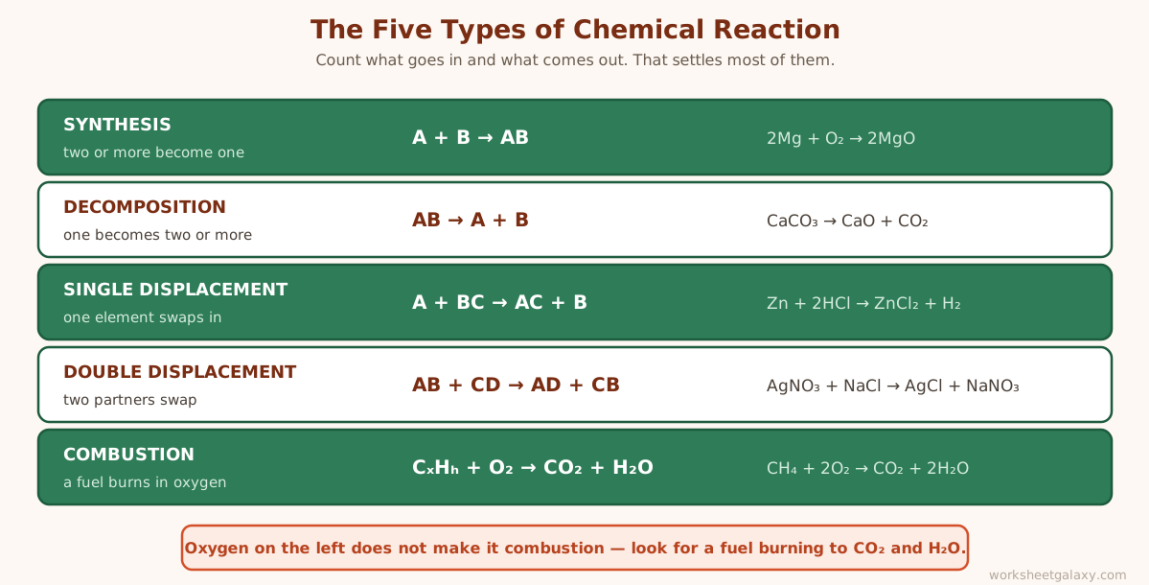
Types of Chemical Reactions Worksheet

Grade 11 Chemistry · Synthesis, decomposition, displacement and combustion

Name: _____ Date: _____ Score: / 24



Part A · Classify the Reaction Write the type next to each equation.

Choose from: synthesis · decomposition · single displacement · double displacement · combustion

#	Equation	Type
1	$2Mg + O_2 \rightarrow 2MgO$	
2	$CaCO_3 \rightarrow CaO + CO_2$	
3	$Zn + 2HCl \rightarrow ZnCl_2 + H_2$	
4	$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$	
5	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	
6	$2KClO_3 \rightarrow 2KCl + 3O_2$	
7	$Cl_2 + 2NaBr \rightarrow 2NaCl + Br_2$	
8	$N_2 + 3H_2 \rightarrow 2NH_3$	

Part B · Predict the Products The type is given. Write the products, then balance.

1. **$Na + Cl_2 \rightarrow ?$**

   This is a synthesis reaction. Complete and balance it.

   Answer: _____

2. **$H_2O \rightarrow ?$**

This is a decomposition reaction. Complete and balance it.

Answer: _____

3. **$Fe + CuSO_4 \rightarrow ?$**

This is a single displacement reaction. Complete and balance it.

Answer: _____

4. **$BaCl_2 + Na_2SO_4 \rightarrow ?$**

This is a double displacement reaction. Complete and balance it.

Answer: _____

5. **$C_3H_8 + O_2 \rightarrow ?$**

This is a combustion reaction. Complete and balance it.

Answer: _____

6. **$CaO + H_2O \rightarrow ?$**

This is a synthesis reaction. Complete and balance it.

Answer: _____

Part C · Balance and Classify Add coefficients, then name the type.

1. **$Al + O_2 \rightarrow Al_2O_3$**

Type: _____

2. **$C_2H_6 + O_2 \rightarrow CO_2 + H_2O$**

Type: _____

3. **$Na + H_2O \rightarrow NaOH + H_2$**

Type: _____

4. $KI + Pb(NO_3)_2 \rightarrow KNO_3 + PbI_2$

Type: _____

Part D · Spot the Error Each classification below is wrong. Give the right one and say why.

1. $CaCO_3 \rightarrow CaO + CO_2$

This has been classified as **single displacement**.

Correct type: _____

2. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

This has been classified as **double displacement**.

Correct type: _____

3. $2Na + Cl_2 \rightarrow 2NaCl$

This has been classified as **decomposition**.

Correct type: _____

Part E · Challenge Reactivity, balancing and one that catches people out.

Activity series — a metal displaces any metal below it, and any metal above hydrogen displaces hydrogen from an acid.

most reactive K › Na › Ca › Mg › Al › Zn › Fe › Pb › H › Cu › Ag › Au least reactive

1. Use the activity series above to decide whether each of these reacts. Write "no reaction" where nothing happens, and a balanced equation where it does. (a) Zn + $CuSO_4$ (b) Cu + $ZnSO_4$ (c) Mg + HCl (d) Ag + HCl

Answer: _____

2. Butane, C_4H_{10}, burns completely in oxygen. Write the balanced equation and name the reaction type.

Answer: _____

3. Hydrogen peroxide breaks down as $2H_2O_2 \rightarrow 2H_2O + O_2$. A student calls this combustion because oxygen appears. Explain why that is wrong and give the correct type.

Answer: _____

Answer Key · Types of Chemical Reactions

Full worked solutions — Grade 11 Chemistry

Part A · Classify the Reaction

1. $2Mg + O_2 \rightarrow 2MgO$
   synthesis
2. $CaCO_3 \rightarrow CaO + CO_2$
   decomposition
3. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
   single displacement
4. $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$
   double displacement
5. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
   combustion
6. $2KClO_3 \rightarrow 2KCl + 3O_2$
   decomposition
7. $Cl_2 + 2NaBr \rightarrow 2NaCl + Br_2$
   single displacement
8. $N_2 + 3H_2 \rightarrow 2NH_3$
   synthesis

Part B · Predict the Products

1. **$2Na + Cl_2 \rightarrow 2NaCl$**
2. **$2H_2O \rightarrow 2H_2 + O_2$**
3. **$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$**
4. **$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$**
5. **$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$**
6. **$CaO + H_2O \rightarrow Ca(OH)_2$**

Part C · Balance and Classify

1. **$4Al + 3O_2 \rightarrow 2Al_2O_3$**
   synthesis
2. **$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$**
   combustion
3. **$2Na + 2H_2O \rightarrow 2NaOH + H_2$**
   single displacement
4. **$2KI + Pb(NO_3)_2 \rightarrow 2KNO_3 + PbI_2$**
   double displacement

Part D · Spot the Error

1. nothing is displaced — one compound simply breaks into two, which is decomposition
   decomposition
2. only one element changes partners. In a double displacement both reactants are compounds and no element appears on its own
   single displacement
3. two reactants become one product, which is the opposite of decomposition
   synthesis

Part E · Challenge

1. • Zn sits above Cu in the series, so it does displace it
   • Cu sits below Zn in the series, so it does not displace it
   • Mg sits above H in the series, so it does displace it
   • Ag sits below H in the series, so it does not displace it
   • (a) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
   • (c) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

   Zn: reaction; Cu: no reaction; Mg: reaction; Ag: no reaction

2. • the products of burning any hydrocarbon are CO_2 and H_2O
   • balance carbon first, then hydrogen, then oxygen last
   • the oxygen comes out as a fraction, so double everything

   $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

3. • H_2O_2 is the only reactant, and it breaks into two products
   • combustion needs oxygen as a reactant burning a fuel; here the oxygen is a product, not a reactant
   • a single reactant breaking apart is decomposition, whatever the products happen to be

   Decomposition — decomposition