

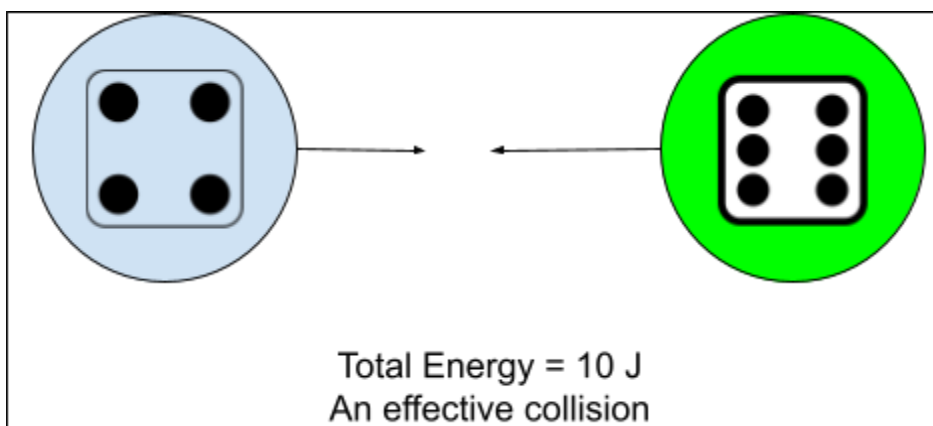
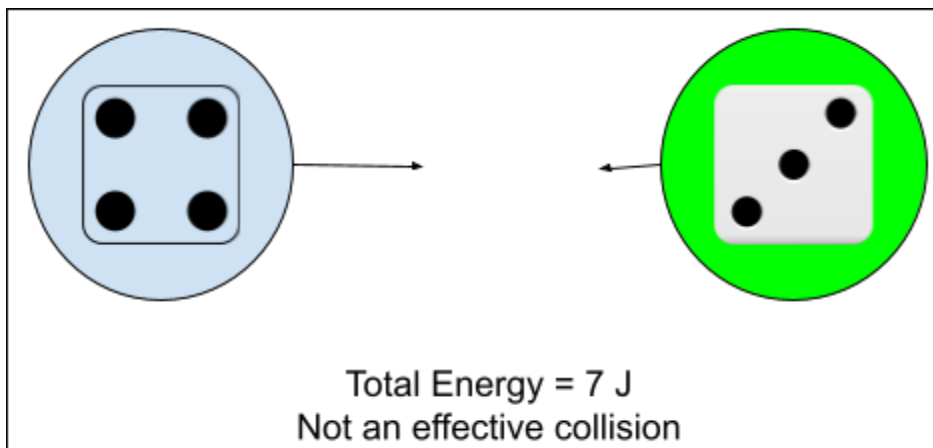
Chemical Reactions Worksheet

Effective Collision: a collision between reactants that causes product(s) to be formed.

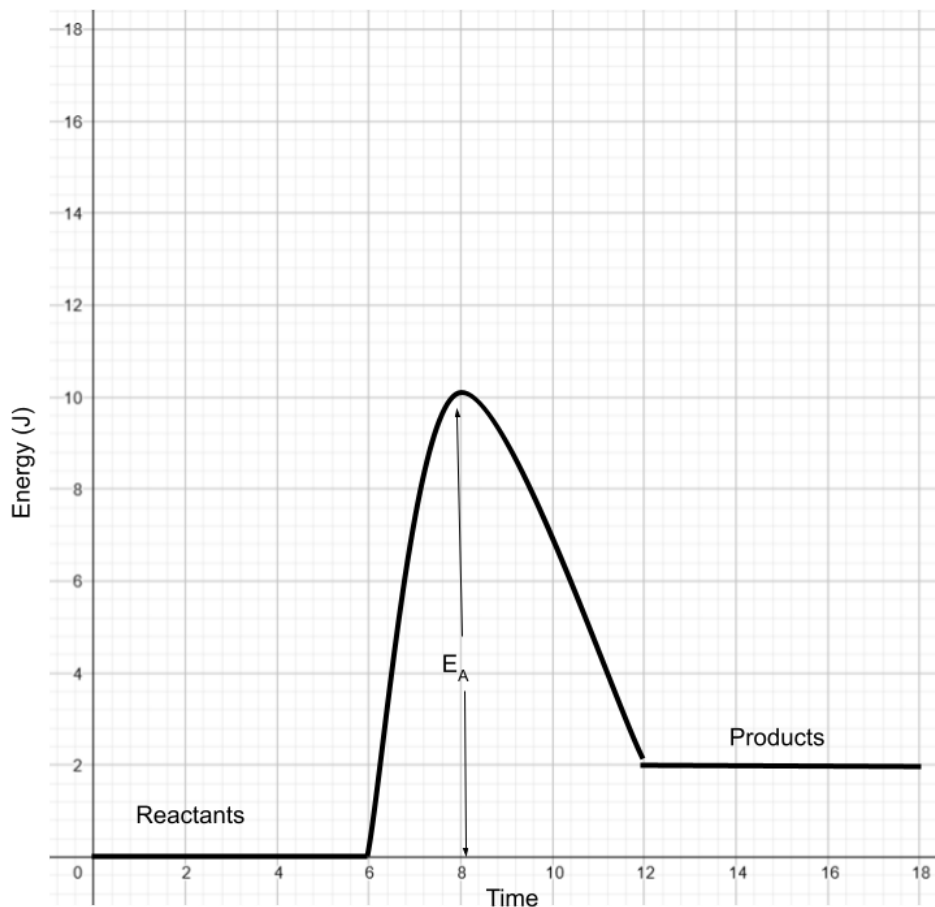
Activation Energy: the minimum energy the reactants must achieve for an effective collision to occur

The molecules in any sample of a chemical will always have a range of energies. In these activities you will be rolling a die to represent the energy of each molecule in a collision. If the total of the two dice is greater than or equal to the Activation Energy it is considered an effective collision.

Consider a reaction that has an Activation Energy of 10 J



The image below represents an endothermic chemical reaction, with an activation energy of 10J.



Activity 1

Roll your dice ten times and use a tally chart to record how many times you get an effective collision. How many totals are 10 or more?

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Activity 2 - Effect of concentration

One way to increase the rate of a chemical reaction is to increase the concentration of the reactants.

We are going to simulate this by rolling more dice than before. Roll the two dice 15 times and record the results below. Use an Activation Energy of 10J.

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Increase the concentration further by rolling 20 more times and record the results below. Again use an Activation Energy of 10J.

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Activity 3 - Effect of surface area

By crushing up solid particles into a powder you can increase the surface area available for a reactant to act on.

We can simulate this by rolling three dice at a time instead of two. Again use an activation of 10J and record how many successful roles you get out of ten.

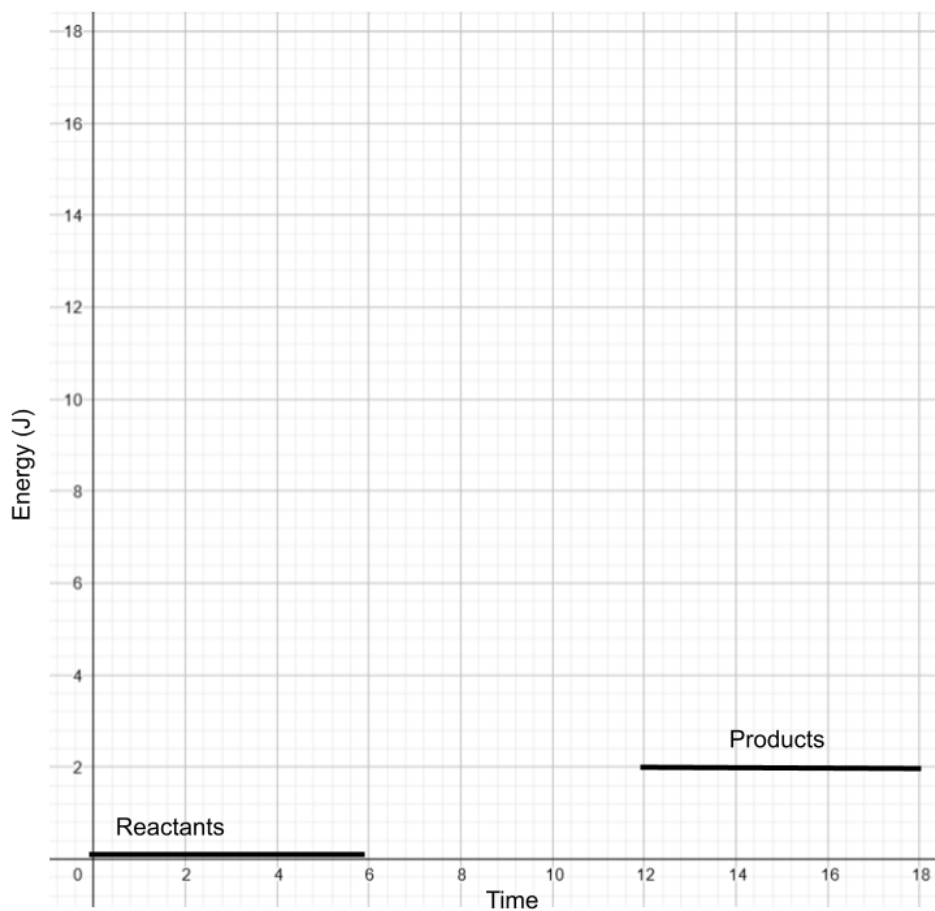
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Activity 4 - Effect of a catalyst

Using a catalyst will reduce the activation energy.

Repeat the same steps as Activity 1 (roll the two dice ten times) and record how many times you achieve a total greater than or equal to 6.

On the diagram below draw the reaction with the catalyst (*hint: what happened to the activation energy?*)



Activity 5 - Effect of temperature

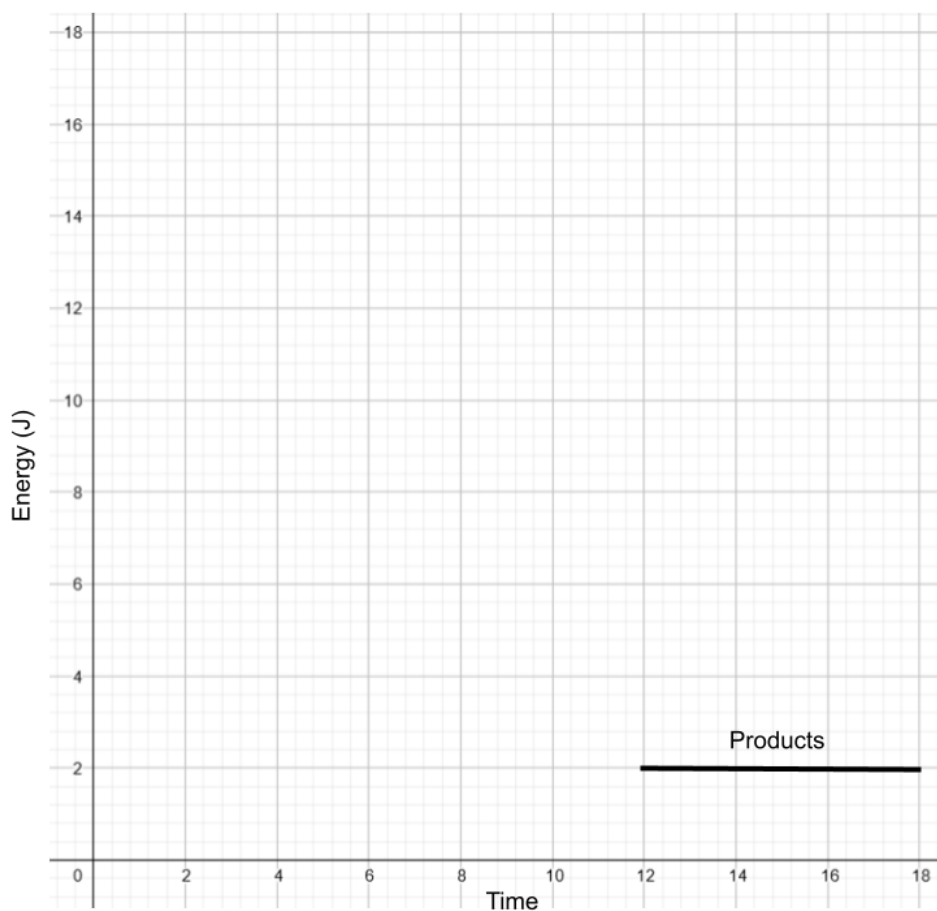
Adding heat can also increase the rate of a chemical reaction.

This time repeat the ten roles as before, but add two to the total each time to simulate the particles having extra energy to start with, from the heat.

Use the 10J from the original activity as your threshold energy.

Record your results below.

Draw the energy profile diagram for this situation.



On the graph below sketch what an exothermic reaction would look like. Make sure to use the following labels: *reactants*, *products*, *activation energy*.

