

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

Open [peebedu.com](http://peebedu.com) and navigate to **Yeast Respiration Lab**. Read the introduction screen, which describes three yeast strains and explains how you will explore the switch between aerobic respiration and alcohol fermentation. Click **Begin Experiment** to enter the workspace.

## Free Response Questions

### Question 1 – Conceptual Analysis

**Simulation Task:** Select **Glucose** as your substrate and observe the rate graph for about 10 seconds with the vessel open. Then click the **Vessel Sealed** button and watch the O<sub>2</sub> Level meter, the rate graph, and the Ethanol Produced counter as oxygen depletes. Note the moment when the equation display switches from aerobic respiration to alcohol fermentation.

**(A)** (1 pt) **Describe** the products that yeast cells generate from glucose when oxygen is unavailable.

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**(B)** (1 pt) **Explain** why yeast cells continue to break down glucose and produce small amounts of ATP after oxygen has been completely depleted from their environment.

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**(C)** (1 pt) **Predict** what would happen to a yeast cell's ATP production if a mutation blocked the conversion of pyruvate to ethanol while the cell remained in an environment with no oxygen.

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

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## Question 2 — Analyze Model / Visual Representation

**Simulation Task:** Click **Reset Experiment**, then select **Glucose** and let the simulation run for 15 seconds with the vessel **open**. Observe the three lines on the rate graph. Then click **Vessel Sealed** and watch until the O<sub>2</sub> Level drops below 15% and the fermentation line appears. After 15 more seconds, click **Vessel Open** again and observe how the rate lines change as oxygen returns. Note the overall pattern on the graph.

**(A)** (1 pt) **Describe** how the metabolic pathway used by yeast cells changes when oxygen is removed from their environment and then restored.

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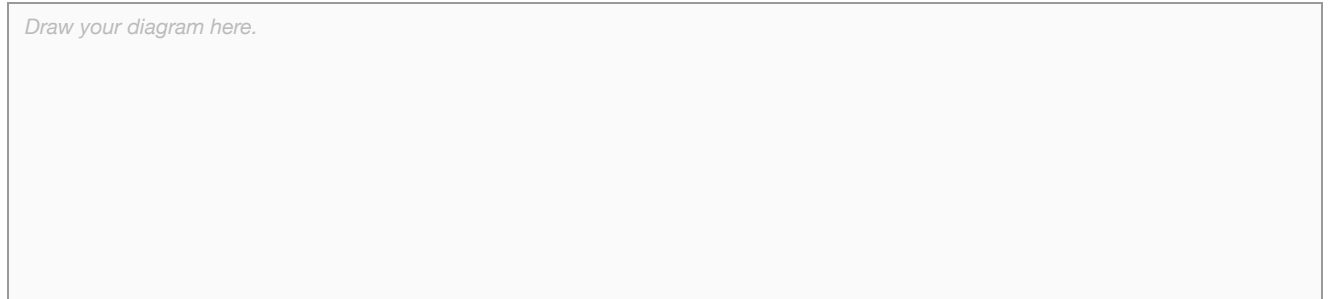
**(B)** (1 pt) **Explain** why yeast cells produce approximately 30-32 ATP per glucose in the presence of oxygen but only 2 ATP per glucose in the absence of oxygen.

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**(C)** (1 pt) **Represent** the branch point at pyruvate by drawing a labeled diagram that shows glucose entering glycolysis, pyruvate as the intermediate, and two diverging pathways -- one aerobic and one anaerobic -- with their respective products and approximate ATP yields.

*Draw your diagram here.*



**(D)** (1 pt) **Explain** how variation in fermentation efficiency among individual yeast cells could affect which individuals survive and reproduce in environments where oxygen availability fluctuates.

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