

Balancing Chemical Equations

Chapter 11

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Objectives

- Balance chemical equations
- Write and balance chemical equations using word sentence.
- VA SOLs: 3a, 3b

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Vocab to know:

- Reactants
- Products
- Catalyst
- Skeleton eqn
- Balanced eqn
- Coefficients
- Chemical eqn

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Symbols

- An arrow separates reactants from products
 - Read as “reacts to form” or “yields”
- “And” = +
- Solid = (s) after formula AgCl (s)
- Liquid = (l) after formula H₂O (l)
- Gas = (g) CO₂ (g)
- Aqueous (dissolved in H₂O) = (aq) NaCl (aq)

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Symbols (cont)

- \leftrightarrow = reversible rxn (also seen as \rightleftharpoons)
- $\xrightarrow{\Delta}$, $\xrightarrow{\text{heat}}$ heat supplied to rxn
- $\xrightarrow{\text{Pt}}$ indicates catalyst used
 - Catalyst = substance that speeds up rxn without being changed or used up

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Balancing Eqns

- Balanced eqns have same number of each element on BOTH sides of eqn
- Use Law of Conservation of Mass
 - Atoms/mass cannot be created or destroyed
 - Must end up with all the atoms you started with

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Balancing Eqns (cont)

- Always use lowest whole-number ratios
 - $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ **NOT** $4\text{H}_2 + 2\text{O}_2 \rightarrow 4\text{H}_2\text{O}$

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NEVER

- NEVER change subscript to balance
 - Changing formula creates a different rxn
 - H_2O is completely different from H_2O_2
- NEVER put coefficient in middle of cmpd
 - 2NaCl OK $\text{Na}2\text{Cl}$ NOT OK

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Practice

- Balance these eqns:
 - $__\text{P} + __\text{O}_2 \rightarrow __\text{P}_4\text{O}_{10}$
 - $4\text{P} + 5\text{O}_2 \rightarrow \text{P}_4\text{O}_{10}$
 - $__\text{Mg} + __\text{N}_2 \rightarrow __\text{Mg}_3\text{N}_2$
 - $3\text{Mg} + \text{N}_2 \rightarrow \text{Mg}_3\text{N}_2$
 - $__\text{Al}(\text{s}) + __\text{O}_2(\text{g}) \rightarrow __\text{Al}_2\text{O}_3(\text{s})$
 - $4\text{Al}(\text{s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{Al}_2\text{O}_3(\text{s})$

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More Practice

- $_\text{AgNO}_3 + _\text{Cu} \rightarrow _\text{Ag} + _\text{Cu(NO}_3)_2$
- $_\text{Na} + _\text{H(OH)} \rightarrow _\text{H}_2 + _\text{NaOH}$
- $_\text{CH}_4 + _\text{O}_2 \rightarrow _\text{CO}_2 + _\text{H}_2\text{O}$
- $_\text{NaOH} + _\text{Fe(NO}_3)_3 \rightarrow _\text{Fe(OH)}_3 + _\text{NaNO}_3$
- $_\text{HgO} \rightarrow _\text{Hg} + _\text{O}_2$

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More Practice

- $2\text{AgNO}_3 + \text{Cu} \rightarrow 2\text{Ag} + \text{Cu(NO}_3)_2$
- $2\text{Na} + 2\text{H}_2\text{O} \rightarrow \text{H}_2 + 2\text{NaOH}$
- $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- $3\text{NaOH} + \text{Fe(NO}_3)_3 \rightarrow \text{Fe(OH)}_3 + 3\text{NaNO}_3$
- $2\text{HgO} \rightarrow 2\text{Hg} + \text{O}_2$

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Word Problems

- Write formulas then balance.
- Aluminum reacts with oxygen to produce aluminum oxide.
- $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$
- Solid copper reacts with aqueous silver nitrate to produce solid silver and aqueous copper (II) nitrate
- $\text{Cu (s)} + 2\text{AgNO}_3 (\text{aq}) \rightarrow \text{Cu(NO}_3)_2 (\text{aq}) + 2\text{Ag (s)}$

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