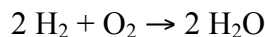


Balancing Equations Worksheet and Key

1. Answer the following questions about the chemical equation shown below:



- What are the reactants?
- What is the product?
- What do we call the number "2" in front of the H_2 (and H_2O)?
- Is the reaction balanced?
- Why is there not a coefficient for O_2 ?
- How many hydrogen **atoms** are needed to produce **two** H_2O molecules?
- How many oxygen **atoms** are needed to produce **two** H_2O molecules?
- How many hydrogen **molecules** are needed to produce **two** H_2O molecules?
- How many oxygen **molecules** are needed to produce **two** H_2O molecules?
- Write the "word equation" that you would use to describe this reaction.
 - Use words in a sentence, not formulas or an arrow. **Ignore the coefficients.**

2. Balance the following chemical equations:

- $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$
- $\text{H}_2 + \text{Cl}_2 \rightarrow \text{HCl}$
- $\text{Ag} + \text{H}_2\text{S} \rightarrow \text{Ag}_2\text{S} + \text{H}_2$
- $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- $\text{HgO} \rightarrow \text{Hg} + \text{O}_2$
- $\text{Co} + \text{H}_2\text{O} \rightarrow \text{Co}_2\text{O}_3 + \text{H}_2$

3. Write **balanced chemical equations** for each of the following descriptions of a chemical reaction.

- You **do not need to include the phases** of the reactants or products.

IMPORTANT NOTE: Before attempting to balance the equations, you must first convert the compound **names** into the correct chemical **formulas**. If you begin to struggle with that, you may wish to go back to Chapter 3 and re-work the naming problems.

- Aluminum metal **reacts with** copper(II) chloride **to produce** aluminum chloride and copper metal.
- Lead(II) nitrate reacts with sodium bromide to produce lead(II) bromide and sodium nitrate.
 - HINT: Since you have *the same polyatomic ion* (nitrate) on **both sides** of the equation you can use the shortcut that was listed in Step #1 of our balancing method.
- Zinc metal reacts with oxygen gas to produce zinc oxide
(Recall that oxygen is one of the diatomic molecules that are referred to by their element's name).

d) Aluminum sulfate reacts with barium iodide to produce aluminum iodide and barium sulfate.

e) At temperatures reached during baking, sodium bicarbonate (baking soda) decomposes (reacts) to produce sodium carbonate, carbon dioxide, and dihydrogen monoxide.

- Recall that *bicarbonate* is a polyatomic ion (not the same as the *carbonate* polyatomic ion).

f) Sodium metal reacts with water to produce sodium hydroxide and hydrogen gas.

g) Lead(IV) sulfide reacts with oxygen gas to produce lead(IV) oxide and sulfur dioxide.

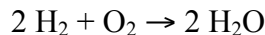
h) Zinc metal reacts with phosphoric acid to produce zinc phosphate and hydrogen gas.

(NOTE: *the formula of phosphoric acid is* H_3PO_4)

SEE NEXT PAGE FOR THE ANSWER KEY

ANSWER KEY

1. Answer the following questions about the chemical equation shown below:



- a) What are the reactants? **H₂ and O₂**
- b) What is the product? **H₂O**
- c) What is the number "2" in front of the H₂ (and H₂O) called? **Coefficient**
- d) Is the reaction balanced? **Yes**
- e) Why is there not a coefficient in for O₂? **When the coefficient would be "1", it is omitted.**
- f) How many hydrogen **atoms** are needed to produce **two** H₂O molecules? **4**
- g) How many oxygen **atoms** are needed to produce **two** H₂O molecules? **2**
- h) How many hydrogen **molecules** are needed to produce **two** H₂O molecules? **2**
- i) How many oxygen **molecules** are needed to produce **two** H₂O molecules? **1**
- j) Write the "word equation" that you would use to describe this reaction.
 - Use words in a sentence, not formulas or an arrow. **Ignore the coefficients.**
Hydrogen **reacts with** oxygen to **produce** dihydrogen monoxide (or water). **or**
Hydrogen **plus** oxygen **produces** dihydrogen monoxide (or water).
 - You can write "**forms**" instead of "**produces**"

2. Balance the following chemical equations:

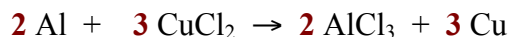
- a) **4** Fe + **3** O₂ → **2** Fe₂O₃
- b) H₂ + Cl₂ → **2** HCl
- c) **2** Ag + H₂S → Ag₂S + H₂
- d) CH₄ + **2** O₂ → CO₂ + **2** H₂O
- e) **2** HgO → **2** Hg + O₂
- f) **2** Co + **3** H₂O → Co₂O₃ + **3** H₂

3. Write **balanced chemical equations** for each of the following descriptions of a chemical reaction.

- You **do not need to include the phases** of the reactants or products.

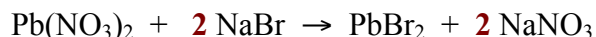
IMPORTANT NOTE: Before attempting to balance the equations, you must first convert the compound **names** into the correct chemical **formulas**. If you begin to struggle with that, you may wish to go back to Chapter 3 and re-work the naming problems.

a) Aluminum metal **reacts with** copper(II) chloride **to produce** aluminum chloride and copper metal.

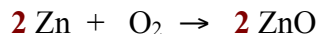


b) Lead(II) nitrate reacts with sodium bromide to produce lead(II) bromide and sodium nitrate.

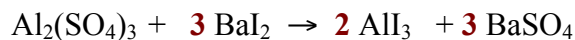
- HINT: Since you have *the same polyatomic ion* (nitrate) on **both sides** of the equation you can use the shortcut that was listed in Step #1 of our balancing method.



c) Zinc metal reacts with oxygen gas to produce zinc oxide
(Recall that oxygen is one of the diatomic molecules that are referred to by their element's name).



d) Aluminum sulfate reacts with barium iodide to produce aluminum iodide and barium sulfate.

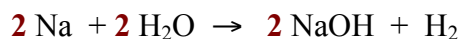


e) At temperatures reached during baking, sodium bicarbonate (baking soda) decomposes (reacts) to produce sodium carbonate, carbon dioxide, and dihydrogen monoxide.

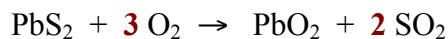
- Recall that *bicarbonate* is a polyatomic ion (not the same as the *carbonate* polyatomic ion).



f) Sodium metal reacts with water to produce sodium hydroxide and hydrogen gas.



g) Lead(IV) sulfide reacts with oxygen gas to produce lead(IV) oxide and sulfur dioxide.



h) Zinc metal reacts with phosphoric acid to produce zinc phosphate and hydrogen gas.
(NOTE: the formula of phosphoric acid is H_3PO_4)

