Ratio of Rates Tells You How Much Faster One Reaction is Compared to Another When…

..Surface Area Increases

$$\frac{rate_{new}}{rate_{old}} = \frac{original + newly\,\exp osed\,area}{original\,surface\,area}$$

Example By exposing a ***total*** of 4 times the surface area of a reactant to another, how much faster will the reation become?
If the original reaction took 3 seconds how long will it take with 4x more surface area?

Answer
The reaction will become 4 times faster and will take ¾ seconds.

..Concentration Increases

$$\frac{rate_{new}}{rate_{old}} = \frac{k[xA]^a[yB]^b}{k[A]^a[B]^b}$$

Example If a = b = 2, what effect will doubling A's and B's concentration have on the rate of reaction?

Answer

$$\frac{rate_{new}}{rate_{old}} = \frac{k[2A]^2[2B]^2}{k[A]^2[B]^2} = 2^2(2^2) = 16$$

The reaction will be 16X faster by doubling the concentration of each reactant.

..Temperature Increases

$$\frac{rate_{new}}{rate_{old}} = 2^{\frac{\Delta T}{10^o C}}$$

Example What temperature change will cause the rate of a reaction to quadruple?

Answer

$$\frac{4}{1} = 2^{\frac{\Delta T}{10^o C}}$$

$$2^2 = 2^{\frac{\Delta T}{10^o C}}$$

equate the exp*onents*:

$$2 = \frac{\Delta T}{10}$$

$$\Delta T = 20^o C$$

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