Overview of Chapter 15

Kinetics

- Rates of Reactions
- Effects on reaction rates:
  - Temperature effects
  - Concentration effects
  - Effects of catalysts
- Integrated Rate Laws
- Reaction Mechanisms

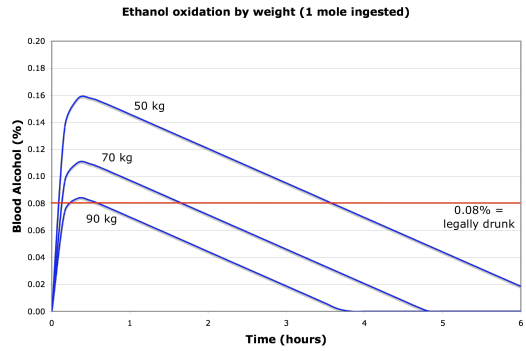
Questions to consider:

- How does carbon dating work?
- How do we measure reaction rates?

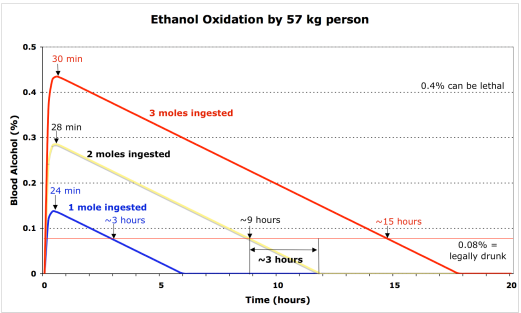
Today's Topics

- Integrated rate laws
- Calculating the order of a reaction
- Half-life

Ethanol Oxidation Rates



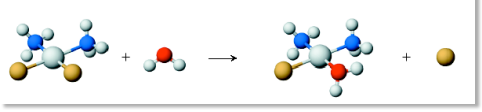
Ethanol Oxidation Rates



Concentrations and Rates

In $Pt(NH_3)_2Cl_2$ (cisplatin), Cl^- in is replaced by H_2O

$$Pt(NH_3)_2Cl_2(aq) + H_2O(\ell) \longrightarrow [Pt(NH_3)_2(H_2O)Cl]^+(aq) + Cl^-(aq)$$



Rate of change of conc of Pt compd

$$= \frac{\text{Amount of cisplatin reacting (mol/L)}}{\text{elapsed time (t)}}$$

Concentrations & Rates

Rate of change of conc of Pt compd

$$= \frac{\textbf{Amount of cisplatin reacting (mol/L)}}{\textbf{elapsed time (t)}}$$

Rate of reaction is proportional to $[Pt(NH_3)_2Cl_2]$

We express this as a RATE LAW

Rate of reaction = k $[Pt(NH_3)_2Cl_2]$

where k = rate constant

k is independent of conc. but increases with T

Deriving Rate Laws

Example: Derive the rate law and k for

$CH_3CHO(g) \rightarrow CH_4(g) + CO(g)$

from experimental data for rate of disappearance of CH_3CHO

Expt.	$[CH_3CHO]$ (mol/L)	Rate of disappearance of CH_3CHO (mol/L·sec)
1	0.10	0.020
2	0.20	0.081
3	0.30	0.182
4	0.40	0.318