

CHEMICAL REACTIONS LAB

WHAT TO TURN IN: Balanced equations for all 20 reactions

1 2 3 4 5 5.1 5.2 6 7 8 9 10 11 12 13.1 13.2 14.1 14.2 15 16

Purpose:

- To observe the five major types of reactions.
- To construct and balanced equations for selected chemical reactions.

Check the **lab hints** on the back page.

Section I: Combination (synthesis) reactions $A + B \rightarrow AB$

Two or more substances come together to form a single new substance.

Reaction 1: Steel wool (containing iron) combines with oxygen

Reaction 2: Copper wool combines with oxygen

Reaction 3: Magnesium combines with oxygen

Reaction 4: Combination of calcium oxide and water

Reaction 5: Combination of carbon dioxide and water

The general rule for reactions like 4 and 5 is a metal oxide reacting with water produces a base, and a nonmetal oxide reacting with water produces an acid. Acids are usually written beginning with H, and bases are usually written ending in (OH). Use this rule to write equations for the following combination reactions:

Reaction 5.1: Aluminum oxide combines with water

Reaction 5.2: Sulfur trioxide combines with water

Section II: Decomposition reactions $AB \rightarrow A + B$

One substance breaks down to two or more simpler substances.

Reaction 6: Decomposition of hydrogen peroxide (H_2O_2)

Reaction 7: Decomposition of sodium hydrogen carbonate into sodium carbonate, water, and carbon dioxide

Section III: Single replacement reactions $A + BC \rightarrow AC + B$

One substance will replace another substance in the compound.

Check the *activity series* at <http://kwanga.net/chemnotes/activity-series-and-solubility-table.pdf> to see if the reactions will occur (if A is strong enough to replace B).

Reaction 8: Reaction of calcium and water

Reaction 9: Reaction of zinc and hydrochloric acid

Reaction 10: Reaction of zinc and lead(II) nitrate

Section IV: Double replacement reactions $AB + CD \rightarrow AD + CB$

The substances are ionized and dissolved in water. The ions are free to move around and find another partner. If the partnership results in a compound which is insoluble in water, a precipitate (a solid) will form. If a gas is formed, you will see bubbles.

If a solid is formed, check the *solubility table* at <http://kwanga.net/chemnotes/activity-series-and-solubility-table.pdf> to see which product is the solid, and label it with an (s).

Reaction 11: Sodium carbonate reacts with barium nitrate

Reaction 12: Lead(II) nitrate reacts with potassium iodide

Reaction 13.1: Sodium bicarbonate reacts with hydrochloric acid (two products)

One of the products is a common acid. This acid product in this reaction is unstable and breaks down to form carbon dioxide and water. Rewrite the complete balanced equation in 13.2, showing three products.

Reaction 13.2 Sodium bicarbonate reacts with hydrochloric acid (three products)

Reaction 14.1: Calcium carbonate reacts with hydrochloric acid (two products)

One of the products is a common acid. This acid product in this reaction is unstable and breaks down to form carbon dioxide and water. Rewrite the complete balanced equation in 13.2, showing three products.

Reaction 14.2: Calcium carbonate reacts with hydrochloric acid (three products)

Section V: Complete Combustion of hydrocarbons $\text{Fuel} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

When a compound composed of carbon and hydrogen completely burns in the presence of oxygen, carbon dioxide and water are produced.

Reaction 15: Complete combustion of methane (CH_4)

Reaction 16: Complete combustion of ethanol ($\text{C}_2\text{H}_5\text{OH}$ or $\text{CH}_3\text{CH}_2\text{OH}$)

LAB HINTS ON BACK PAGE →

CHEMICAL REACTION LAB HINTS

REACTION NUMBER:

- 1) "Super Seven;" criss-cross in the reaction; Fe is +3 in the crisscross; heat symbol (Δ)
- 2) "Super Seven;" criss-cross in the reaction; Cu is +1 in the crisscross; heat symbol needed
- 3) "Super Seven;" criss-cross in the reaction; heat symbol (Δ)
- 4) One product with hydroxide in it; criss-cross in the reaction
- 5) The acid product is one of the six major acids
 - 5.1) base product containing hydroxide; criss-cross
 - 5.2) acid product is one of the six major acids

- 6) Catalyst needed; "Super Seven;" one product is a gas required for burning to occur; one product is a very common liquid
- 7) Heat symbol needed (Δ)

- 8) Check activity series first to confirm; write water as HOH which makes it easier to balance; criss-cross in the reaction; "Super Seven"
- 9) Check activity series first to confirm; follow format; criss-cross in the reaction
- 10) Check activity series first to confirm; follow format; criss-cross in the reaction

- 11) Criss-cross; check solubility table and label solid product formula with (s)
- 12) Criss-cross; check solubility table and label solid product formula with (s)

- 13.1) Criss-cross; need two products (see directions)
- 13.2) Criss-cross; need three products (see directions)
- 14.1) Criss-cross; need two products (see directions)
- 14.2) Criss-cross; need three products (see directions)

- 15) Complete combustion of a hydrocarbon; heat symbol needed (Δ)
- 16) Complete combustion of a hydrocarbon; heat symbol needed (Δ)