

## Chemical Change vs. Physical Change

When a piece of paper is ripped in half, it is still paper – only smaller! Since no new substances are formed, the change is only a physical change. When a piece of paper burns, heat is released, there may be some ash left behind, and two gases, carbon dioxide and water vapor, are released. These are not only physical changes. They are chemical changes as well. Carbon dioxide and water are new substances. They were not present before the change.

When new substances form, typically, there are a number of other changes that serve as evidence of the chemical change. They are: [1] energy changes, such as the heat released when paper burns; [2] the release of gases, such as carbon dioxide and water vapor; [3] the formation of a solid in solution (not in this reaction) or the formation of water; [4] a change in color – carbon dioxide and water are invisible, colorless gases while paper is opaque; and [5] a change in odor – the obvious smell of burning paper comes from the incompletely burned carbon which is left behind to form the ash. These five changes serve only as evidence of a chemical change. There is no rule that identifies chemical changes unequivocally except that new substances are formed. That takes a knowledge of chemistry.



Based on the reading above and your knowledge of chemistry state whether each of the following represents a **PHYSICAL CHANGE** only, or a **CHEMICAL CHANGE** as well.

1. Breaking glass ..... \_\_\_\_\_
2. Dissolving sugar  $[C_{12}H_{22}O_{11}(s) + H_2O(l) \rightarrow C_{12}H_{22}O_{11}(aq) + H_2O(l)]$  ..... \_\_\_\_\_
3. Rusting iron  $[4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(g)]$  ..... \_\_\_\_\_
4. Boiling water  $[H_2O(l) \rightarrow H_2O(g)]$  ..... \_\_\_\_\_
5. Digesting sugar  $[C_{12}H_{22}O_{11}(aq) + H_2O(l) \rightarrow 2C_6H_{12}O_6(aq)]$  ..... \_\_\_\_\_
6. Burning gasoline  $[2C_8H_{18}(g) + 25O_2(g) \rightarrow 16CO_2(g) + 18H_2O(g)]$  ..... \_\_\_\_\_
7. Respiration  $[C_6H_{12}O_6(aq) + 6O_2(g) + 6H_2O(g) \rightarrow 6CO_2(g) + 12H_2O(g)]$  .. \_\_\_\_\_
8. Forming ozone from oxygen  $[3O_2(g) \rightarrow 2O_3(g)]$  ..... \_\_\_\_\_
9. Dissolving salt  $[NaCl(s) + H_2O(l) \rightarrow NaCl(aq) + H_2O(l)]$  ..... \_\_\_\_\_
10. Exploding dynamite ..... \_\_\_\_\_