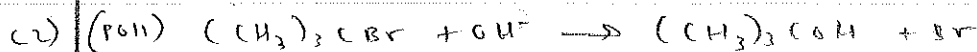


$$\frac{\overset{\text{Macro}}{-\Delta[\text{CH}_3\text{Cl}]}}{\Delta t} = \frac{-d[\text{CH}_3\text{Cl}]}{dt} = \boxed{\text{rate}} = \overset{\text{Micro}}{k[\text{CH}_3\text{Cl}][\text{OH}^-]}$$



$$\frac{\overset{\text{Macro}}{-\Delta[(\text{CH}_3)_3\text{CBr}]}}{\Delta t} = \frac{-d[(\text{CH}_3)_3\text{CBr}]}{dt} = \boxed{\text{rate}} = k[(\text{CH}_3)_3\text{CBr}][\text{OH}^-]$$

\swarrow AV
 \uparrow INSTA



what is rate law for this reaction?

$$\text{Rate} = k[(\text{CH}_3)_3\text{CBr}]$$

