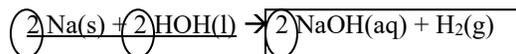


Chemical Equations Reactions Homework Answers

1. In the following equation, circle the coefficients, underline the reactants and put a box around the products.



2. List the seven diatomic molecules: H_2 , N_2 , O_2 , F_2 , Cl_2 , Br_2 , I_2

3. **False** - The seven elements that form diatomic molecules ALWAYS have a subscript of two, even when they are bonded to other atoms.

4. When we use the compound water in this chapter, we will not write H_2O . Instead, we will write the formula as **HOH** and **H⁺** will be the cation and **OH⁻** will be the anion.

5. What do each of the following abbreviation represent when they appear in a chemical equation?

- | | |
|-----------------------|---------------------|
| a. aq: aqueous | c. l: liquid |
| b. s: solid | d. g: gas |

6. What is the rule for whether an element can be replaced in a single replacement reaction? **Elements higher on the chart can replace elements below it, but elements lower on the chart cannot replace elements higher on the chart.**

7. **False** - A cation can only replace a cation but an anion can replace a cation or an anion.

8. What is the most active cation? What is the most active anion? **Li, F**

9. What do you write as the product for a reaction that cannot occur? **N.R.**

10. **Single Replacement Reactions.** Write complete balance chemical reaction for each of the following.

- A strip of magnesium metal is placed in a solution of iron(II) chloride.
 $\text{Mg} + \text{FeCl}_2 \rightarrow \text{MgCl}_2 + \text{Fe}$
- A strip of aluminum is placed in a solution of lithium nitrate
 $\text{Al} + \text{LiNO}_3 \rightarrow \text{N.R.}$
- A piece of cadmium metal is oxidized by adding it to a solution of copper(II) chloride.
 $\text{Cd} + \text{CuCl}_2 \rightarrow \text{CdCl}_2 + \text{Cu}$
- Chlorine gas is bubbled into a solution of sodium bromide.
 $\text{Cl}_2 + 2\text{NaBr} \rightarrow \text{Br}_2 + 2\text{NaCl}$
- Solid potassium fluoride is added to liquid iodine.
 $\text{KF} + \text{I}_2 \rightarrow \text{N.R.}$
- A piece of solid sodium is added to a beaker of water.
 $2\text{Na} + 2\text{HOH} \rightarrow 2\text{NaOH} + \text{H}_2$

11. **Double Replacement.** Write complete balance chemical reaction for each of the following.

- Solutions of zinc bromide and silver nitrate are combined.
 $\text{ZnBr}_2 + 2\text{AgNO}_3 \rightarrow \text{Zn(NO}_3)_2 + 2\text{AgBr}$
- Solutions of barium chloride and potassium fluoride are mixed together.
 $\text{BaCl}_2 + 2\text{KF} \rightarrow \text{BaF}_2 + 2\text{KCl}$
- A solution of aluminum nitrate is added to a solution of sodium hydroxide
 $\text{Al(NO}_3)_3 + 3\text{NaOH} \rightarrow \text{Al(OH)}_3 + 3\text{NaNO}_3$
- A solution of calcium chloride is added drop by drop to a solution of sodium carbonate.
 $\text{CaCl}_2 + \text{Na}_2\text{CO}_3 \rightarrow \text{CaCO}_3 + 2\text{NaCl}$
- A solution of nickel(II) bromide is added to a solution of potassium hydroxide.
 $\text{NiBr}_2 + 2\text{KOH} \rightarrow 2\text{KBr} + \text{Ni(OH)}_2$

12. **Synthesis:** Write complete balance chemical reaction for each of the following.

- Hydrogen gas and oxygen gas are heated together
 $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- Solid sodium is added to liquid bromine
 $2\text{Na} + \text{Br}_2 \rightarrow 2\text{NaBr}$
- A strip of aluminum is heated in chlorine gas
 $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$
- Solid pieces of potassium and iodine are heated strongly
 $2\text{K} + \text{I}_2 \rightarrow 2\text{KI}$
- Solid iron and sulfur are heated strongly together
 $\text{Fe} + \text{S} \rightarrow \text{FeS}$ OR $2\text{Fe} + 3\text{S} \rightarrow \text{Fe}_2\text{S}_3$

13. **Decomposition:** Write complete balance chemical reaction for each of the following.

- Solid calcium chloride is heated strongly.
 $\text{CaCl}_2 \rightarrow \text{Ca} + \text{Cl}_2$
- Electricity is passed through water causing it to decompose.
 $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
- Solid sodium chlorate is strongly heated.
 $2\text{NaClO}_3 \rightarrow 2\text{NaCl} + 3\text{O}_2$
- Solid copper(II) sulfate pentahydrate is heated strongly.
 $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} \rightarrow \text{CuSO}_4 + 5\text{H}_2\text{O}$
- Solid calcium carbonate is strongly heated.
 $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

14. **Combustion:** Write complete balance chemical reaction for each of the following.

- Solid nickel(II) sulfide is strongly heated in air.
 $2\text{NiS} + 3\text{O}_2 \rightarrow 2\text{NiO} + 2\text{SO}_2$
- Hexane (C_6H_{14}) is combusted in air.
 $2\text{C}_6\text{H}_{14} + 19\text{O}_2 \rightarrow 12\text{CO}_2 + 14\text{H}_2\text{O}$
- Propanone (CH_3COCH_3) is burned in air.
 $\text{CH}_3\text{COCH}_3 + 4\text{O}_2 \rightarrow 3\text{CO}_2 + 3\text{H}_2\text{O}$
- Sulfur in its standard state is burned in air.
 $\text{S}_8 + 8\text{O}_2 \rightarrow 8\text{SO}_2$

15. **Modified True/False.** If a statement is true, circle true. If a statement is false, circle false and rewrite the statement making it true.:

- False** - When solving double(**single**) displacement equations, you must look at the activity series to see if the reaction can occur.
- True** - In order for a combustion reaction to occur, oxygen is needed as a reactant.
- False** - Decomposition reactions never(**sometimes**) have compounds in their products.
- True** - In the decomposition of a hydrate, the water is removed from the hydrate and is written as a separate product.
- False** - In the decomposition of a chlorate(**carbonate**), carbon dioxide is always one of the products.
- False** - When using a multivalent cation, you can(**can't**) use a different charge in your reactant and your product

16. **Mixed Problems.** For each of the following reactions, write a balanced equation for the reaction. Coefficients should be in terms of lowest whole numbers.

- Magnesium metal is burned in nitrogen gas.
 $3\text{Mg} + \text{N}_2 \rightarrow \text{Mg}_3\text{N}_2$
- Lead foil is immersed in silver nitrate solution.
 $\text{Pb} + 2\text{AgNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_2 + 2\text{Ag}$ $\text{Pb} + 4\text{AgNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_4 + 4\text{Ag}$
- A solution of ammonium sulfate is added to a solution of barium hydroxide.
 $(\text{NH}_4)_2\text{SO}_4 + \text{Ba}(\text{OH})_2 \rightarrow \text{BaSO}_4 + 2\text{NH}_4\text{OH}$
- Ethanol ($\text{C}_2\text{H}_5\text{OH}$) is completely burned in air.
 $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$
- Solutions of zinc sulfate and sodium phosphate are mixed.
 $3\text{ZnSO}_4 + 2\text{Na}_3\text{PO}_4 \rightarrow \text{Zn}_3(\text{PO}_4)_2 + 3\text{Na}_2\text{SO}_4$
- Solutions of silver nitrate and lithium bromide are mixed.
 $\text{AgNO}_3 + \text{LiBr} \rightarrow \text{LiNO}_3 + \text{AgBr}$
- A solution of ammonium thiocyanate is added to a solution of iron(II) chloride.
 $2\text{NH}_4\text{SCN} + \text{FeCl}_2 \rightarrow \text{Fe}(\text{SCN})_2 + 2\text{NH}_4\text{Cl}$
- Carbon disulfide vapor is burned in excess oxygen.
 $\text{CS}_2 + 3\text{O}_2 \rightarrow \text{CO}_2 + 2\text{SO}_2$
- A solution of sodium hydroxide is added to a solution of ammonium chloride.
 $\text{NaOH} + \text{NH}_4\text{Cl} \rightarrow \text{NaCl} + \text{NH}_4\text{OH}$