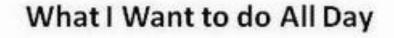
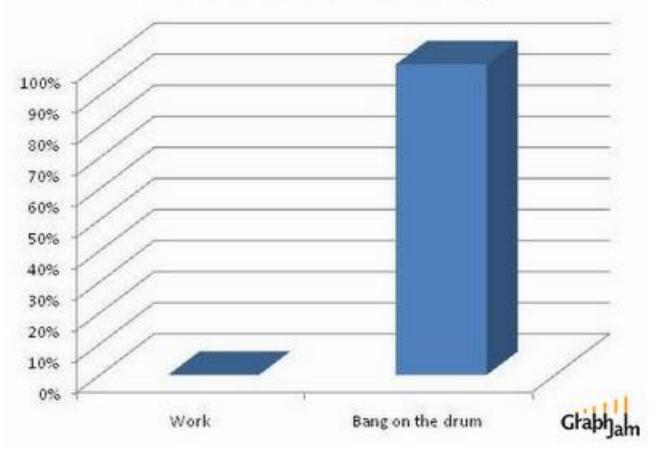
Average & Instantaneous Rates With Graphs





Outcomes:

• Perform a lab to measure the average and instantaneous rates of a chemical reaction.

Rates With Graphs:

We can use a graph of concentration vs. time to find average and instantaneous rates of a reaction.

Average Rates:

Found by calculating the <u>SLOPE</u> of a concentration vs. time graph over a certain <u>INTERVAL</u>.

Instantaneous Rates:

- Are rates at a **<u>SPECIFIC</u>** TIME in a reaction.
- Are found by calculating the **<u>SLOPE</u>** of the line **<u>TANGENT</u>** to a point on the curve.
- A **TANGENT** line is a **STRAIGHT** LINE through a certain **POINT** on a curve.
- We use this method because the rate of a reaction will change over time and not produce a <u>LINEAR</u> graph.



The following data was collected for the reaction $SO_2Cl_2 \rightarrow SO_2 + Cl_2$

[SO ₂ Cl ₂] (mol/L)	Time (s)
0.100	0
0.082	100
0.067	200
0.055	300
0.045	400
0.037	500
0.030	600
0.025	700
0.02	800

a) Determine the average rate for the first 200 seconds.

$$RATE = \frac{\Delta [SO_{2}Cl_{2}]}{\Delta t} = \frac{0.067mol - 0.1mol}{L} = 1.65 \times 10^{-4} \frac{mol}{L.5}$$

b) Determine the average rate of reaction for the 500 to 700 second time interval.

$$Rate = \frac{\Delta [So_{2}C|_{2}]}{\Delta t} = \frac{0.025 \text{ mol}}{2005} - 0.037 \frac{\text{mol}}{C} = 6 \times 10^{-5} \frac{\text{mol}}{1.5}$$

c) Account for the difference between the rates in (a) and (b)
 $a > b \rightarrow \text{more reactanst} \otimes \text{beginning, more collisions, ..., fasta rate.}$

