

Name: _____ Period: _____ Date: _____

Open peebedu.com and navigate to **Endosymbiotic Theory Interactive**. Click the **Launch Interactive** button to begin. In Level 0, observe the different prokaryotes and their metabolic inputs and outputs. Click on the prokaryote that consumes glucose and O₂ to produce ATP. Progress through the educational slides and quizzes, then continue through all four levels by following the on-screen instructions.

Free Response Questions

Question 1 – Conceptual Analysis

Simulation Task: Complete Level 0 by clicking on the aerobic prokaryote (the one that consumes glucose and O₂ to produce ATP). Observe the phagocytosis animation in Level 1 as your cell engulfs the prokaryote. After engulfment, read the "Evidence for Endosymbiotic Theory" list that appears on the info screen.

(A) (1 pt) **Describe** the structural features of mitochondria that are similar to features found in free-living prokaryotic cells.

(B) (1 pt) **Explain** why the double membrane of mitochondria is considered evidence that these organelles originated through engulfment by a host cell rather than being assembled by the host cell's own endomembrane system.

(C) (1 pt) **Predict** how a eukaryotic cell's ATP production would be affected over successive cell divisions if a mutation prevented its mitochondria from replicating their own DNA.

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

Question 2 — Analyze Model / Visual Representation

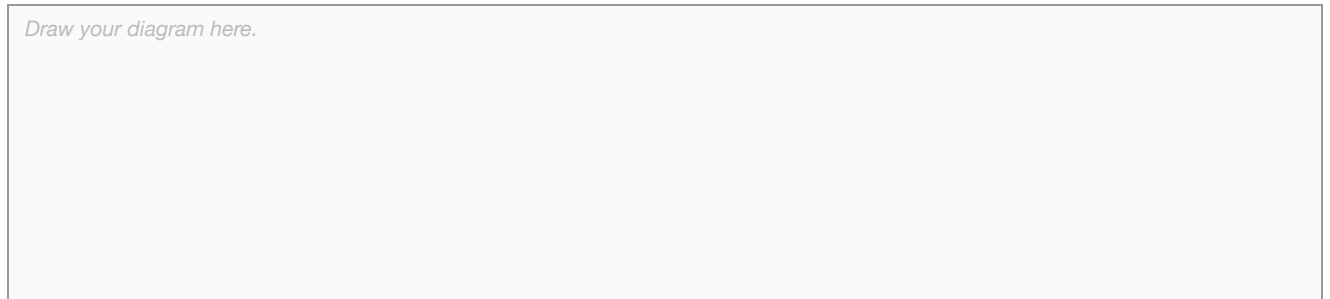
Simulation Task: *In Level 0, observe how the prokaryotes (aerobic bacteria, anaerobic bacteria) perform their metabolic reactions without internal membrane-bound organelles. Then advance to Level 4, where your eukaryotic cell contains both mitochondria and chloroplasts. Observe how molecules are transported between these compartments along intracellular pathways.*

(A) (1 pt) **Describe** the difference in where metabolic reactions occur in a prokaryotic cell compared to a eukaryotic cell that contains mitochondria and chloroplasts.

(B) (1 pt) **Explain** why the eukaryotic cell in the simulation can carry out both aerobic respiration and photosynthesis simultaneously, while the individual prokaryotes observed earlier each perform only one of these processes.

(C) (1 pt) **Represent** the structural differences between a prokaryotic cell and a eukaryotic cell that resulted from endosymbiosis by drawing two labeled diagrams: one prokaryotic cell without membrane-bound organelles and one eukaryotic cell with double-membraned mitochondria and chloroplasts, labeling the structures that serve as evidence for endosymbiotic theory.

Draw your diagram here.



(D) (1 pt) **Explain** how a host cell that engulfed an aerobic prokaryote could have gained a competitive advantage over host cells that did not.

2.10.A.1, 2.10.A.2, 2.10.A.3