

SNC2D CHEMISTRY

CHEMICAL REACTIONS

☛ Chemical Reactions
(P.174-175)

Chemical Reactions

Chemical reactions may involve sophisticated chemicals, as in the explosive reaction of dynamite, or simple household materials, as in the reaction of a bathroom cleaner with a stain. They may occur constantly, as in the growth of your body, or occasionally, as in the changing colour of leaves in the fall.



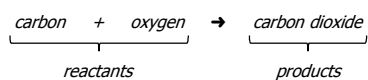
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Chemical Reactions


In a **chemical reaction**, one or more substances change to produce new substances. Each starting substance in the reaction is called a **reactant**; each new substance formed is called a **product**. Because there are so many chemical reactions, it is important to have a clear and consistent way of describing them. For example,



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 **Chemical Reactions**

For convenience, chemists use two types of equations to describe chemical reactions. In a **word equation**, names are used to represent each chemical. In a **chemical equation**, chemical formulas are used to represent each chemical. For example, when carbon (C) burns, it reacts with oxygen (O₂) to form carbon dioxide (CO₂). The equations for this reaction are:

word equation: carbon + oxygen → carbon dioxide

chemical equation: C_(s) + O_{2(g)} → CO_{2(g)}

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 **Chemical Reactions**


NOTE!

- word and chemical equations are always read from left to right, with the reactants located on the left and the products on the right
- the arrow describes the direction of the reaction and is read "produces"
- a plus sign between chemical symbols is read as "and"

word equation: carbon + oxygen → carbon dioxide

chemical equation: C_(s) + O_{2(g)} → CO_{2(g)}

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 **Chemical Reactions**

NOTE!

- the state of each substance is indicated by placing the appropriate symbol in brackets after the formula – (s) for solid, (l) for liquid, (g) for gas, and (aq) for solutions

word equation: carbon + oxygen → carbon dioxide

chemical equation: C_(s) + O_{2(g)} → CO_{2(g)}

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Chemical Reactions

For example, when pop is bottled, pressurized carbon dioxide is pumped into the pop. Some carbon dioxide reacts with water to produce carbonic acid. The (aq) state symbol tells you that carbonic acid is dissolved in water. Dissolved acids give pop its tart taste.

word equation: carbon dioxide + water → carbonic acid

chemical equation: $\text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{CO}_3(\text{aq})$

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Chemical Reactions

And when you open a bottle of pop, you release the pressure inside the bottle. This causes some carbonic acid molecules to break apart, releasing bubbles of carbon dioxide. The chemical reaction for this is the reverse of the one just discussed.

word equation: carbonic acid → carbon dioxide + water

chemical equation: $\text{H}_2\text{CO}_3(\text{aq}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

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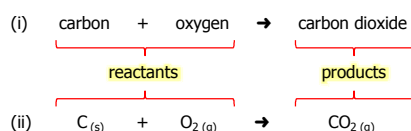
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Chemical Reactions

CHEMICAL REACTION


- ❖ process in which substances (i.e. reactants) interact to produce new substances (i.e. products) with new properties
- ❖ can be described using (i) a word equation or (ii) a chemical equation
- ❖ letter in brackets after chemical formula indicates the state
- ❖ for example,



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 **Chemical Reactions**

PRACTICE


1. Examine the following word equation:

propane + oxygen → carbon dioxide + water

(a) Name the reactant(s) in this reaction.
 (b) Name the product(s) in this reaction.
 (c) What is the purpose of the arrow in the word equation?

(a) propane & oxygen
 (b) carbon dioxide & water
 (c) it points from the reactants to the products

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 **Chemical Reactions**

PRACTICE

2. What information is provided in a chemical equation that is not provided in a word equation?

state symbols – (s) for solid, (l) for liquid, (g) for gas, (aq) for solution

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 **Chemical Reactions**


PRACTICE

3. Write word equations to represent the following chemical reactions:

(a) Aluminum resists corrosion because it reacts with a gas found in air to form a protective coating of aluminum oxide.

(a) aluminum + oxygen → aluminum oxide

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 **Chemical Reactions**


PRACTICE

3. Write word equations to represent the following chemical reactions:

(b) When aluminum foil is placed in a solution of copper(II) chloride, copper metal and another solution are formed.

(b) aluminum + copper(II) chloride → copper + aluminum chloride

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 **Chemical Reactions**


PRACTICE

3. Write word equations to represent the following chemical reactions:

(c) When sodium sulphate and calcium chloride solutions are mixed, a precipitate of calcium sulphate and another substance is formed.

(c) sodium sulphate + calcium chloride
→ calcium sulphate + sodium chloride

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 **Chemical Reactions**

RECALL!

Before we go much further you need to remember that some elements are made up of molecules that consist of a pair of atoms. These diatomic molecules were referred to as the "**magnificent seven**" since they form the shape of the number 7 in the periodic table.

Element	Formula
bromine	Br ₂
chlorine	Cl ₂
fluorine	F ₂
hydrogen	H ₂
iodine	I ₂
nitrogen	N ₂
oxygen	O ₂

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Check Your Learning

1. The following reaction shows how calcium carbonate (CaCO_3) is used to make calcium oxide, an important ingredient in cement:



- (a) Name the reactant(s) and the product(s).
 (b) Write the word equation for this reaction.
 (c) Name the gaseous product.

- (a) Rs = calcium carbonate Ps = calcium oxide & carbon dioxide
 (b) calcium carbonate \rightarrow calcium oxide + carbon dioxide
 (c) carbon dioxide

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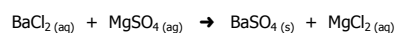
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Check Your Learning

2. Consider this reaction:



- (a) Name the reactant(s) and the product(s).
 (b) Compare the states of the four chemicals.
 (c) Name the product that remains dissolved in water.

- (a) Rs = barium chloride & magnesium sulfate
 Ps = barium sulfate & magnesium chloride
 (b) three are in solution, one is a solid
 (c) magnesium chloride

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Check Your Learning

3. Write the word equations for the following reactions:


- (a) CaCl_2 and Na_2SO_4 react to form CaSO_4 and NaCl .

- (a) calcium chloride + sodium sulphate
 \rightarrow calcium sulphate + sodium chloride

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 **Check Your Learning**

3. Write the word equations for the following reactions:
 (b) BaCO_3 reacts when heated to produce BaO and CO_2 .

(b) barium carbonate \rightarrow barium oxide + carbon dioxide


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 **Check Your Learning**

3. Write the word equations for the following reactions:
 (c) AgNO_3 reacts with KCl to produce AgCl and KNO_3 .

(c) silver nitrate + potassium chloride
 \rightarrow silver chloride + potassium nitrate


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 **Check Your Learning**


4. When a coil of copper is dipped in silver nitrate solution, a furry deposit of silver metal forms on the coil. The solution also turns blue as a copper (II) nitrate solution forms. Write the word and chemical equation for this reaction.

copper + silver nitrate
 \rightarrow silver + copper (II) nitrate

$\text{Cu} + \text{AgNO}_3 \rightarrow \text{Ag} + \text{Cu}(\text{NO}_3)_2$



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 ✓ Check Your Learning

TEXTBOOK
P.175 Q.1,2,5
P.241 Read "The Bombardier Beetle"; Answer Q.1

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