

Name: _____ Period: _____ Date: _____

Open **peebedu.com** and navigate to **ATP Cycle**. This is a fast-paced game where you interpret prompts and decide whether each cellular scenario requires the **phosphorylation of ADP** (storing energy) or the **hydrolysis of ATP** (releasing energy). Read the instructions carefully before you begin.

Free Response Questions

Question 1 — Conceptual Analysis

Simulation Task: Play the ATP Cycle game through at least two full rounds. For each prompt, note whether the correct answer is ATP hydrolysis (energy release) or ADP phosphorylation (energy storage). Keep a tally of how many cellular processes require hydrolysis versus phosphorylation.

(A) (1 pt) **Describe** how the molecule that cells use as their primary energy currency is recycled between its high-energy and low-energy forms.

(B) (1 pt) **Explain** why a cell that increases the amount of cellular work it performs must also increase the rate at which ADP is phosphorylated back to ATP.

(C) (1 pt) **Predict** what would happen to a cell's ability to carry out energy-requiring processes if a toxin prevented the regeneration of ATP from ADP while ATP hydrolysis continued.

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

Question 2 — Analyze Model / Visual Representation

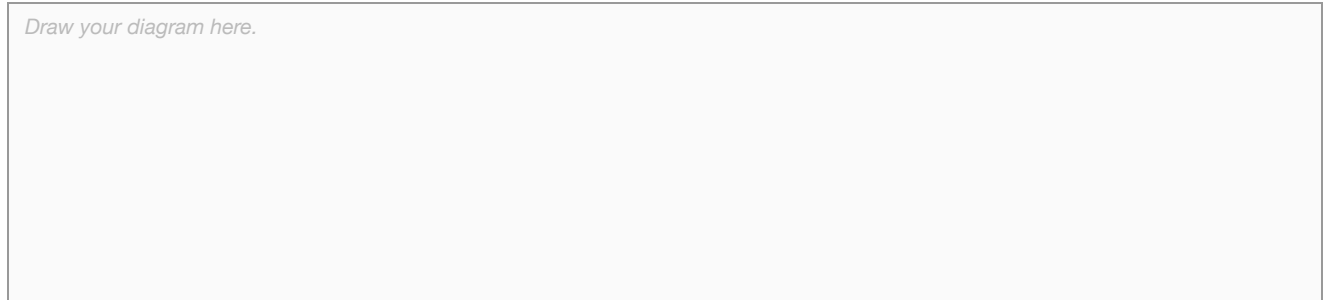
Simulation Task: During the game, identify three different cellular processes that appear as prompts. For each, record whether the process requires ATP hydrolysis or ADP phosphorylation and note the type of cellular work involved (e.g., mechanical, transport, chemical).

(A) (1 pt) **Describe** the types of cellular work that depend on the energy transferred by ATP hydrolysis.

(B) (1 pt) **Explain** why the ATP cycle is found in organisms across all three domains of life -- Bacteria, Archaea, and Eukarya.

(C) (1 pt) **Represent** the ATP/ADP cycle by drawing a labeled circular diagram that shows ATP hydrolysis releasing energy for cellular work and ADP phosphorylation using energy from an energy-releasing reaction to regenerate ATP.

Draw your diagram here.



(D) (1 pt) **Explain** how a cell that could no longer regenerate ATP would lose the ability to maintain the solute concentration gradients that active transport establishes across its plasma membrane.

3.3.A.1, 3.3.B.1