

Decomposition Reactions

Note: Slides contain audio. Click icon in bottom right corner to play.



Click this icon to play audio



There are millions of chemical reactions that are known to occur. Among these millions of reactions, certain types display similar characteristics. As a result, chemists are able to group reactions into 4 basic types to help organize these known reactions and to help chemists predict the products of unknown reactions.

Synthesis



Decomposition



Single Displacement



Double Displacement



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Decomposition Reactions](#)

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Decomposition Reactions

In a decomposition reaction, one large reactant compound breaks down (or decomposes) into two or more smaller substances. A decomposition reaction is the opposite of a synthesis reaction. Using this information, try to write a general formula for a decomposition reaction before clicking the button below. The general formula for a decomposition reaction can be written as follows:



[Click for the General Formula
for a Synthesis Reaction](#)

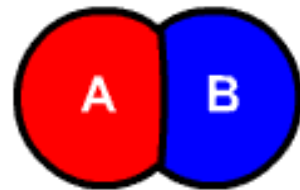


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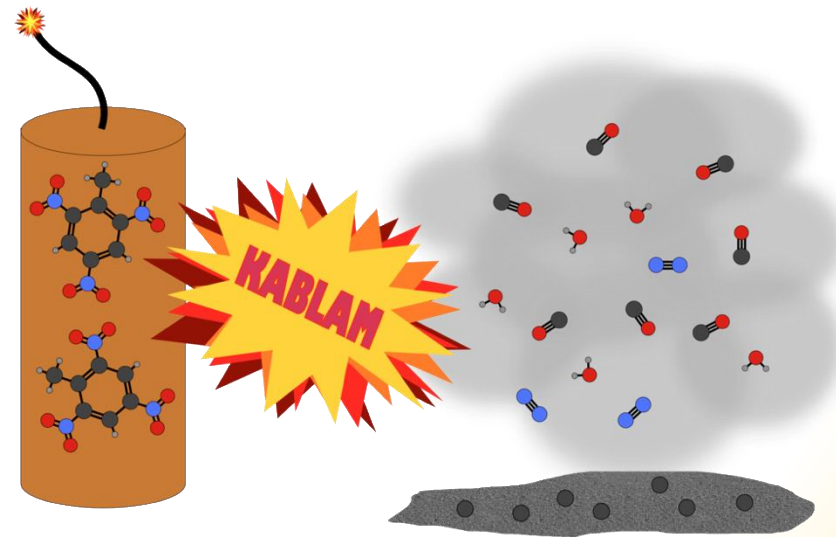
Where the compound AB is the reactant which decomposes into the products A and B.



More on Decomposition
Reactions



Decomposition reactions are used in many types of explosives such as TNT. Typically, for a decomposition reaction to occur, energy is needed to get the reaction started, this is why, for example, for a stick of TNT to explode a fuse must be lit. This fuse provides the energy to allow the decomposition reaction to begin, resulting in a flaming explosion.



Pharaoh's Serpent –
Decomposition Reaction



A good example of a decomposition reaction is commonly referred to as the pharaoh's serpent reaction in which a white powder made up of mercury thiocyanate is ignited resulting in a visually stunning decomposition reaction.

[Click to view the Pharaoh's
Serpent Reaction](#)



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[Click for the Reaction Equation](#)



In the pharaoh's serpent reaction the large, complex molecule mercury thocyanate, $(\text{Hg}(\text{SCN})_2)$ decomposes into carbon nitride (C_3N_4), mercury sulfide (HgS) and carbon disulfide (CS_2) when energy is provided in the form of a flame or spark. Try to write the balanced equation for this reaction on your own, then click the button below to view it.

Balanced Reaction Equation



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You should notice in this reaction equation, one large molecule decomposes into several smaller substances, identifying it as a decomposition reaction.

Products of
Decomposition Reactions



Reactants in a decomposition reaction can decompose into simple elements, more complex compounds or combinations of the two.

For example, simple ionic compounds often decompose into their more simple elemental forms. Potassium chloride (KCl) decomposes into solid potassium and chloride gas when electricity is used to provide energy. Write the balanced reaction equation for this reaction.

Decomposition of KCl



Reactants in a decomposition reaction can decompose into simple elements, more complex compounds or combinations of the two. For example, potassium chloride (KCl) decomposes into solid potassium and chloride gas when electricity is used to provide energy.



Other decomposition reactions involve the breakdown of reactants into both elements and compounds, such as the decomposition of potassium chlorate (KClO_3) into potassium chloride and oxygen gas. Predict the balanced equation for this reaction.

Decomposition of
 KClO_3



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Finally, some reactants decompose only into other compounds, for example calcium carbonate (CaCO_3) decomposes into 2 different compounds, calcium oxide (CaO) and carbon dioxide (CO_2)

Decomposition of
 CaCO_3



Finally, some reactants decompose only into other compounds, for example calcium carbonate (CaCO_3) decomposes into 2 different compounds, calcium oxide (CaO) and carbon dioxide (CO_2):



Test your
understanding



Test your understanding:

Which of the following reactions is a decomposition reaction? (Click the box with the correct answer.)



Incorrect. Try again:

Which of the following reactions is a decomposition reaction? (Click the box with the correct answer.)



Correct

In the reaction:



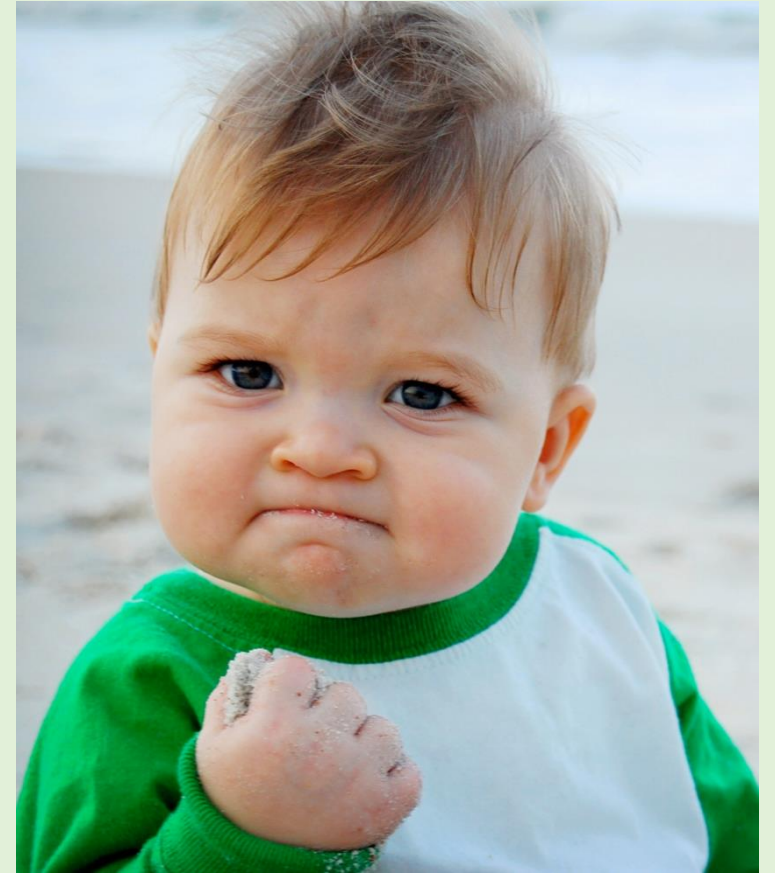
One reactant breaks down into 2 smaller substances, indicating a decomposition reaction has taken place.

Summary



Success!

You have reached the end of this activity. You will know that you have achieved the goals for this activity when you can describe and identify decomposition reactions, can give examples of different types of decomposition reactions and can describe the different types of products that can form from a decomposition reaction.



[Back to Start](#)

