Redox Challenge

Name: _____ **Period:** _____ **Date:** _____

> Open **peebedu.com** and navigate to **Redox Challenge**. Click **Launch Interactive** to begin. The simulation presents the OIL RIG mnemonic: **Oxidation Is Loss** of electrons, **Reduction Is Gain** of electrons. You will progress through 8 redox reactions in photosynthesis and cellular respiration, choosing whether each molecule is oxidized or reduced. Hover over each molecule to see where the reaction occurs in the cell.

Free Response Questions

Question 1 — Conceptual Analysis

> **Simulation Task:** *In the Redox Challenge, progress through all 8 reactions. For each reaction, note whether the molecule is oxidized or reduced and the cellular location shown in the tooltip. Pay particular attention to Reaction 1 ($H_2O \rightarrow O_2$) and Reaction 8 ($O_2 \rightarrow H_2O$) and the role each plays in its respective pathway.*

(A) (1 pt) **Describe** the initial source of electrons for the light-dependent reactions and the final molecule that accepts those electrons.

(B) (1 pt) **Explain** why the Calvin cycle cannot produce sugars when the light-dependent reactions are not operating, even though the Calvin cycle itself does not directly require light.

(C) (1 pt) **Predict** what would happen to the oxygen available for aerobic consumers in a pond ecosystem if a pollutant blocked the water-splitting reaction in the photosynthetic organisms living in that pond.

(D) (1 pt) **Justify** your prediction.

Question 2 — Analyze Model / Visual Representation

> **Simulation Task:** *In the Redox Challenge, complete Reactions 5 through 8 and use the hover tooltips to identify the cellular location of each reaction. Note the progression from cytoplasm to mitochondrial matrix to inner mitochondrial membrane.*

(A) (1 pt) **Describe** the molecule that serves as the initial electron donor and the molecule that serves as the final electron acceptor in cellular respiration.

(B) (1 pt) **Explain** why glucose, a molecule with high potential energy, is oxidized through a series of many sequential reactions rather than in a single step.

(C) (1 pt) **Represent** the path of electrons through cellular respiration by drawing a diagram of a cell showing the cytoplasm and a mitochondrion, with arrows tracing electron flow from glucose through each stage to the final electron acceptor and labels for the key electron carriers.

Draw your diagram here.

(D) (1 pt) **Explain** why the electrons that a consumer's mitochondria use to generate ATP can be traced back to the sun.

3.5.A.3