**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.

|  |
| --- |
| HCl(*aq*) + NaOH(*aq*) irreversible arrow NaCl(*aq*) + H2O(*l*) *exchange* |
| H2(*g*) + Br2(*g*) irreversible arrow2HBr(*g*) *synthesis* |
| Br2(*g*) + BaI2(*s*) irreversible arrowBaBr2(*s*) + I2(*g*) *exchange* |
| 2H2O(*l*) irreversible arrow2H2(*g*) + O2(*g*) *decomposition* |

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

3. ABirreversible arrowA + B

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

5. Single exchange: AB + C irreversible arrow**CB + A**

Double exchange: AB + CD irreversible arrow**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** |
| O2(*g*) | **0** |
| Iron ion in Fe2O3(*s*) | **3+** |
| Oxide in Fe2O3(*s*) | **2-** |

2.

|  |  |  |
| --- | --- | --- |
| **Substance** | **Did Reactant Gain or Lose Electrons to Form Product?** | **Oxidation or Reduction?** |
| Fe(*s*) forms iron ion | **Lose** | **Oxidation** |
| O2(*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?** |
| CH3CH2OH | **Lose H** | **Oxidation** |
| NAD+ | **Gain H** | **Reduction** |

4.

|  |  |
| --- | --- |
| **Substance** | **Oxidation or Reduction?** |
| D-Glucose forming D-gluconic acid | **Oxidation** |
| Cu2+ forming Cu2O | **Reduction** |

**Activity 21: Skill Development—Oxidation and Reduction**

1.

|  |  |  |
| --- | --- | --- |
| **Reaction** | **Oxidation** | **Reduction** |
| Formation of Salt: | **Sodium metal**  **(lost electrons)** | **Chlorine**  **(gained electrons)** |
| Burning of Coal: | **Carbon**  **(oxygen is added to carbon)** | **Oxygen**  **(always being reduced when reacted as O2)** |
| Complete Combustion of Glucose: | **D-glucose**  **(hydrogen was lost from C)** | **O2**  **(hydrogen added to water)** |
| Reaction 8 of Citric Acid Cycle: | **Malate**  **(H removed from C2)** | **NAD+**  **(H was added)** |

2. a. Reduction