

Biology Lab Activities: Cellular Respiration

How to use this manual

This lab manual is intended for use with the [Visible Biology](#) product.

Where to find 3D models

Units

Flashcard Decks

Flashcards

Quizzes

Study

Lab Activities

My Library

Lab activities that correspond to the following views are available as PDFs.

Get Labs

Prokaryotic and Eukaryotic Cells Lab

1. Bacterial Cell

2. Animal Cell

3. Plant Cell

Under the Study section of Visible Biology, there is a Lab Activities tab.

Select "Get Labs" to download the lab activities.

Find the row of 3D views that corresponds to each lab manual and use the views to investigate and find answers.

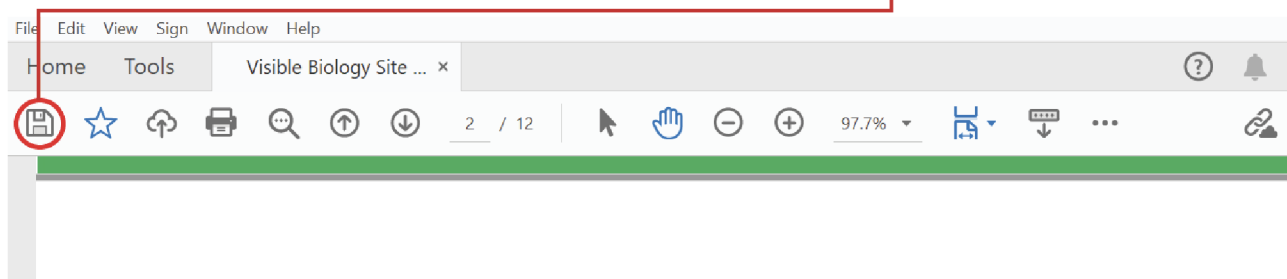
How to save answers

1. Have Adobe Reader installed on your computer.
Windows: <https://get.adobe.com/reader/>
Mac: <https://helpx.adobe.com/acrobat/kb/install-reader-dc-mac-os.html>

2. Download each lab file to your computer.



3. Open the downloaded file in Adobe Reader.
Right-click on the file. In the menu that appears, go to "Open with..." and select Adobe Reader from the submenu.
4. Type your answers into the boxes to complete the lab and select the "Save" icon to save the lab.



5. Submit your saved version of the lab to your instructor via email, dropbox, Google Drive, or however your instructor has requested.

Any questions? visiblebiology.com

Name:

Date:

Biology Lab Activities: Cellular Respiration

Background Questions

Based on what you've learned in class, in your textbook, and from using Visible Biology, answer the following questions about cellular respiration.

1. Fill in the blanks in the cellular respiration equation: $C_6H_{12}O_6 + 6 \underline{\hspace{1cm}} \rightarrow 6 CO_2 + 6 \underline{\hspace{1cm}}$ + up to 38 molecules of $\underline{\hspace{1cm}}$.
2. What are the reactants involved in cellular respiration?
3. What are the products of cellular respiration?
4. Cellular respiration consists of four main phases. Complete the following sentences about these phases and where they take place.
 - a. $\underline{\hspace{1cm}}$ takes place in the cytosol.
 - b. Pyruvate oxidation takes place in the $\underline{\hspace{1cm}}$.
 - c. The $\underline{\hspace{1cm}}$ cycle takes place in the mitochondrial matrix.
 - d. Oxidative phosphorylation takes place in the $\underline{\hspace{2cm}}$.
5. In 2–3 sentences, explain why cellular respiration is important for a eukaryote's survival.

Name:

Date:

Lab 1: Mitochondria Structures, Reactants, and Products of Cellular Respiration

Activity 1: Label a mitochondrion

1. Launch the view
 - Launch Visible Biology.
 - Navigate to Study/Lab Activities, and find the Cellular Respiration Lab section.
 - Select view 1. Mitochondrion (Cellular Respiration).
2. Label the image below
 - Explore the 3D model of the mitochondrion going through cellular respiration to find the structures you need to label.
 - Fill in the blanks to label the structures from the list below.

Part A: Label the mitochondria structures

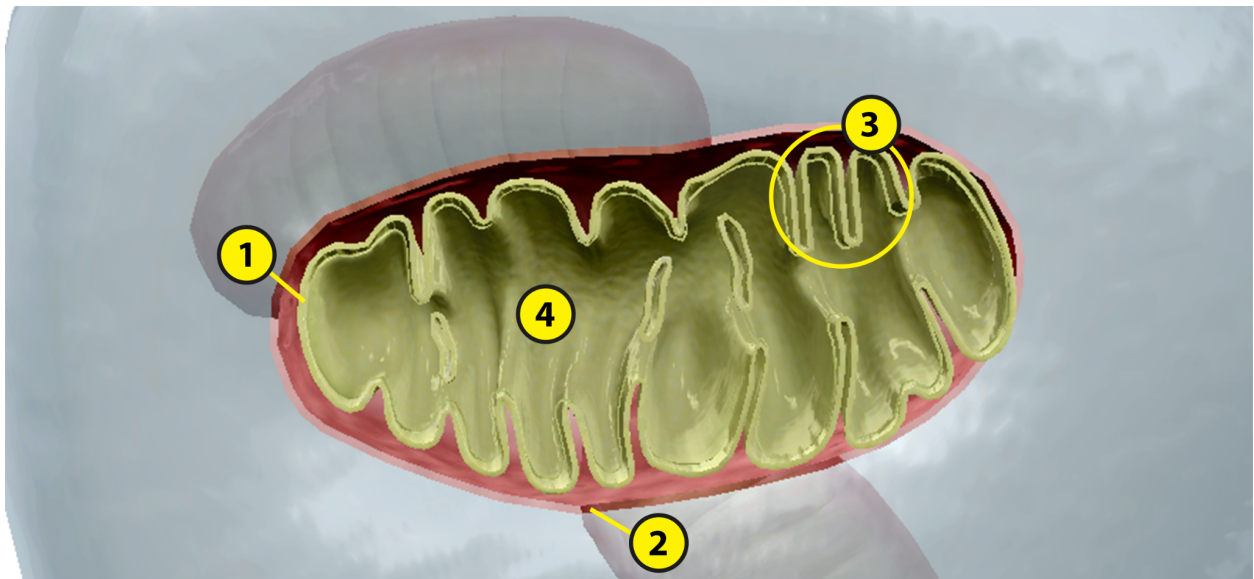
Word List:

Cristae

Inner membrane

Matrix

Outer membrane



Part B: Label the reactants and products of glycolysis

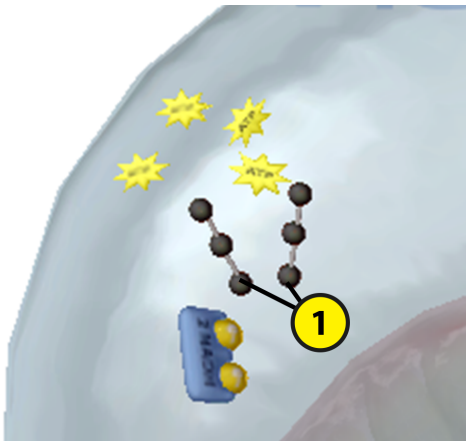
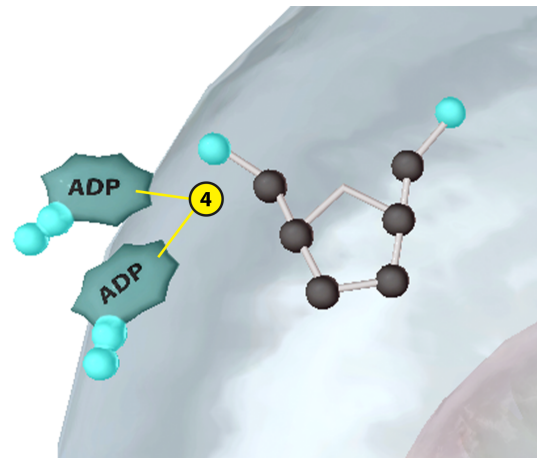
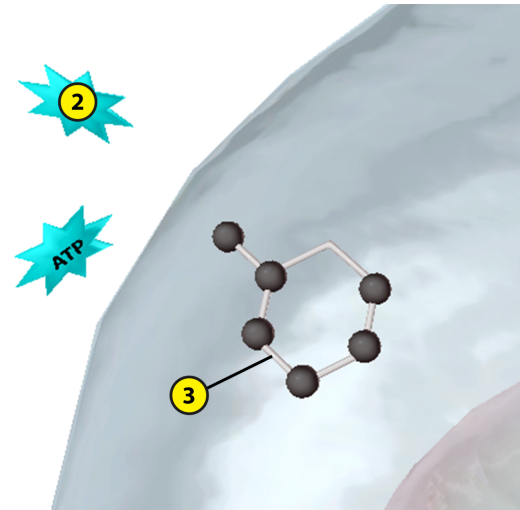
Word List:

ATP

ADP

Glucose ($C_6H_{12}O_6$) molecule

Pyruvates



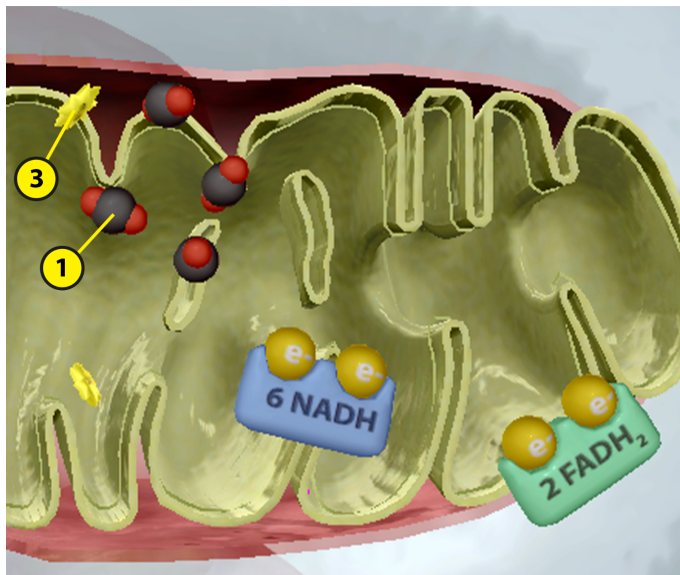
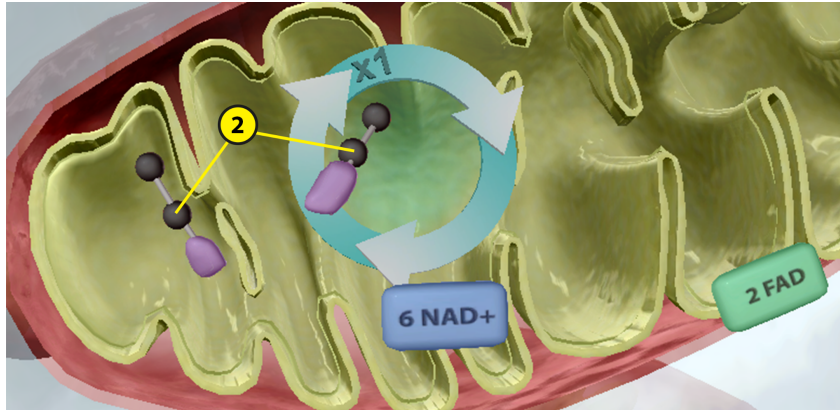
Part C: Label the reactants and products of pyruvate oxidation and the citric acid cycle

Word List:

Acetyl-CoA

ATP

Carbon dioxide (CO_2) molecules



Part D: Label the reactants and products of oxidative phosphorylation

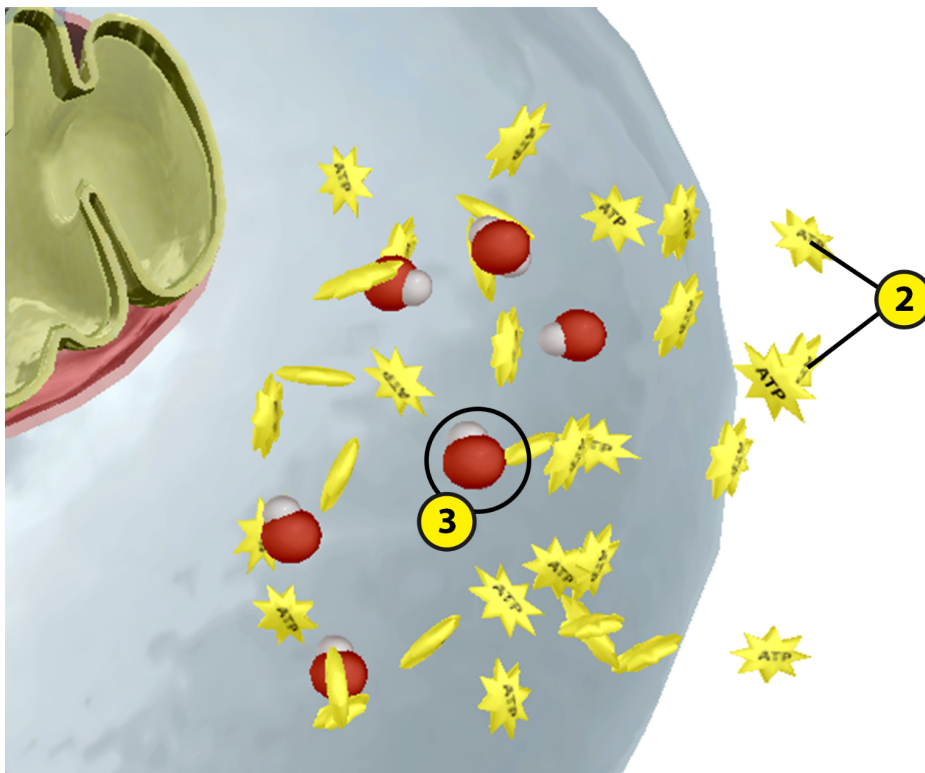
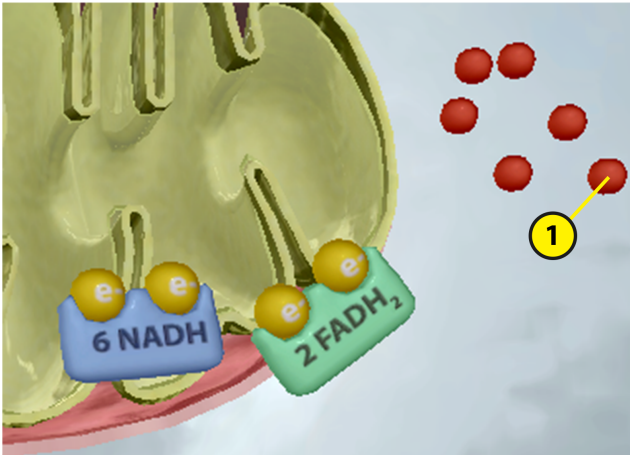
Word List:

ATP

Oxygen (O₂) molecules

Water (H₂O) molecules

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—
—



Name:

Date:

Lab 1: Mitochondria Structures, Reactants, and Products of Cellular Respiration

Activity 2: Explore the roles mitochondria structures play in cellular respiration

Refer to your labeled mitochondrion model from Activity 1 and the content in Visible Biology. Based on what you've learned, match each of the following structures with the brief description of its role in cellular respiration.

Structures:

- a. Inner membrane
- b. Matrix
- c. Cristae
- d. Cytosol

Descriptions:

___ This structure contains the electron transport chain, and chemiosmosis occurs across this structure to produce water molecules and ATP.

___ These structures increase the surface area of the inner mitochondrial membrane to facilitate gas exchange.

___ This fluid surrounds the mitochondria, and it's where glycolysis takes place.

___ This is the fluid-filled inner part of the mitochondrion, where the citric acid cycle takes place.

Name:

Date:

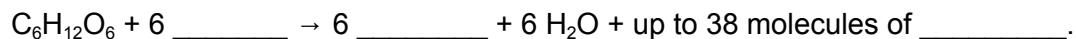
Lab 1: Mitochondria Structures, Reactants, and Products of Cellular Respiration

Activity 3: Explore the reactants and products of cellular respiration

Refer to your labeled reactants and products of cellular respiration from Activity 1 and the content in Visible Biology. Based on what you've learned, complete the following table on the molecules involved in cellular respiration.

Molecule Type	Reactant/Product	Where It Comes From	Stage(s) It's Part of	Its Significance
Carbon Dioxide	Product	Made in the _____	Pyruvate oxidation and citric acid cycle	It is a byproduct of cellular respiration essential for _____.
Oxygen	Reactant	From _____ from the lungs or the _____ surrounding the cell	Oxidative phosphorylation	It combines with _____ to form water molecules during oxidative phosphorylation.
Glucose	Reactant	From _____ an animal/human consumes or produced by plants via _____	Glycolysis	It is converted into two _____ during glycolysis.
Water	Product	Made in the _____	Oxidative phosphorylation	It is a byproduct of cellular respiration essential for _____.
ATP	Product	Made in the cytosol and the mitochondrial _____ and inner membrane	Glycolysis, citric acid cycle, and oxidative phosphorylation	It provides the energy that powers many _____.

Based on what you've learned from labeling the mitochondrion (cellular respiration) model and completing the table, fill in the blanks to balance the cellular respiration equation:



Name:

Date:

Lab 2: Cellular Respiration in the Mitochondrion

Refer to your labeled reactants and products of cellular respiration image from Lab 1, Activity 1.

1. In the space that follows, draw a mitochondrion (or paste a screenshot of your drawing). Your drawing should include the following:
 - a. Inside the mitochondrion, draw the inner and outer membranes, cristae, and matrix.
 - b. Outside the mitochondrion, draw the cytosol, as well as the ATP molecules, carbon dioxide (CO_2) molecules, water (H_2O) molecules, oxygen (O_2) molecules, glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) molecules, NAD^+ , NADH , FAD , FADH_2 , and electrons with arrows showing how they move into, out of, or through the mitochondrion. Be sure to accurately portray the number of each of these molecules in your drawing.

2. Based on your drawing and what you've learned about cellular respiration, put the following steps of cellular respiration into the correct order (from 1–5).
 - ___ Within the mitochondrion, the pyruvates are converted into acetyl-CoA.
 - ___ Glucose is converted into fructose, which is converted into two pyruvates.
 - ___ The electron transport chain and chemiosmosis produce water molecules and ATP.
 - ___ Acetyl-CoA goes into the citric acid cycle, producing carbon dioxide, ATP, NADH , FADH_2 , and electrons.
 - ___ NADH and FADH_2 bring electrons to the electron transport chain.

3. In your own words, briefly describe the cellular respiration equation.

4. The equation for photosynthesis is $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$. Based on this equation and what you've learned about cellular respiration, how do these two processes relate to each other?