3/26/13

✓ c1) Hydrogen-3 (tritium, H-3) is found in primary coolant water of a nuclear reactor. Tritium is a beta emitter w/ a $t_{1/2}$ = 12.3 years. For a given sample containing tritium, after how many years will only 12% of sample remain

$$\boxed{36.9 \text{ years}}$$

$$100\% \xrightarrow[1/2]{} 50\% \xrightarrow[1/2]{} 25\% \xrightarrow[1/2]{} 12.5\%$$

$$3 \times 12.3 = 36.9$$

Kinetics - how fast chemical rxns occur

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

ex) $2NO_2(g) \rightarrow 2NO(g) + O_2(g)$

$$\text{rxn rate} = \frac{-\Delta[NO_2]}{2\Delta t} = \frac{\Delta[NO]}{2\Delta t} = \frac{\Delta[O_2]}{\Delta t}$$

2 mol NO_2 = 1 mol rxn

1 mol O_2 = 1 mol rxn

$$\text{Avg rate} \quad \frac{[NO_2]_f - \Delta[NO_2]_i}{t_f - t_i}$$

Instantaneous rate = slope of tangent

take deriv of line

$$\frac{-d[NO_2]}{2\,dt}$$

Initial rate is rate at time = 0 best to define

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

empircal rate law - relationship between rate and concentration is called

-rate of rxn depends on concentration

Ex) $A + B \rightarrow C + D$

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

k = rate constant

Ex) $CH_3Cl + OH^- \longrightarrow CH_3OH + Cl^-$

Macro — Micro

$$-\frac{\Delta[CH_3Cl]}{\Delta t} = -\frac{d[CH_3Cl]}{dt} = \boxed{\text{rate}} = k[CH_3Cl][OH^-]$$

Ex) $(CH_3)_3CBr + OH^- \longrightarrow (CH_3)_3COH + Br$

Macro

$$-\frac{\Delta[(CH_3)_3CBr]}{\Delta t} = -\frac{d[(CH_3)_3CBr]}{dt} = \boxed{\text{rate}} = k[(CH_3)_3CBr][OH^-]$$

AV ↗

↑ INSTA

(2) (poll) $(CH_3)_3CBr + OH^- \longrightarrow (CH_3)_3COH + Br^-$

what is rate law for this reaction?

$\text{Rate} = k[(CH_3)_3CBr]$

(3) (poll)