

Chemical Changes Vs. Physical ChangesPart I:

<u>Description</u>	<u>Chemical and/or Physical RXN? &amp; Why?</u>
1. In this type of reaction, substance's chemical identity changes from start to end because atoms re-arrange themselves.	
2. Any substance changing phase (solid $\leftrightarrow$ liquid $\leftrightarrow$ gas)	
3. In this type of reaction, the weak bonds between molecules (intermolecular forces) are being broken &/or reformed	
4. This reaction can sometimes be recognized because it results in light being released, a color change, a solid being formed from two liquids combining, or an odor being produced.	
5. In this type of reaction, the strong bonds between atoms (covalent, metallic, ionic) are broken &/ or reformed.	
6. Burning a sheet of paper	
7. Crushing a can	
8. Tearing a sheet of paper	
9. Bacteria causing food to rot	
10. You digest your lunch	

**Part II:** Interpret the following equations & determine if a physical change or chemical change occurs.

Describe what is happening (below)	Chemical and/or Physical RXN? & Why?
11. $\text{CO}_2 (\text{s}) \rightarrow \text{CO}_2 (\text{g})$ EX: $\text{CO}_2$ (Dry ice) is a solid & it turns into $\text{CO}_2$ gas	EX: <u>physical reaction</u> - $\text{CO}_2$ is just undergoing a phase change, but it's still the same chemical.
12. $\text{CO}_2 (\text{g}) + \text{H}_2\text{O} (\text{l}) \rightarrow \text{H}_2\text{CO}_3 (\text{aq})$	
13. $\text{CaCl}_2 (\text{aq}) + 2 \text{NaOH} (\text{aq}) \rightarrow \text{Ca}(\text{OH})_2 (\text{s}) + 2 \text{NaCl} (\text{aq})$	
14. $\text{H}_2\text{O} (\text{s}) \rightarrow \text{H}_2\text{O} (\text{l})$	
15. $\text{NaCl} (\text{s}) \rightarrow \text{NaCl} (\text{aq}) \rightarrow \text{Na}^+ (\text{aq}) + \text{Cl}^- (\text{aq})$	
16. $\text{H}_2\text{O} (\text{l}) + \text{Electricity} \rightarrow \text{H}_2 (\text{g}) + \text{O}_2 (\text{g})$	

## Understanding Chemical Equations

Some chemicals are extremely dangerous and harmful to the body, even in small amounts. Match the following chemical equations with their descriptions.

### OPTIONS:

- a.  $\text{NH}_2\text{Cl}(\text{aq}) + \text{NH}_3(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{N}_2\text{H}_4(\text{g}) + \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- b.  $2 \text{C}_8\text{H}_{14}(\text{l}) + 23 \text{O}_2(\text{g}) \rightarrow 16 \text{CO}_2(\text{g}) + 14 \text{H}_2\text{O}(\text{l})$
- c.  $\text{CO}(\text{g}) + \text{FeHb}(\text{aq}) \rightarrow \text{FeHb}(\text{CO})(\text{aq})$
- d.  $\text{COCl}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow 2 \text{HCl}(\text{g}) + \text{CO}_2(\text{g})$
- e.  $\text{NaCN}(\text{s}) + \text{HCl}(\text{aq}) \rightarrow \text{HCN}(\text{g}) + \text{NaCl}(\text{aq})$
- f.  $\text{C}_{17}\text{H}_{21}\text{O}_4\text{N}(\text{s}) + \text{NaOH}(\text{aq}) \rightarrow \text{C}_{16}\text{H}_{18}\text{O}_4\text{N}^-(\text{aq}) + \text{Na}^+(\text{aq}) + \text{CH}_3\text{OH}(\text{aq})$
- g.  $2\text{CH}_3\text{OH}(\text{l}) + \text{O}_2(\text{g}) \rightarrow 2 \text{CH}_2\text{O}(\text{l}) + 2 \text{H}_2\text{O}(\text{l})$

Letter	(NOTE: 1 equation above is not used)
	1. Phosgene was used extensively in World War I as a poisonous gas. When inhaled, it reacts with water in the lungs to produce hydrochloric acid, which causes severe lung damage and ultimately leads to death. Carbon dioxide is also formed.
	2. When octane and oxygen gas are burned in our cars, carbon dioxide and water come out of the exhaust. The increase in carbon dioxide in the atmosphere is causing global warming.
	3. Chloroamine and hydroxide, which are formed when bleach and ammonia are mixed, react with excess ammonia ( $\text{NH}_3$ ) to form hydrazine, a toxic and potentially explosive gas. Sodium chloride and water are also formed in the reaction
	4. "Crack", or "free base", is the most toxic form of cocaine. It is made by treating cocaine with sodium hydroxide. Methanol and sodium ions are also products.
	5. Carbon monoxide binds very strongly with hemoglobin, a compound in the blood. The carbon monoxide-hemoglobin complex prevents hemoglobin from carrying either oxygen or carbon dioxide and causes a person to suffocate.
	6. Sodium cyanide is a poisonous white powder. It also reacts with hydrochloric acid to form the very toxic gas hydrogen cyanide. Sodium chloride is a by-product of this reaction.