

Name: _____ Period: _____ Date: _____

Open [peebedu.com](https://www.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 cells that are actively performing work, such as muscle contraction and membrane transport, consume and regenerate their entire supply of ATP within minutes.

(C) (1 pt) **Predict** what would happen to a bacterial cell's ability to maintain its membrane ion gradients 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

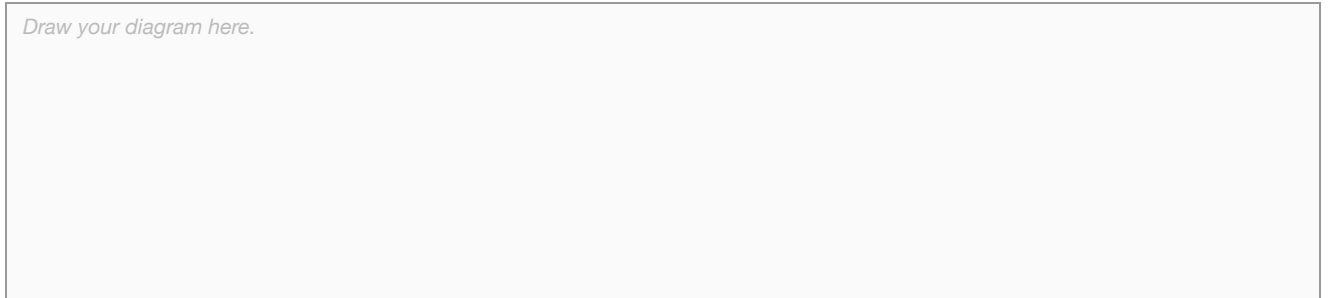
Simulation Task: During the game, identify three different cellular processes that appear as prompts. For each, record whether the process requires ATP hydrolysis or ADP phosphorylation and note the type of cellular work involved (e.g., mechanical, transport, chemical).

(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 decrease in the availability of organic molecules at the base of a food web could affect ATP-dependent processes in a tertiary consumer.

3.3.A.2, EK 3.3.B.1