Chemical vs. Physical Changes

ROSEDALE
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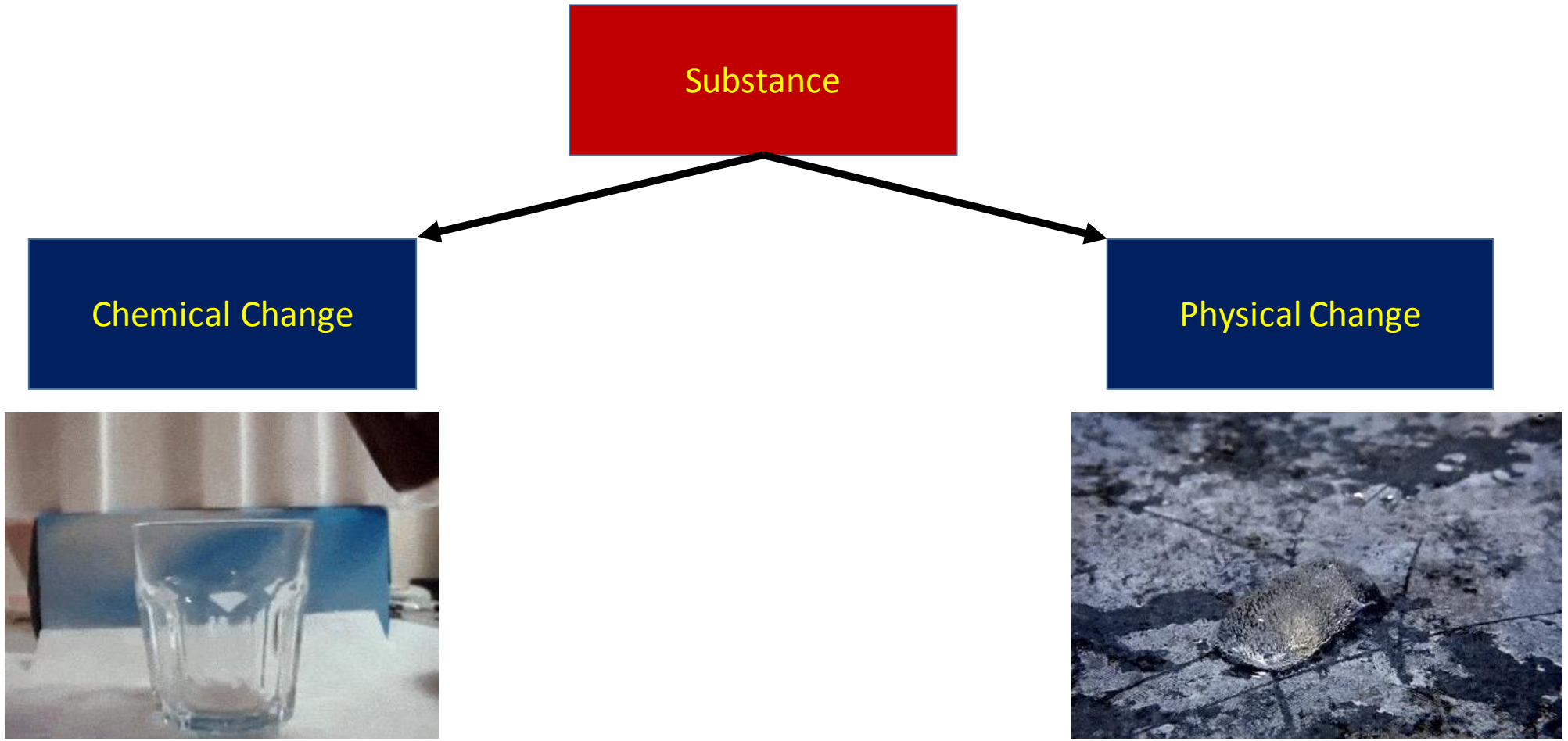
Chemistry is the study of different substances and the changes that these substances undergo. These types of changes can be put into 2 different categories: chemical changes and physical changes.



A physical change in a substance is one in which a substance undergoes some type of change from its original form but no **new** substance is formed. This means that the chemical structure of the substance is the same before and after the change occurs. The properties of the substance may be different after a physical change, but it is still the same substance.

Click for Example of Physical Change

When a physical change occurs, no new substance is produced. For example, when ice, which is the solid form of water, melts it undergoes a change of state from a solid to a liquid. However, the chemical structure of the substance remains the same before and after the change.

Physical Change:

Water (solid) → Water (liquid)

$H_20_{(s)} \rightarrow H_20_{(l)}$

Click for More Examples of Physical Change

When a physical change occurs the substance maintains the same chemical structure before and after. Some examples of physical changes include:

- Changes of state
- Changing shape (bending a nail)
- Breaking a substance (breaking glass)

When a chemical change occurs, a new substance, with different chemical and physical properties is formed from the original. This type of change is called a chemical reaction. In a chemical reaction, the original substances are called the **reactants** and the newly formed substances are called the **products**.

In a chemical reaction a new substance or substances (products) are formed from an original substance or substances (reactants). Therefore the products of a chemical reaction will have a different chemical structure than the reactants. When baking soda is mixed with vinegar, a chemical reaction occurs to produce among other products, carbon dioxide gas (CO_2) which is what causes the bubbling reaction.

Sodium Bicarbonate + Acetic Acid → Carbon Dioxide + Water + Sodium Acetate

$$\mathbf{NaHCO_3 + HC_2H_3O_2 \rightarrow NaC_2H_3O_2 + H_2O + CO_2}$$

There are different clues that indicate whether a chemical reaction has taken place and a new substance has formed. One of these clues that a chemical reaction has taken place is if heat is released. For example, when a match is lit, a chemical reaction takes place that causes the release of heat which can be both felt as an increase in temperature and seen by the appearance of the flame.

When a match is lit, chemicals on the match head combine with oxygen in the air causing a chemical reaction called a combustion reaction that releases heat and produces new substances such as ash and smoke.

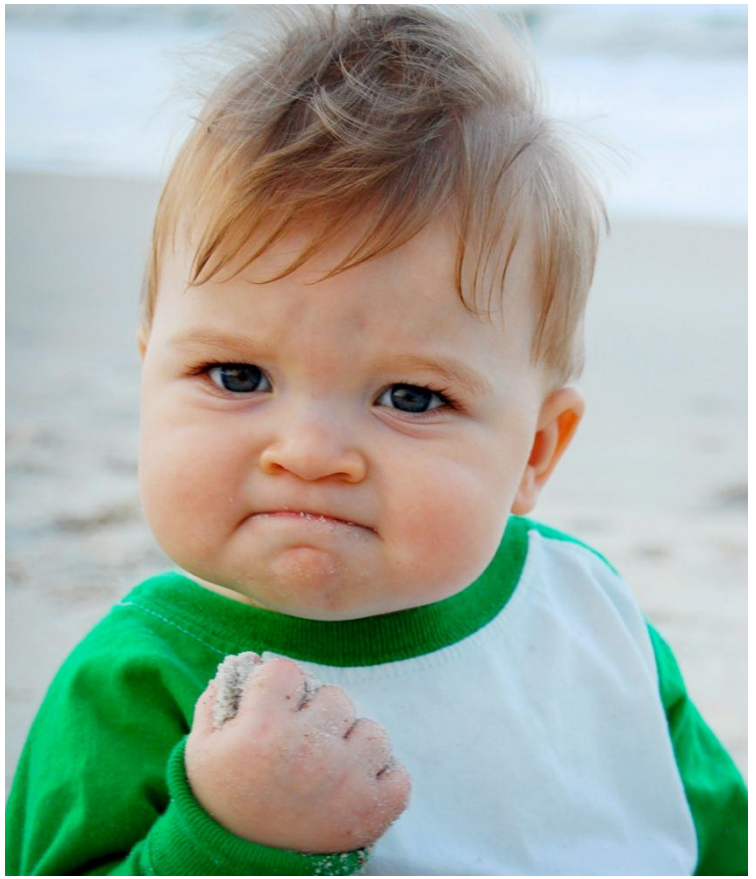
Click for More Clues of Chemical Change

There are several different clues that indicate whether a chemical reaction has taken place. A chemical reaction has likely taken place when any one of the following can be observed:

- Heat is released
- Heat is absorbed
- Light is produced
- A Precipitate is formed
- Gas is produced
- New odour is produced

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 what occurs during physical changes, chemical changes and can identify clues that indicate which type of change has occurred. As well, you will be able to identify the type of change that has occurred based on reaction equations.



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