CHAPTER 6 Synthesis Reaction Equations

BLM 2-34

Goal • Use this page to practise balancing synthesis reaction equations.

What to Do

1. Balance each equation for a synthesis reaction.

- (a) $K \rightarrow K,O$
- (b) P_4 + Cl_2 \rightarrow PCl_5
- (c) Cu + S_s \rightarrow CuS
- (d) Mg + O_2 \rightarrow MgO
- (e) Fe + O_2 \rightarrow Fe_2O_3
- (g) C + O_2 \rightarrow CO
- (h) N_2 + O_2 \rightarrow NO_2
- $(i) \quad Li \qquad + \qquad N_{_2} \qquad \rightarrow \qquad Li_{_3}N$
- (j) S_8 + O_2 \rightarrow SO_2
- 2. Write a balanced chemical equation to represent each reaction described below.
 - (a) Aluminum metal reacts with oxygen to form aluminum oxide.
 - (b) Metallic zinc combines with sulphur to form zinc sulphide.

Decomposition Reaction Equations

BLM 2-35

Goal • Use this page to practise balancing decomposition reaction equations.

What to Do

1. Balance each equation for a decomposition reaction.

- (a) NaCl \rightarrow Na + Cl₂
- (b) $CaBr_2 \rightarrow Ca + Br_2$
- (c) $CCl_4 \rightarrow Cl_2$
- $\text{(d)} \quad N\text{Cl}_{_3} \quad \rightarrow \qquad \quad N_{_2} \qquad + \qquad \quad \text{Cl}_{_2}$
- (e) $P_4O_{10} \rightarrow P_4 + O_2$
- (f) $Ag_2O \rightarrow Ag + O_2$
- (g) HCl \rightarrow H₂ + Cl₂
- (h) KI \rightarrow K + I_2
- (i) $AlCl_3 \rightarrow Al + Cl_2$
- (j) CuO \rightarrow Cu + O_2
- 2. Write a balanced chemical equation to represent each reaction described below.
 - (a) Rubidium oxide decomposes into its elements.
 - (b) Calcium chloride decomposes into its elements.

CHAPTER 6 Single Replacement Reaction Equations

BLM 2-36

Goal • Use this page to practise balancing single replacement reaction equations.

1. Balance each equation for a single replacement reaction.

- (a) K + H_3PO_4 \rightarrow K_3PO_4 + H_2
- (b) Fe + H_2S \rightarrow Fe_2S_3 + H_2
- (c) Cl_2 + $MgBr_2$ \rightarrow $MgCl_2$ + Br_2
- (d) $Cu + Ag_2CO_3 \rightarrow CuCO_3 + Ag$
- (e) Br_2 + KI \rightarrow I_2 + KBr
- (f) $Mg + Zn_3(PO_4)$, $\rightarrow Mg_3(PO_4)$, + Zn
- (g) K + $Al(NO_3)_3 \rightarrow Al$ + KNO_3
- (h) Ca + H_2O \rightarrow $Ca(OH)_2$ + H_2
- (i) Na + H_2SO_4 \rightarrow Na_2SO_4 + H_2
- (j) K + H_2O \rightarrow KOH + H_2
- 2. Write a balanced chemical equation to represent each reaction described below.
 - (a) Silver reacts with gold(III) nitrate.
 - (b) Copper reacts with lead(II) sulphate.

CHAPTER 6

Double Replacement Reaction Equations

BLM 2-37

Goal • Use this page to practise balancing double replacement reaction equations.

What to Do

1. Balance each equation for a double replacement reaction.

(a)	Na,SO ₄	+	BaCl,	\rightarrow	$BaSO_4$	+	NaCl
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(b)
$$HNO_3$$
 + $Ba(OH)$, \rightarrow H_2O + $Ba(NO_3)$,

(c) Na,CO₃ + Fe(NO₃)₃
$$\rightarrow$$
 Fe₂(CO₃)₃ + NaNO₃

(d)
$$CaCl_2$$
 + K_3PO_4 \rightarrow $Ca_3(PO_4)_2$ + KCl

(e)
$$Al_2(SO_4)_3$$
 + $Ba(OH)_2$ \rightarrow $Al(OH)_3$ + $BaSO_4$

(f) NaOH +
$$H_2SO_4$$
 \rightarrow H_2O + Na_2SO_4

(g)
$$Na_3PO_4$$
 + Ag_2SO_4 \rightarrow Na_2SO_4 + Ag_3PO_4

(h)
$$Na_2CrO_4$$
 + $Cu(NO_3)_2$ \rightarrow $NaNO_3$ + $CuCrO_4$

(i)
$$H_3PO_4$$
 + KOH \rightarrow H_2O + K_3PO_4

(j)
$$Na_2CO_3$$
 + HNO_3 \rightarrow H_2CO_3 + $NaNO_3$

- 2. Write a balanced chemical equation to represent each reaction described below.
 - (a) Solutions of sodium hydroxide and hydrochloric acid react.
 - (b) A silver nitrate solution reacts with a sodium chloride solution.

CHAPTER 6 Combustion Reaction Equations

BLM 2-38

Goal • Use this page to practise balancing combustion reaction equations.

What to Do

1. Balance each equation for a combustion reaction.

- (a) $C_{2}H_{6}$ CO, H,O (b) C_3H_8 Ο, CO, H,O (c) C_6H_{14} Ο, CO, H,OΟ, (d) C_8H_{18} CO, H,O (e) C,H, Ο, CO, H,O
- (f) C_2H_4 + O_2 \rightarrow CO_2 + H_2O
- (h) $C_6H_{12}O_6$ + O_2 \rightarrow CO_2 + H_2O
- (i) CH_4 + O_2 \rightarrow CO_2 + H_2O
- (j) $C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$
- 2. Write a balanced chemical equation to represent each reaction described below.
 - (a) Candle wax, C₂₅H₅₂, is burned to produce carbon dioxide and water.
 - (b) Sucrose, $C_{12}H_{22}O_{11}$, is burned to produce carbon dioxide and water.

Classifying and Balancing Equations

BLM 2-39

Goal • Use this page to practise classifying and balancing reactions.

What to Do

Classify each reaction as a synthesis (S), decomposition (D), single replacement (SR), double replacement (DR), or combustion (C) reaction. Then, balance each equation.

	Reaction	Classification
1.	$\text{Li} + \text{AlCl}_3 \rightarrow \text{Al} + \text{LiCl}$	
2.	$NH_3 \rightarrow N_2 + H_2$	
3.	$K + Br_2 \rightarrow KBr$	
4.	$C_{10}H_{22}$ + O_2 \rightarrow CO_2 + H_2O	
5.	$NH_4OH + H_2CO_3 \rightarrow H_2O + (NH_4)_2CO_3$	
6.	$H_2O \rightarrow H_2 + O_2$	
7.	Al + $Cl_2 \rightarrow AlCl_3$	
8.	$Zn + SnF_4 \rightarrow Sn + ZnF_2$	
9.	$Ni + HCl \rightarrow NiCl_2 + H_2$	
10.	$Au(CN)_3 + Zn \rightarrow Au + Zn(CN)_2$	
11.	O_2 + Be \rightarrow BeO	
12.	$FeCl_3 + Na_2SO_3 \rightarrow NaCl + Fe_2(SO_3)_3$	
13.	C_8H_{18} + O_2 \rightarrow CO_2 + H_2O	
14.	$(NH_4)_2S + Mn(NO_3)_2 \rightarrow NH_4NO_3 + MnS$	
15.	$P_4 + F_2 \rightarrow PF_3$	
16.	$Al_2(SO_4)_3 + Na_3PO_4 \rightarrow Na_2SO_4 + AlPO_4$	
17.	$CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$	
18.	$H_3(PO_4) + Cu(OH)_2 \rightarrow H_2O + Cu_3(PO_4)_2$	

BLM 2-34, Synthesis Reaction Equations

- 1. (a) $4K + O_1 \rightarrow 2K_1O$
 - (b) $P_4 + 10Cl_2 \rightarrow 4PCl_3$
 - (c) $8Cu + S_8 \rightarrow 8CuS$
 - (d) $2Mg + O_2 \rightarrow 2MgO$
 - (e) $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$
 - (f) $4P_4 + 5S_9 \rightarrow 8P_5$
 - (g) $2C + O_2 \rightarrow 2CO$
 - (h) N₂ + 2O₂ \rightarrow 2NO₂
 - (i) 6Li + N, $\rightarrow 2Li$, N
 - (j) $S_8 + 8O_7 \rightarrow 8SO_7$
- 2. (a) $4Al + 3O_2 \rightarrow 2Al_2O_3$
 - (b) $8Zn + S_8 \rightarrow 8ZnS$

BLM 2-35, Decomposition Reaction Equations

- 1. (a) $2\text{NaCl} \rightarrow 2\text{Na} + \text{Cl}_2$
 - (b) CaBr, \rightarrow Ca + Br,
 - (c) $CCl_4 \rightarrow C + 2Cl_7$
 - (d) $2NCl_3 \rightarrow N_2 + 3Cl_2$
 - (e) $P_4O_{10} \rightarrow P_4 + 5O_2$
 - (f) $2Ag_2O \rightarrow 4Ag + O_2$
 - (g) $2HCl \rightarrow H$, + Cl,
 - (h) $2KI \rightarrow 2K + I$,
 - (i) $2AlCl_3 \rightarrow 2Al + 3Cl_3$
 - (j) $2CuO \rightarrow 2Cu + O$,
- 2. (a) $2Rb_2O \rightarrow 2Rb + O_2$
 - (b) $CaCl_2 \rightarrow Ca + Cl_2$

BLM 2-36, Single Replacement Reaction Equations

- 1. (a) $6K + 2H_3PO_4 \rightarrow 2K_3PO_4 + 3H_7$
 - (b) 2Fe + 3H,S \rightarrow Fe,S, + 3H,
 - (c) Cl, + MgBr, \rightarrow MgCl, + Br,
 - (d) $Cu + Ag_{,}CO_{,} \rightarrow CuCO_{,} + 2Ag_{,}$
 - (e) Br, + KI \rightarrow I, + KBr
 - (f) $3Mg + Zn_3(PO_4) \rightarrow Mg_3(PO_4) + 3Zn$
 - (g) $3K + Al(NO_3)_3 \rightarrow Al + 3KNO_3$
 - (h) $Ca + 2H,O \rightarrow Ca(OH), + H,$
 - (i) $2Na + H_1SO_4 \rightarrow Na_1SO_4 + H_1$
 - (j) $K + H,O \rightarrow KOH + H,$
- 2. (a) $3Ag + Au(NO_3)_3 \rightarrow Au + 3AgNO_3$
 - (b) $Cu + PbSO_4 \rightarrow Pb + CuSO_4$

BLM 2-37, Double Replacement Reaction Equations

- 1. (a) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$
 - (b) $2HNO_3 + Ba(OH)_2 \rightarrow 2H_2O + Ba(NO_3)_2$
 - (c) $3\text{Na}_{2}\text{CO}_{3} + 2\text{Fe}(\text{NO}_{3})_{3} \rightarrow \text{Fe}_{2}(\text{CO}_{3})_{3} + 6\text{NaNO}_{3}$
 - (d) $3CaCl_{2} + 2K_{3}PO_{4} \rightarrow Ca_{3}(PO_{4}) + 6KCl$
 - (e) $Al_2(SO_4)_3 + 3Ba(OH)_2 \rightarrow 2Al(OH)_3 + 3BaSO_4$
 - (f) $2\text{NaOH} + \text{H,SO}_4 \rightarrow 2\text{H,O} + \text{Na,SO}_4$
 - (g) $2Na_3PO_4 + 3Ag_3SO_4 \rightarrow 3Na_3SO_4 + 2Ag_3PO_4$
 - (h) Na,CrO₄ + Cu(NO₃), \rightarrow 2NaNO₃ + CuCrO₄

- (i) $H_3PO_4 + 3KOH \rightarrow 3H_3O + K_3PO_4$
- (j) $Na_2CO_3 + 2HNO_3 \rightarrow H_2CO_3 + 2NaNO_3$
- 2. (a) NaOH + HCl \rightarrow H₂O + NaCl
 - (b) $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

BLM 2-38, Combustion Reaction Equations

- 1. (a) $2C_{3}H_{6} + 7O_{7} \rightarrow 4CO_{7} + 6H_{7}O_{7}$
 - (b) $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
 - (c) $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O_3$
 - (d) $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O_3$
 - (e) $2C_{2}H_{2} + 3O_{3} \rightarrow 2CO_{3} + 2H_{3}O_{4}$
 - (f) $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O_3$
 - (g) $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$
 - $(\bar{h}) C_6 H_{12} O_6 + 6 O_2 \rightarrow 6 C O_2 + 6 H_2 O_3$
 - (i) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O_3$
 - (j) $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$
- 2. (a) $C_{25}H_{52} + 38O_2 \rightarrow 25CO_2 + 26H_2O$
 - (b) $2C_{12}H_{22}O_{11} + 24O_2 \rightarrow 24CO_2 + 22H_2O$

BLM 2-39, Classifying and Balancing Chemical Equations

	Reaction	Classification	
1.	3Li + AlCl₃ → Al + 3LiCl	SR	
2.	$2NH_3 \rightarrow 3N_2 + 3H_2$	D	
3.	$2K + Br_2 \rightarrow 2KBr$	S	
4.	$2C_{10}H_{22} + 31O_2 \rightarrow 20CO_2 + 22H_2O$	С	
5.	$2NH_4OH + H_2CO_3 \rightarrow 2H_2O + (NH_4)_2CO_3$	DR	
6.	$2H_2O \rightarrow 2H_2 + O_2$	D	
7.	$2AI + 3CI_2 \rightarrow 2AICI_3$	S	
8.	$2Zn + SnF_4 \rightarrow Sn + 2ZnF_2$	SR	
9.	$Ni + 2HCl \rightarrow NiCl_2 + H_2$	SR	
10.	$2Au(CN)_3 + 3Zn \rightarrow 2Au + 3Zn(CN)_2$	SR	
11.	$O2 + 2Be \rightarrow 2BeO$	S	
12.	$2\text{FeCl}_3 + 3\text{Na}_2\text{SO}_3 \rightarrow 6\text{NaCl} + \text{Fe}_2(\text{SO}_3)_3$	DR	
13.	$2C_8H_{18} + 25O2 \rightarrow 16CO_2 + 18 H_2O$	С	
14.	$(NH_4)_2S + Mn(NO_3)_2 \rightarrow 2NH_4NO_3 + MnS$	DR	
15.	$P4 + 6F2 \rightarrow 4PF3$	S	
16.	$Al_2(SO_4)_3 + 2Na_3PO_4 \rightarrow 3Na_2SO_4 + 2AlPO_4$	DR	
17.	$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$	О	
18.	$2H_3(PO_4) + 3Cu(OH)_2 \rightarrow 6H_2O + Cu_3(PO_4)_2$	DR	