

Physical and Chemical Changes

Change is COOL!



Physical vs. Chemical Changes

Physical changes occur when substances or objects undergo a change without changing into another substance

Chemical changes are changes substances undergo when they become new or different substances.



Physical vs. Chemical Changes

Remember that after a:

- ❖ Physical change – object's identity remains the same
 - Usually involves energy (like heat) and states of matter.
- ❖ Chemical change – object's identity changes
 - Chemical changes happen on a **molecular** level



http://www.chem4kids.com/files/matter_chemphys.html



Physical Change

Melting of ice cream is an example of a physical change.

- Involves heat

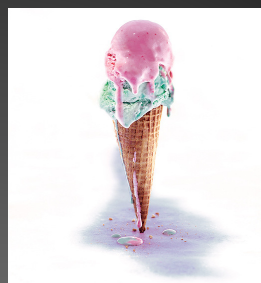


Image available at
<http://www.icecreamclubonline.com/>

YOUR TURN: Can you think of other examples of physical changes?



Chemical Change

Burning of a candle is an example of a chemical change.

At the molecular level: The wax molecule changes to carbon dioxide and water molecules.

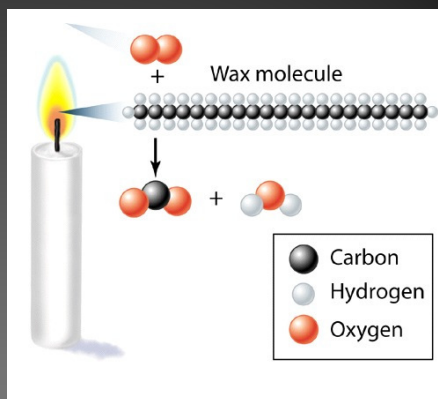


Image available at Colin Baird, "Chemistry in Your Life". 2nd ed., (ISBN 0-7167-7042-3) New York: W.H. Freeman, 2006.



Other examples of chemical changes

Tarnishing of silver



Image available at <http://www.photographersdirect.com/buyers/stockphoto.asp?imageid=1263140>

Corrosion (rusting) of iron

Image available at <http://www.mrmartinweb.com/bicycle.html>



Other examples of chemical changes

Can you think of another term for chemical changes?

Chemical change = **chemical reaction**

YOUR TURN: Can you think of other examples of everyday life chemical reactions?



Can you identify the following changes as physical or chemical?

Melting of ice

Digestion of food

Formation of frost on your window

Milk turns sour

Crushing a plastic bottle

Fireworks

Collecting and Preserving Evidence

Physical and chemical changes are sometimes involved in the collection of physical evidence from a crime scene

Ex. *Latent fingerprints* (invisible to the naked eye) are treated with chemicals to become visible (= chemical change)

Developing latent fingerprints

Image source:
http://www.clpex.com/images/Articles/RTX/s-Dsc_0025.jpg



Reference: M. Johl, "Investigating Chemistry: A Forensic Science Perspective." W.H.Freeman: New York, 2007. p. 26.

Collecting and Preserving Evidence

Ex. Bloody clothes are dried out to prevent the blood from decomposing.

❖ Identify the underlined words above as either a *physical* or *chemical* change.

Question: *Why are evidence collected in separate containers?*



Reference: M. Johl, 2007, p. 25



Identifying chemical changes

Chemical changes are more difficult to identify than physical changes

- Can't see changes in molecules
- But we can look for observable signs
 - ❖ color change
 - ❖ bubbling and fizzing
 - ❖ light production
 - ❖ smoke, and
 - ❖ presence of heat



<http://www.usoe.k12.ut.us/curr/Science/sciber00/8th/matter/sciber/chemchnng.htm>



Everyday life chemical changes/reactions

- Acid-base reactions
 - Q. Do you know where in our body do we have acids?
 - Q. Can you give some examples of acids? Bases?
 - Q. Can you give an example of acid-base reaction?



Everyday life chemical changes/reactions

➤ Oxidation reactions

Q. Can you tell which gas is used or produced during oxidation?


Q. What could be an observable sign of oxidation reaction?





ACID and BASES of everyday life



IF IT TASTES SOUR IT MUST BE
AN ACID



BSC Image available at C. Snyder, "The Extraordinary Chemistry of Ordinary Things," 4th ed. Wiley, 2003.

Acidic soil **Alkaline (basic) soil**

Figure 11.17 Hydrangeas. These flowers are blue when grown in _____ soil and pink when grown in _____.

(Diane Hirsch/Fundamental Photographs)

Image available at C. Baird and W. Gloffke, "Chemistry In Your Life." New York: Freeman, 2003. (p. 437)

Acidic and basic are two extremes that describe chemicals, just like hot and cold are two extremes that describe temperature.

Mixing acids and bases can cancel out their extreme effects; much like mixing hot and cold water can even out the water temperature.

A substance that is neither acidic nor basic is **neutral**.

<http://www.epa.gov/acidrain/measure/ph.html>

