

Activity 21: Chemical Reactions

Learning Objectives

Part 1 Distinguish synthesis, decomposition, and exchange reactions.

Part 2 Identify the substance being oxidized and reduced in both inorganic and organic redox reactions.

Estimated Completion Time 30 Minutes

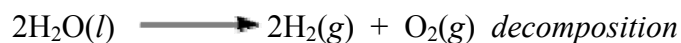
Instructor Information

Basic information on reaction types as described in Anatomy and Physiology and some General Biology texts. This activity should assist in connecting the courses.

ANSWERS TO QUESTIONS

Part 1. Types of Chemical Reactions

1.



2. Synthesis is the opposite of a decomposition (make vs. breakdown).

3. $\text{AB} \longrightarrow \text{A} + \text{B}$

4. In a double exchange, both compounds exchange and element, in a single exchange, one element is exchanged.

5. Single exchange: $AB + C \longrightarrow CB + A$
 Double exchange: $AB + CD \longrightarrow AD + CB$
(This assumes that A and C are metal elements and that B and D are nonmetals.)

6. a. synthesis b. decomposition c. exchange

Activity 21: Skill Development—Types of Chemical Reactions

1. a. exchange b. decomposition c. synthesis
 2. a. synthesis b. decomposition c. exchange

Part 2. Oxidation and Reduction

1.

Substance	Charge
Fe(s)	0
O ₂ (g)	0
Iron ion in Fe ₂ O ₃ (s)	3+
Oxide in Fe ₂ O ₃ (s)	2-

2.

Substance	Did Reactant Gain or Lose Electrons to Form Product?	Oxidation or Reduction?
Fe(s) forms iron ion	Lose	Oxidation
O ₂ (g) forms oxide	Gain	Reduction

3.

Substance	Did the Reactant Gain O (or Lose H) or Gain H (Lose O) to Form Product?	Oxidation or Reduction?
CH ₃ CH ₂ OH	Lose H	Oxidation
NAD ⁺	Gain H	Reduction

4.

Substance	Oxidation or Reduction?
D-Glucose forming D-gluconic acid	Oxidation
Cu^{2+} forming Cu_2O	Reduction

Activity 21: Skill Development—Oxidation and Reduction

1.

Reaction	Oxidation	Reduction
Formation of Salt: $2 \text{Na}(s) + \text{Cl}_2(g) \longrightarrow 2 \text{NaCl}(s)$	Sodium metal (lost electrons)	Chlorine (gained electrons)
Burning of Coal: $\text{C}(s) + \text{O}_2(g) \longrightarrow \text{CO}_2(g)$	Carbon (oxygen is added to carbon)	Oxygen (always being reduced when reacted as O_2)
Complete Combustion of Glucose: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \longrightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$ D-glucose	D-glucose (hydrogen was lost from C)	O_2 (hydrogen added to water)
Reaction 8 of Citric Acid Cycle:	Malate (H removed from C2)	NAD^+ (H was added)

2. a. Reduction