

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Open [peedu.com](https://www.peedu.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.

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**(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.

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**(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.

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

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## 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.

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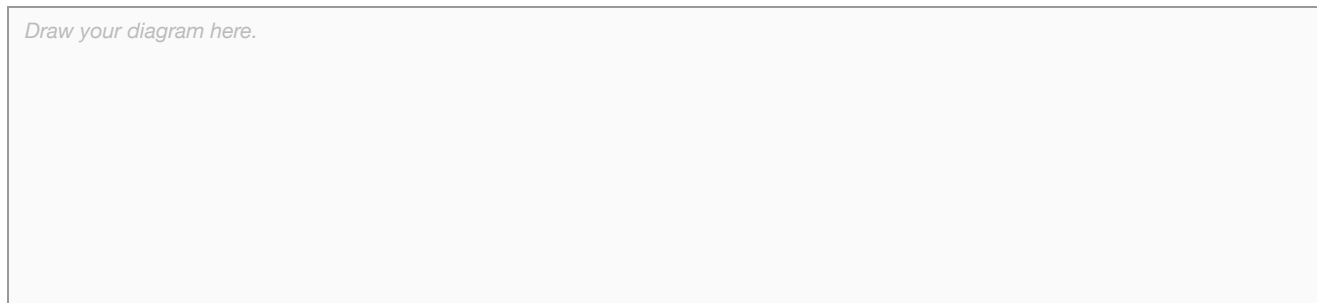
**(B)** (1 pt) **Explain** why glucose, a molecule with high potential energy, is oxidized through a series of many sequential reactions rather than in a single step.

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**(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.

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3.5.A.3