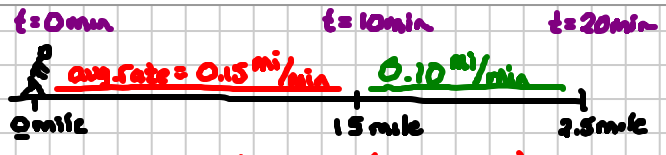
Lecture 41 Reaction Rates. How Fast?

Note Title 1/4/2012

Race



$$Rate_{runner} = \frac{\Delta dist}{\Delta t} = \frac{(1.5mi - 0mi)}{(10min - 0min)} = 0.15 \frac{mile}{min}$$

$$Rate_{runner} = \frac{\Delta dist}{\Delta t} = \frac{(2.5mi - 1.5mi)}{(20min - 10min)} = 0.10 \frac{mile}{min}$$

> Compare: runner slows down

Chemistry. Reaction rate is determined to be the change in concentration (prod. or react) per unit time.

$$Rate_{rxn} = +\frac{1}{coef}\frac{\Delta conc_{prod}}{\Delta time} \quad \text{...or...} \quad Rate = -\frac{1}{coef}\frac{\Delta conc_{react}}{\Delta time}$$

reactants conc decreasing!

Shorthand molar conc. reactant = [reactant]

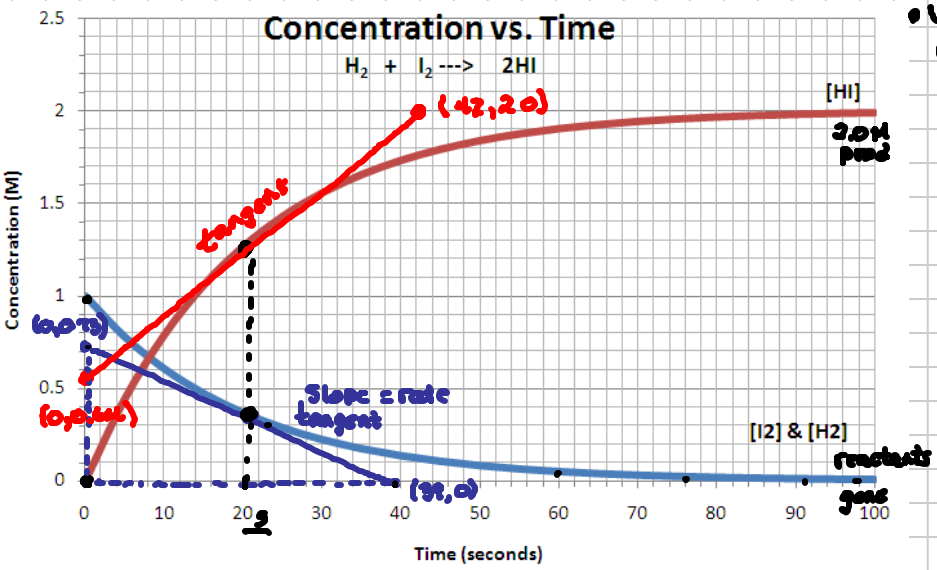
Example: Determine the reaction rate in terms of reactants or products for the following balanced chemical equation:

$$1H_{2(g)} + 1I_{2(g)} \rightarrow 2HI_{(g)}$$

$$rate_{rxn} = -\frac{1}{1}\frac{\Delta[H_2]}{\Delta t} = -\frac{1}{1}\frac{\Delta[I_2]}{\Delta t} = +\frac{1}{2}\frac{\Delta[HI]}{\Delta t}$$

reactant; bal chem. equation

HI is appearing 2x as fast as I_2 & H_2 disappear.



- What is the rate of the reaction at t = 20 seconds?

Reactant: (0, 0.73) (98, 0)

$$rate = -\frac{\Delta conc}{\Delta t} = -\frac{(0.73 - 0)}{(0 - 98)}$$

$$= 0.019 \, M/s$$

Product: (0, 0.40) & (42, 2.0)

$$rate = +\frac{1}{2}\frac{\Delta conc}{\Delta time} = \frac{1}{2}\frac{(0.40 - 2.0)}{(0 - 42)}$$

(coef)

$$= 0.017 \, M/s$$

Equal! Not errors in tangent