

MASS

&

MATTER



Students will verify that an object is the sum of its parts.

- a. Demonstrate that the mass of an object is equal to the sum of its parts by manipulating and measuring different objects made of various parts.
- b. Investigate how common items have parts that are too small to be seen without magnification.

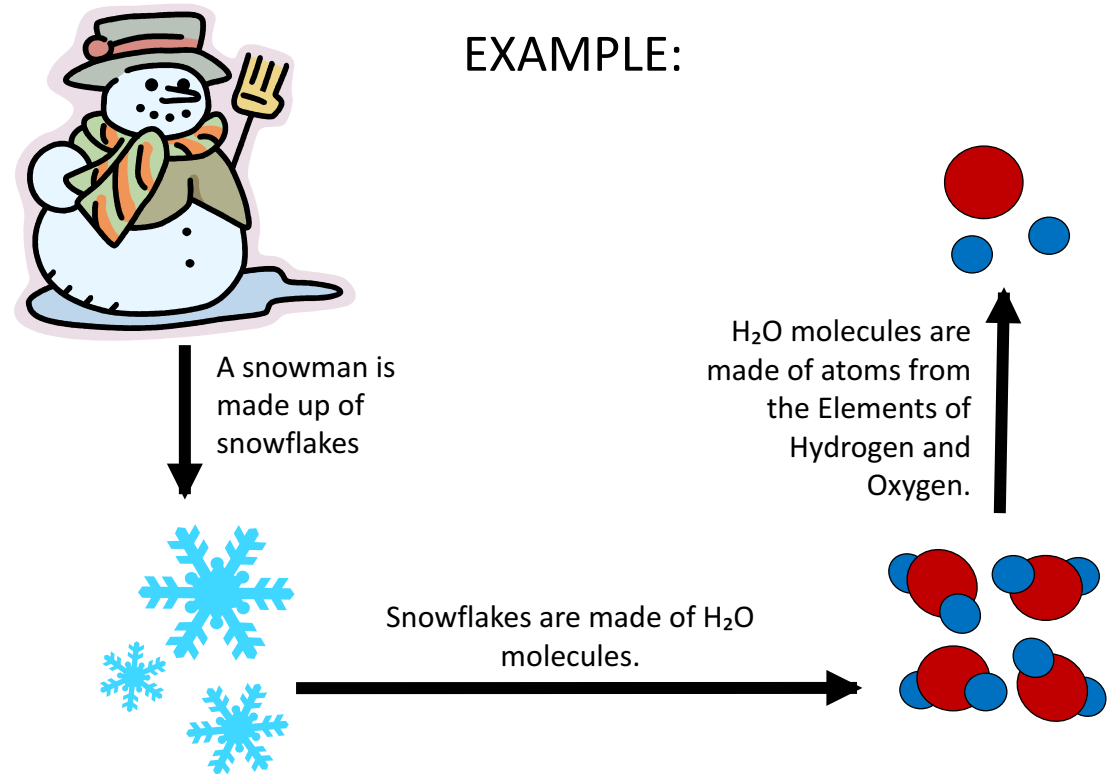
Students will explain the difference between a physical change and a chemical change.

- a. Investigate physical changes by separating mixtures and manipulating (cutting, tearing, folding) paper to demonstrate examples of physical change.
- b. Recognize that the changes in state of water (water vapor/steam, liquid, ice) are due to temperature differences and are examples of physical change.
- c. Investigate the properties of a substance before, during, and after a chemical reaction to find evidence of change.

S5P1: Students will verify that an object is the sum of its parts.

b. Investigate how common items have parts that are too small to be seen without magnification.

Objects can be broken down to smaller parts that cannot be seen with the naked eye. An object can be broken down into smaller parts, such as cells, and those cells can be broken down into molecules and elements, which can then be broken down into individual atoms. Everything is made of smaller parts that cannot be seen without magnification.



---Vocabulary---

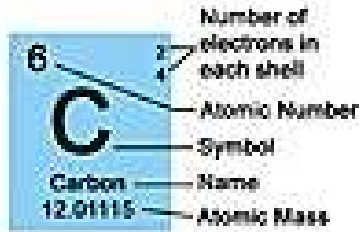
Atom: the smallest possible particle of an element

Molecule: a single particle of matter made up of two or more atoms joined together

Element: a substance made of just one kind of atom

Periodic Table of the Elements

Period	1A	2A	3A	4A	5A	6A	7A	8A	9A									
1	1 H Hydrogen 1.00794	2 He Helium 4.002602																
2	3 Li Lithium 6.941	4 Be Beryllium 9.0122	5 B Boron 10.811	6 C Carbon 12.01115	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.9984	10 Ne Neon 20.179										
3	11 Na Sodium 22.98976928	12 Mg Magnesium 24.304	13 Al Aluminum 26.9815385	14 Si Silicon 28.0855	15 P Phosphorus 30.973761998	16 S Sulfur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 39.948										
4	19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955912	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938044	26 Fe Iron 55.845	27 Co Cobalt 58.933195	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
5	37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90584	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium 98	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.3675	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.757	52 Te Tellurium 127.6	53 I Iodine 126.90447	54 Xe Xenon 131.29
6	55 Cs Cesium 132.90545196	56 Ba Barium 137.327	57 La Lanthanum 138.90547	58 Ce Cerium 140.12	59 Pr Praseodymium 140.90766	60 Nd Neodymium 144.242	61 Pm Promethium 144.9126	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92534	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93032	68 Er Erbium 167.259	69 Tm Thulium 168.93032	70 Yb Ytterbium 173.054	71 Lu Lutetium 174.967	
7	87 Fr Francium 223	88 Ra Radium 226	89 Ac Actinium 227	90 Th Thorium 232.0377	91 Pa Protactinium 231.036888	92 U Uranium 238.02891	93 Np Neptunium 237.0481732	94 Pu Plutonium 244	95 Am Americium 243	96 Cm Curium 247	97 Bk Berkelium 247	98 Cf Californium 251	99 Es Einsteinium 252	100 Fm Fermium 257	101 Md Mendelevium 258	102 No Nobelium 259	103 Lr Lawrencium 260	



Metals
 Nonmetals
 Transition Elements
 Noble Gases
 Inner Transition Elements
★ Synthetic
▲ Radioactive
{ } Atomic weight of most stable isotope
1 New designation
1A Original designation

Unknown elements 113 - 118 are shown in their predicted positions

S5P2: Students will explain the difference between a physical change and a chemical change.

a. Investigate physical changes by separating mixtures and manipulating (cutting, tearing, folding) paper to demonstrate examples of physical change.

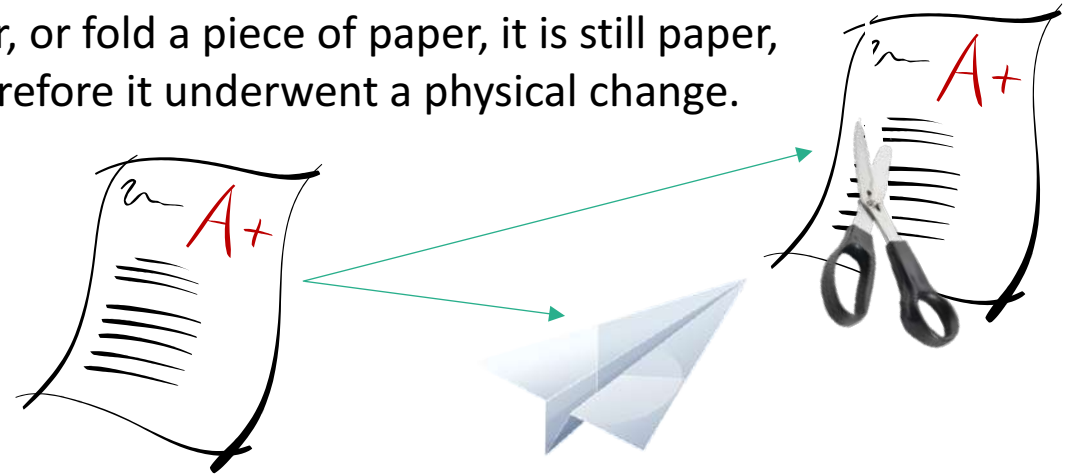
Mixture:

When you put two or more substances together physically, such as when you put tomatoes and lettuce in a salad, the substances can be separated, which means that it is a mixture. Also, if you mix salt and water, you can separate the salt from the water through evaporation, which makes saltwater a mixture.



Physical Change:

If you change the appearance or state of something, but the change does not affect the type of atoms it is composed of or the change is reversible, the object experienced a physical change. For example, if you cut, tear, or fold a piece of paper, it is still paper, therefore it underwent a physical change.



---Vocabulary---

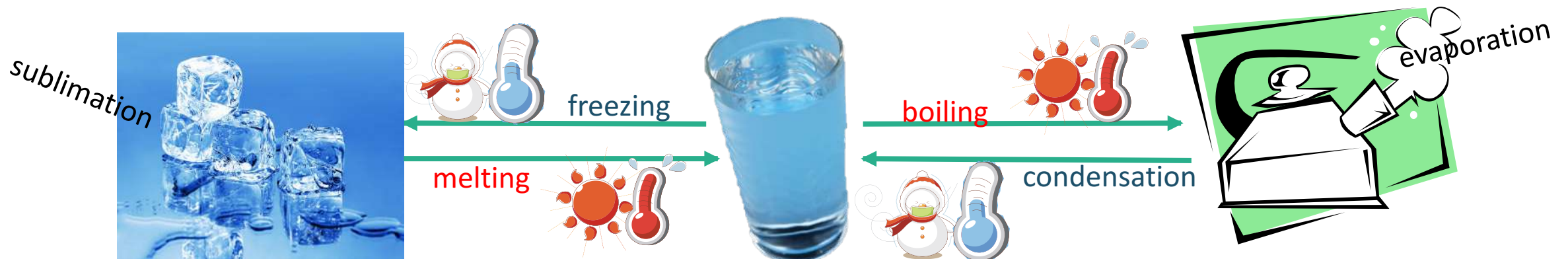
Physical Change: a change that does not result in a new substance

Mixture: matter made up of two or more substances or materials that are physically combined and can be separated

S5P2: Students will explain the difference between a physical change and a chemical change.

b. Recognize that the changes in state of water (water vapor/steam, liquid, ice) are due to temperature differences and are examples of physical change

Water undergoes changes of state very noticeably and so provides a good example of physical change. When water is a room temperature it is a liquid, but when it gets below the freezing point of 32°F or 0°C, it becomes a solid and the water becomes ice. Surprisingly, parts of the ice become gases in the process known as sublimation. When the ice begins to warm above the freezing point, it starts to become a liquid once again. If the liquid reaches the boiling point of 212°F or 100°C, the liquid becomes a gas and the water becomes steam or water vapor. The steam then evaporates into the air. If the temperature drops below the boiling point, the steam will once again become a liquid through the process of condensation. Because all of these changes are reversible and do not alter the substance, they are examples of physical change. Change of state is a physical change dependent on temperature changes.



---Vocabulary---

Change of State: a substance can change its state depending on the conditions surrounding it

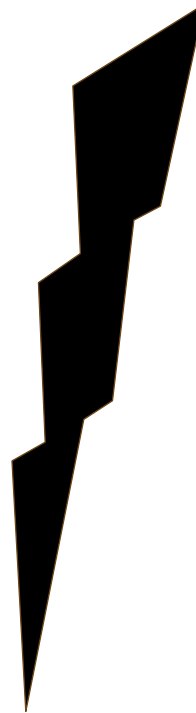
S5P2: Students will explain the difference between a physical change and a chemical change.

c. Investigate the properties of a substance before, during, and after a chemical reaction to find evidence of change.

When you are examining a substance, you can notice a variety of characteristics. If you are noticing qualities that involve just the object itself, you are examining physical properties. If you are examining characteristics that involve how the object interacts with other substances, you are observing chemical properties.

Physical Properties

luster
color
mass
reflectivity
permeability
volume
density
malleability
texture
size
temperature
magnetism
conductivity
freezing and boiling point
...and more!



Chemical Properties

flammability
reactivity
explosiveness
half-life
decomposition
oxidization
toxicity
chemical stability
corrosion
heat of combustion
radioactivity
...and more!

---Vocabulary---

Physical Property: a trait of a substance by itself

Chemical Property: a characteristic that involves how a substance interacts with other substances

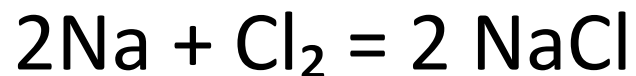
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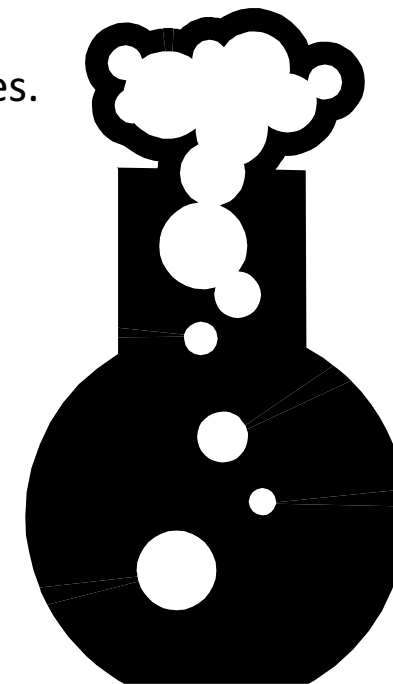
****Watch this video to explore the chemical reactions with Bill Nye!**** <https://www.youtube.com/watch?v=smkVzfZmDIU>

Chemical reactions, or chemical changes, take two or more substances to create a totally new substance, or substances, that can have completely different properties from the original substances. If you combine two or more elements in a chemical reaction, you can create a compound. This compound is a new substance with its own characteristics separate from the elements that were used to form it.

For example, the salt that you can find in your kitchen was formed through the following chemical reaction:



This chemical reaction takes Sodium, which is a metal that can be toxic or explosive, and Chlorine, a green gas that is poisonous and has a nasty odor, to make Sodium Chloride, a substance necessary for living beings to ingest and used to flavor food.



****Watch this video to explore the differences between physical and chemical changes!**** <https://www.youtube.com/watch?v=M8tyjwB42X4>

---Vocabulary---

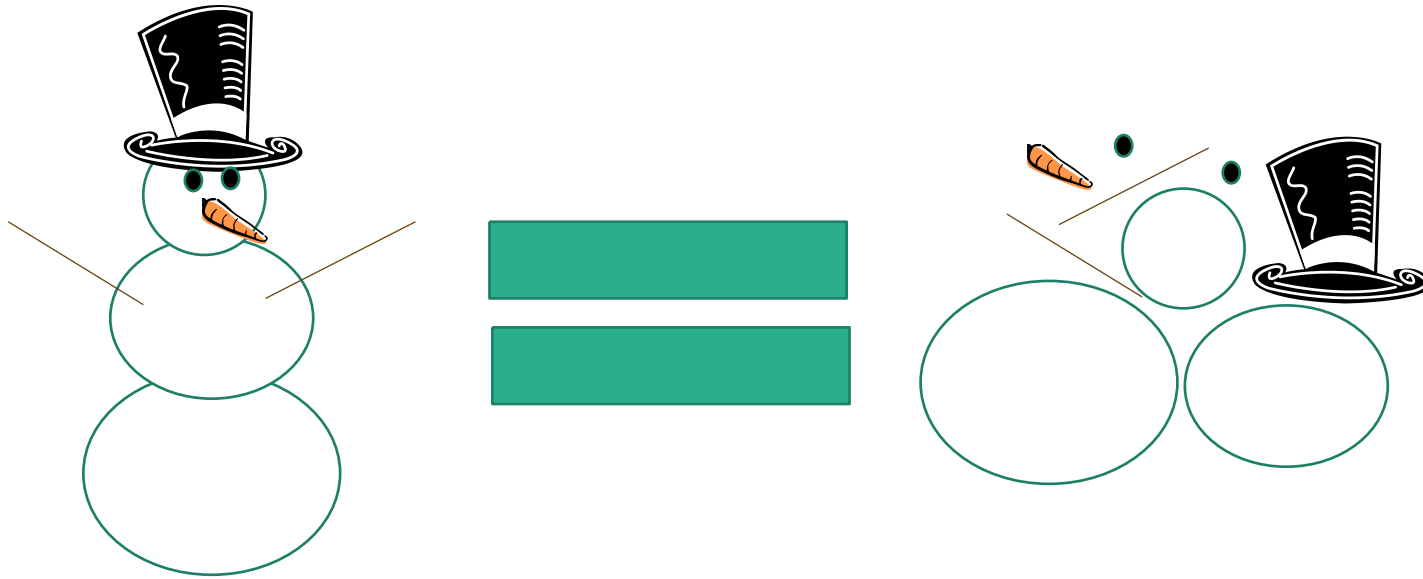
Chemical Change: a change that results in the formation of new substances

Chemical Reaction: another term for chemical change

Compound: a substance made of two or more kinds of atoms that are chemically combined

S5P1: Students will verify that an object is the sum of its parts.

a. Demonstrate that the mass of an object is equal to the sum of its parts by manipulating and measuring different objects made of various parts.



If you break an object down to all of the parts that compose it, it has the same mass as the whole object. In essence, the mass of an object is the same as all of the parts that form it. Even if an object goes through a chemical change, all of the mass of the products will equal the mass of the reactants. Mass can not be created or destroyed.

---Vocabulary---

Law of Conservation of Mass: the total amount of mass remains constant in an isolated system in spite of any physical or chemical changes that may take place

**To learn more about mass and matter, visit
these websites that focus on 5th grade
standards:**

<http://www.frodonz.com/physicalscience.html>

And

<http://www.jonathanfeicht.com/physical-changes.html>