

Name _____

Period _____

activation energy webquest

Visit the sites below to complete the activities associated with each.

http://www.chem.vt.edu/RVGS/ACT/notes/act_energy.html

Chemical reactions ordinarily occur as a result of _____ between reacting particles.

Doubling the concentration of CO , holding NO_2 constant, the number of collisions in a given time _____.

Reactions occur as a direct result of _____ between molecules

It is possible to calculate the rate at which molecules collide with each other by using the _____.

In order for collisions to be effective, there must be considerable _____ in the collisions. The slower moving molecules do not have enough _____ to react when they collide...they bounce off one another and retain their _____. (this called the Kinetic Theory)

Every reaction requires a certain minimum energy for the reaction to occur--it is called _____, E_a , and is expressed in _____ kJ.

List the three properties of activation energy:

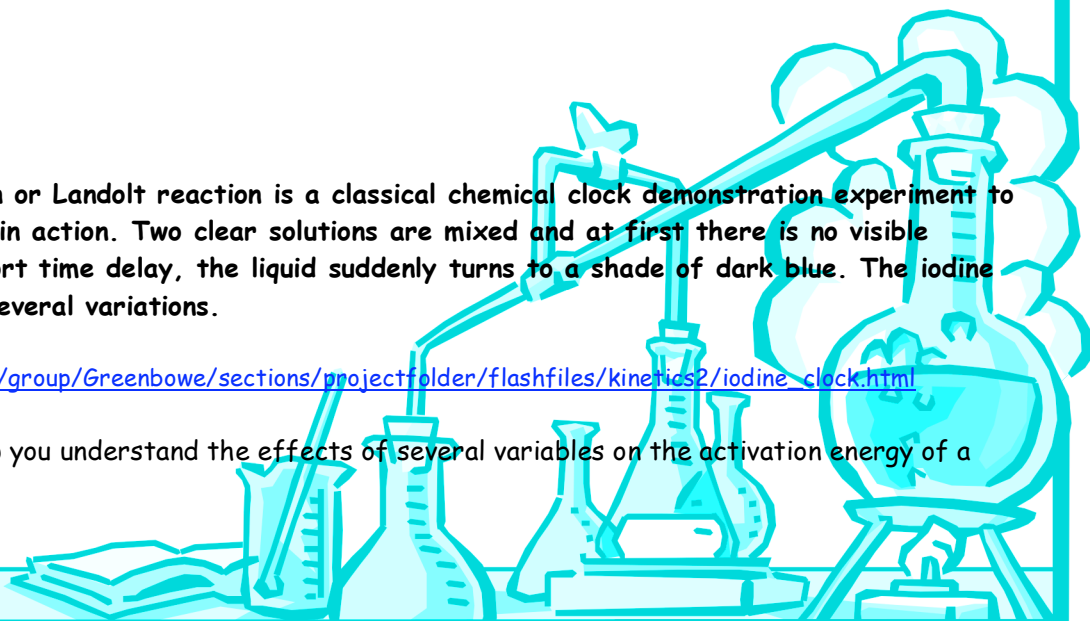
- 1.
- 2.
- 3.

_____ an intermediate species that is an unstable, high energy species that must be formed before the reaction can occur.

The Iodine clock reaction or Landolt reaction is a classical chemical clock demonstration experiment to display chemical kinetics in action. Two clear solutions are mixed and at first there is no visible reaction, but after a short time delay, the liquid suddenly turns to a shade of dark blue. The iodine clock reaction exists in several variations.

http://www.chem.iastate.edu/group/Greenbowe/sections/projectfolder/flashfiles/kinetics2/iodine_clock.html

This is a simulation to help you understand the effects of several variables on the activation energy of a reaction.



Directions:

Keep all of the variables as they are when you get to the site. These conditions will be your "control".

Click on the Start button and wait as the reactants get mixed. Once the reactants have been poured into the beaker click the arrow (looks like the play button) on the timer. This will start the clock.

Let the timer play until the reaction is complete. The beaker of liquid will turn dark gray when the reaction is complete. Push pause once the reaction has completed in order to record the time.

"Control" Reaction time: _____

Repeat the process above changing only the temperature. Try a warmer temperature and a cooler temperature. Record the times for each below.

Warmer Temp:

Cooler Temp:

Time _____

Time _____

In one sentence or two, summarize the effect of temperature on the rate of a reaction.

Now, using what you learned about the kinetic theory on the first page, how would you explain the effect of temperature on the rate of a reaction?

Return the temperature to 25 °C. Change the concentration of the reactants one at a time. To change the concentration of a solution you need to also change the amount of water.

In this simulation you are also required to keep the volume of the reactants constant. Check to make sure that you have enough liquid to equal 100 mL.

Click on start and then the timer. Record the time.

Use 54 mL of H₂O and 6 mL KI. Time the reaction took: _____

Use 63 mL of H₂O and 15 mL (NH₄)₂S₂O₈. Time the reaction took: _____

In one or two sentences, summarize the effect of concentration on the rate of a reaction.

Scientific Process Review! Why did you only change one variable at a time? (For example, why wouldn't you change the concentration and the temperature at the same time?)

Before you visit the next site, read the questions below. The video starts right away, so you need to know what to listen for before it begins! BEFORE, you type in the website below, be sure the volume of your computer is on and loud enough that you can hear it. Otherwise, you will miss the introduction and won't be able to fill in the next time statements.

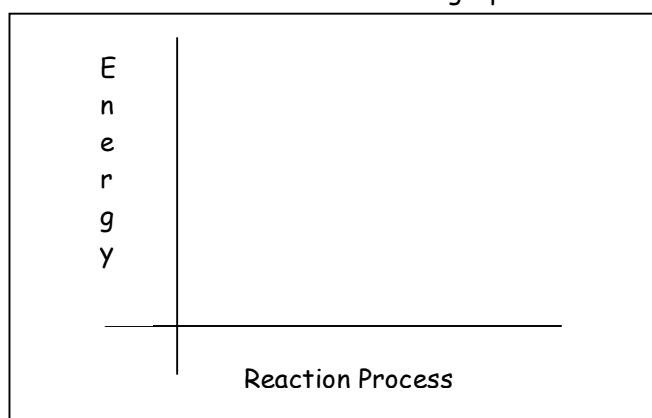
<http://www.mhhe.com/physsci/chemistry/essentialchemistry/flash/activa2.swf>

When molecules collide they must have a minimum amount of _____
for the reaction to occur.

No change will result from the collision if the molecules have less kinetic energy than the _____ energy of the reaction.

Exothermic Reaction:

Draw the profile of an exothermic reaction on the graph axes.



A: As the molecules approach each other, there is an _____ force between one of the oxygen atoms and the carbon atom of the CO molecule.

The bonds between the nitrogen and oxygen atom becomes _____ and the bond length becomes _____.

B: As molecules collide, they form an _____.
This is a _____ species formed by the reactants.

The activation energy is the _____ amount of energy needed for the reaction to proceed.

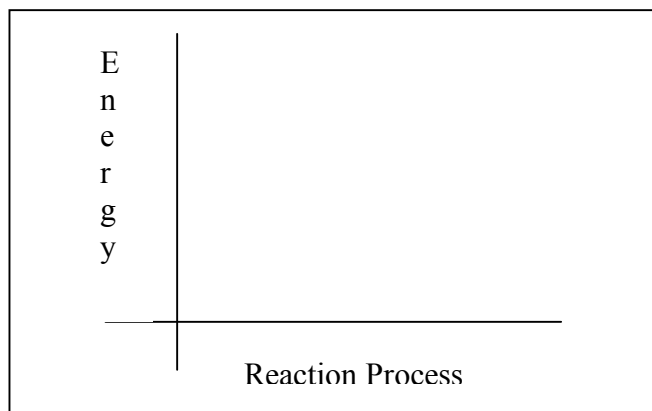
C: At this point the bond between the carbon and oxygen continues to _____, and the bond between the nitrogen and oxygen continues to _____.

D: The new bond has now formed and the bond between nitrogen and oxygen has been _____.

The products are more _____ than the reactants. The energy of the products is _____ than the energy of the reactants. This means that energy (heat) was _____ to the surroundings. These are characteristics of _____ reactions.

Endothermic Reaction:

Draw the profile of an endothermic reaction on the graph axes.



A: As the molecules approach each other they are _____ to each other.

The bonds between the chlorine atoms _____ and lengthen as a bond begins to form between a chlorine atom and nitrogen.

B: An activated complex forms as a result of the _____ between the two molecules before they form the product.

C: The new bond will continue to _____ as the old bond between the chlorine atoms weakens and begins to break.

D: The products of the reaction are _____ stable than the reactants. This means that energy (heat) is _____ from the surroundings. These are characteristics of an _____ reaction.