

# Eukaryotic Cell Structure: Organelles in Animal & Plant Cells

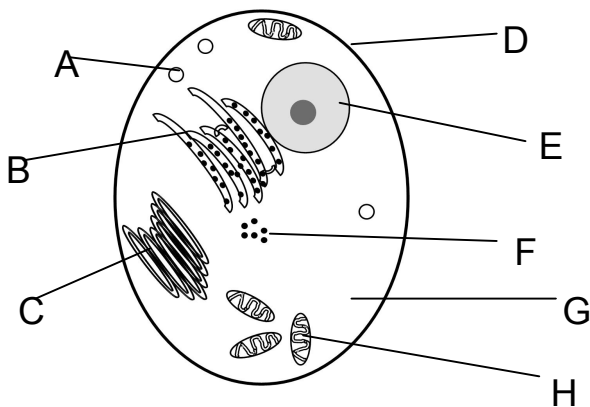
Why are organelles important and how are plants and animals different?

## Why?

The cell is the basic unit and building block of all living things. Organisms can be unicellular or multicellular. Large multicellular organisms have many cells, and many types of cell. In order to survive both unicellular and multicellular organisms rely on the cell to perform all the necessary life functions. To do this certain functions must be separated within different areas of the cell.

A cell is often compared to a factory or other large structured organization, to help us understand how different parts of the cell perform different tasks.

## Model 1: Animal Cell and Organelles



Part of factory	Cell organelle
Control Room (E)	Nucleus
Factory Manager	DNA/Chromosomes
Assembly line (B)	Endoplasmic reticulum (ER)
Assembly line workers (F)	Ribosomes
Janitor (A)	Lysosomes
Generator (H)	Mitochondria
Packing Line (C)	Golgi Body
Factory Floor (G)	Cytoplasm
Shipping department	Vesicles
Warehouse	Vacuole
Loading dock	Pores/gated channels
Security Fence (D)	Cell membrane

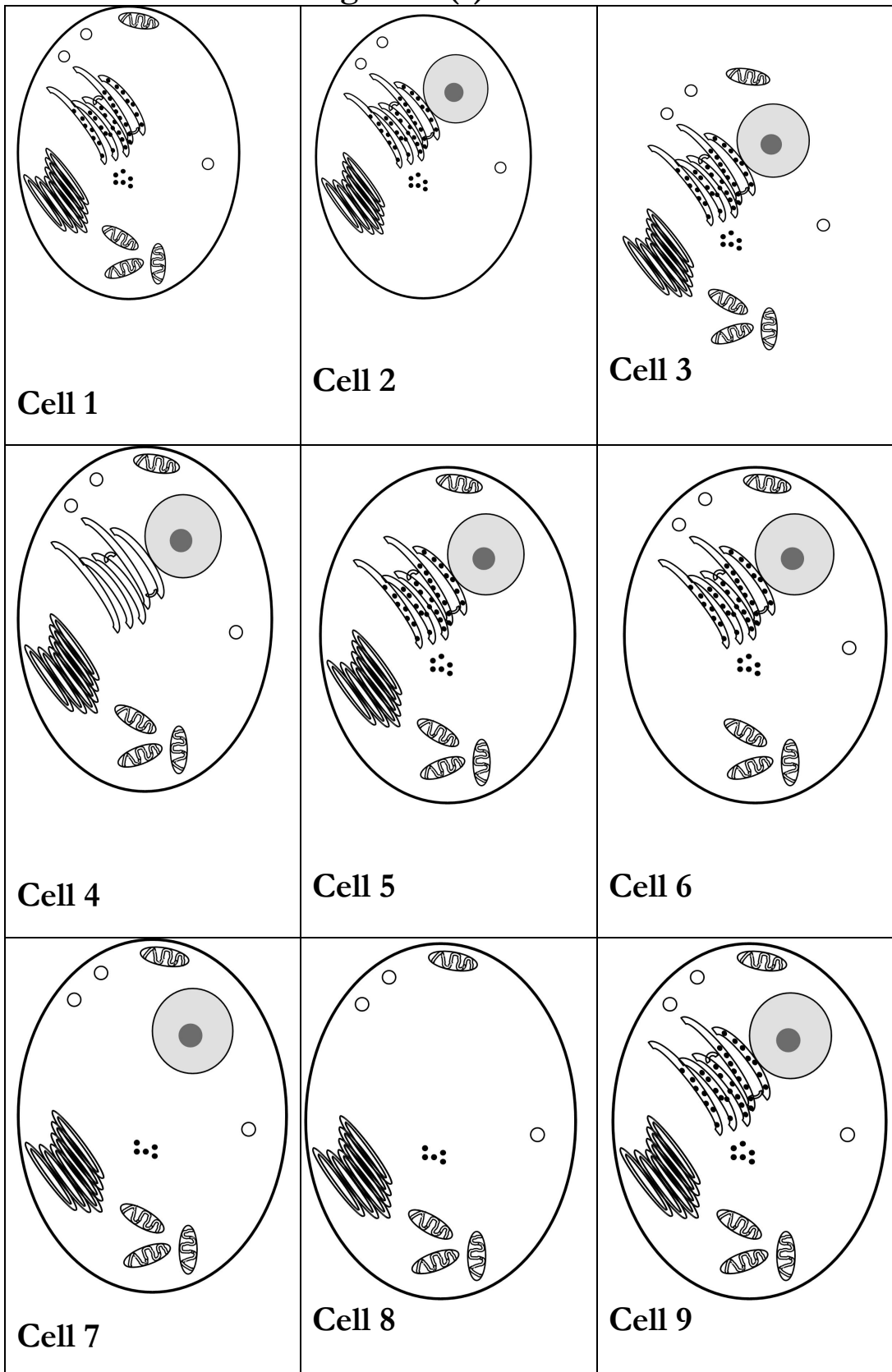
1. Using the letters from the table above, label the cell diagram with the organelle names.
2. Which cell organelle controls the activities of the entire cell?
3. In a factory, where would you expect to find the manager?
4. In a cell what substance is analogous to a factory manager and where would it be found?
5. Which organelle would generate energy to power cellular activities?
6. Which organelle would be responsible for assembling cell products?
7. Once these products have been assembled, to which organelle would they go next?
8. What container might the cellular products be placed in to?



9. Starting with instructions from the factory manager (DNA/Chromosomes), create a flow chart to show how a product is produced and shipped from a cell. All parts of the cell from the table above must be used in your flow chart.

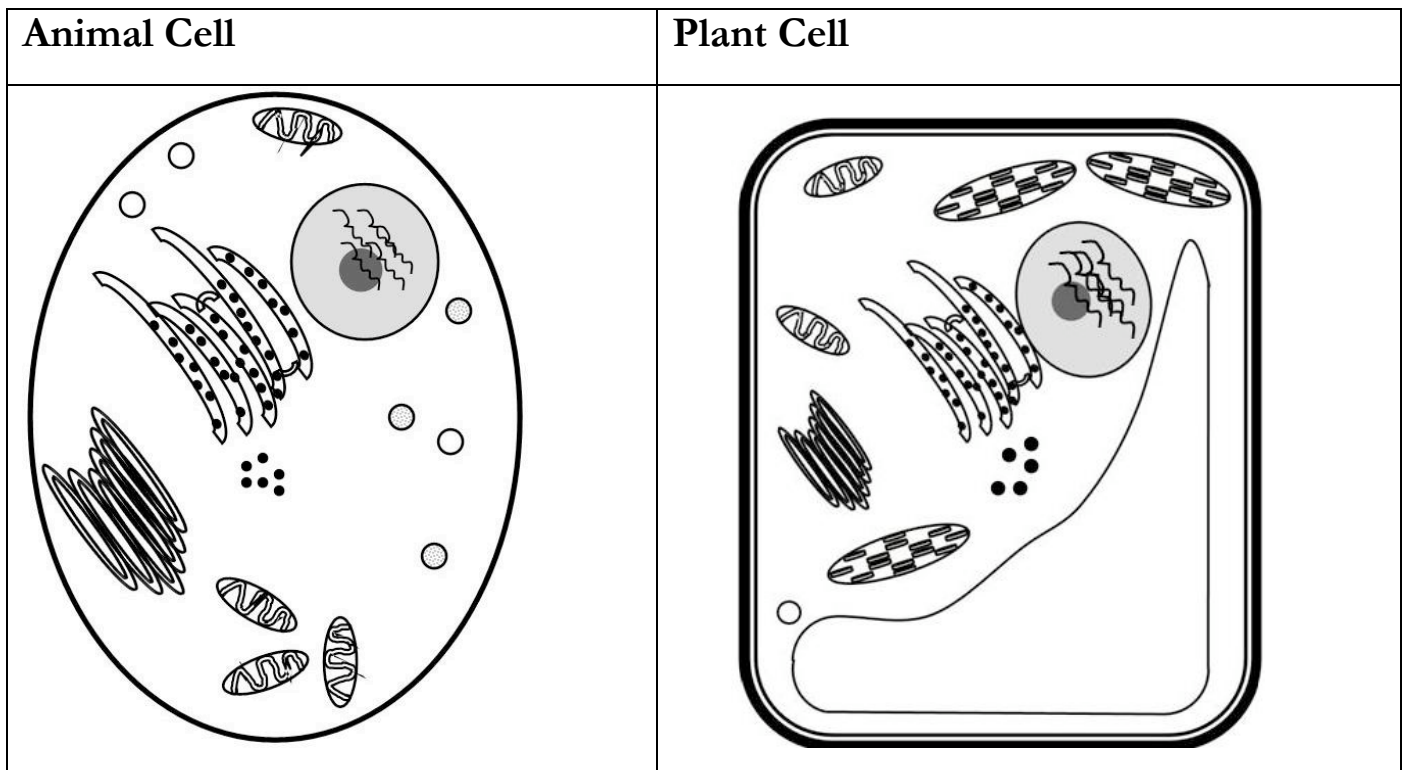


**Model 2: Animal Cells with organelle(s) removed**



10. Which cell is not missing any organelles?
11. What organelle in Cell 2 is missing?
12. Using grammatically correct sentences, describe why Cell 2 would not function normally.
13. Which two cells will have difficulty containing and getting rid of wastes within the cell? Why?
14. Cell 1 is missing one organelle. List as many reasons as possible why Cell 1 will not survive.
15. Cell 7 & Cell 4 will not be able to synthesize a major bio-molecule. What molecule is this?

### Model 3: Animal vs. Plant Cells



16. Do both of these cells have a nucleus?

17. Do both of these cells have mitochondria?
18. Describe 3-5 differences between the plant and animal cells. Circle or locate each of these differences on the diagram above.


## Read This!

Plant cells have these three organelles not found in animal cells. They include Cell Wall, Large Central Vacuole, and Plastids (including Chloroplasts).



19. Complete the table below using the three plant organelles.

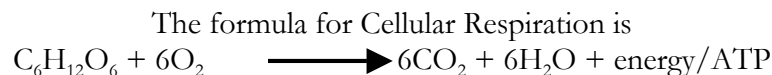
Organelle	Function
	Fluid filled organelle stores water, enzymes and waste products. Size of this organelle can change.
	Supports and protects the cell.
	Some store food or pigments; one type transfers energy from light to organic compounds

20. Label each of these three organelles on the plant cell diagram.
-  21. Individually, in one grammatically correct sentence, describe why it is necessary for plants to have chloroplasts.
22. Have everyone read their answer to question 15. As a group, rewrite the answer combining all of your answers.
23. The central vacuole stores water. What would happen to the size of the central vacuole if a plant does not have enough water?
24. Describe the appearance of the vacuole in a well-watered plant. What effect would this have on the cell wall of the plant?
25. Using your response to question 18, construct an explanation for why a plant has both a rigid cell wall and a cellular membrane.

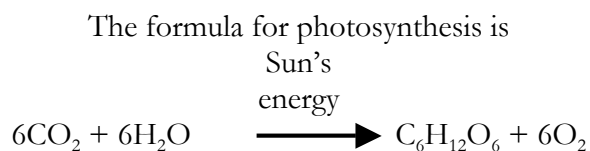
## Extension Questions

### Read This!

All cells undergo cellular respiration for the production of energy. Energy is necessary for all metabolic activity within the cell.



Plants carry out photosynthesis for the production of glucose. The glucose then becomes the energy source for cellular respiration.



26. In what organelle does cellular respiration occur? Do plants and animals both have that structure?
27. In what organelle does photosynthesis occur? Do plants and animals both have that structure?
28. Using the equations above, explain the relationship between mitochondria and chloroplasts.
29. Plants have both mitochondria and chloroplasts so they can produce their own source of glucose to fuel cellular respiration, whereas animal cells have only mitochondria. If an animal eats only meat what would be their source of glucose?
30. Where in the human body would you find cells with more mitochondria? Why?

# HSPI Activity Teacher Guide

## Learning Objectives

- 1) Understand the structure and function of the basic organelles of the cell
- 2) Understand some of the relationships between these organelles
- 3) Know the different organelles in a plant cell and their functions.

## Prerequisites

Students should have sufficient information from prior study in middle school to attempt this activity. For lower ability/special needs students the teacher may need to spend more time in facilitating Model 1 to ensure students know the roles within a factory organization and how to relate them to a cell.

## Assessment Questions

A1. Cells that actively produce proteins will contain large numbers of?

- a. Ribosomes
- b. Mitochondria
- c. Cilia
- d. Chloroplasts

B2. Plant cells have a large membrane-bound space in which water, waste products, and nutrients are stored. This is known as

- a. Mitochondria.
- b. Central vacuole
- c. Chloroplasts.
- d. Golgi apparatus.

D3. All eukaryotic cells have

- a. a covering called a membrane that surrounds the cell and controls what information and materials enter and leave it.
- b. an internal fluid that gives shape to the cell and supports the other things within it.
- c. a central zone or nucleus that contains the cell's genes.
- d. All of the above.

4. List the three organelles that plants cells have and that are not found in animal cells. (They include Cell Wall, Large Central Vacuole, and Plastids (including Chloroplasts))

5. Describe 3 differences between the plant and animal cells. (Plant cells have the following organelles, while animal cells do not: Cell Wall, Large Central Vacuole, and Plastids (including Chloroplasts)).

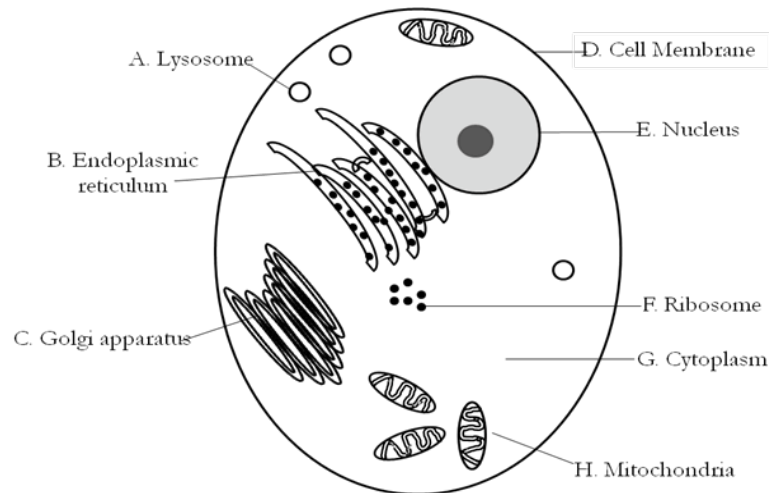
6. Describe 3 similarities between plant and animal cells. (List any of the organelles other than Cell Wall, Large Central Vacuole, and Plastids (including Chloroplasts)).

## Teacher Tips

In 45 minute class will probably not have time for extension questions. Additionally, extension questions may be more advanced than some Biology 1 classes. It might help the students to have an additional copy of just Model 2 for each group. This may prevent frustration as students flip back and forth in the activity.

## Target Responses

- Using the letters from the table above, label the cell diagram with the organelle names.



- Which cell organelle controls the activities of the entire cell? *Nucleus*
- In a factory, where would you expect to find the manager? *Control room*
- In a cell what substance is analogous to a factory manager and where would it be found? *DNA/Chromosomes; in the nucleus*
- Which organelle would generate energy to power cellular activities? *Mitochondria*
- Which organelle would be responsible for assembling cell products? *Ribosomes/ER*
- Once these products have been assembled, to which organelle would they go next? *Golgi Body*
- What container might the cellular products be placed in to? *Vesicle*

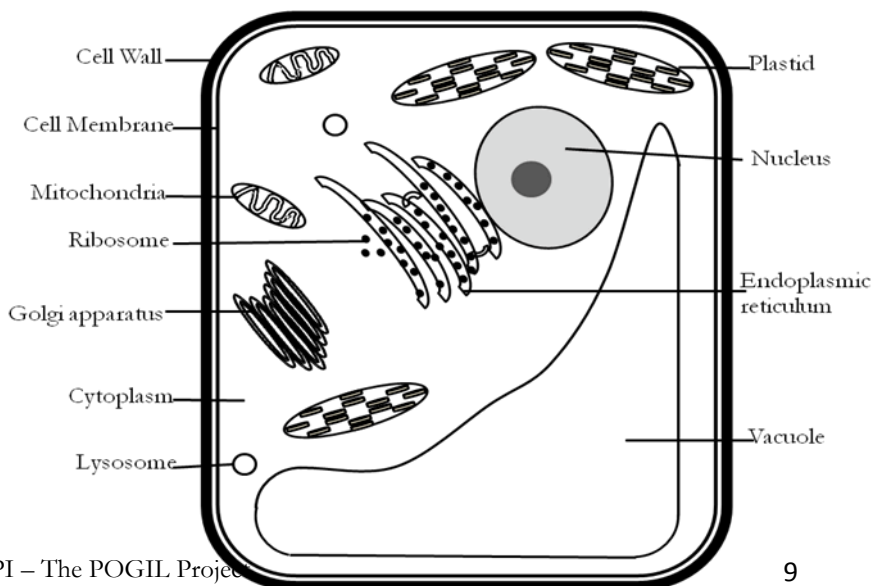


9. Starting with instructions from the factory manager (DNA/Chromosomes), create a flow chart to show how a product is produced and shipped from a cell. All parts of the cell from the table above must be used in your flow chart. *Accept any reasonable answer that includes all named organelles.*
10. Which cell is not missing any organelles? *Cell 9*
11. What organelle in Cell 2 is missing? *Mitochondria*
12. Using grammatically correct sentences, describe why Cell 2 would not function normally. *Cell 2 would not be able to produce energy, more specifically there would be no ATP production. A more advanced student might recognize that the cell will not be able to carry out cellular respiration*
13. Which two cells will have difficulty containing and getting rid of wastes within the cell? Why? *Cell 3 (missing cell membrane) and Cell 5 (missing lysosome)*
14. Cell 1 is missing one organelle. List as many reasons as possible why Cell 1 will not survive. *No genetic information, no reproduction, no protein production (no enzymes), no growth*
15. Cell 7 & Cell 4 will not be able to synthesize a major bio-molecule. What molecule is this? *Protein production*
16. Do both of these cells have a nucleus? *Yes*
17. Do both of these cells have mitochondria? *Yes*
18. Describe 3-5 differences between the plant and animal cells. Circle or locate each of these differences on the diagram above. *Answers should include shape, chloroplasts, cell wall, vacuole*

19.

Organelle	Function
Vacuole	Fluid filled organelle stores enzymes and waste products.
Cell Wall	Supports and protects the cell.
Plastid/Chloroplast	Some store food or pigments; one type (chloroplast) transfers energy from light to organic compounds

20. Label each of these three organelles on the plant cell diagram.



21. Individually, in one grammatically correct sentence, describe why it is necessary for plants to have chloroplasts. *Chloroplasts are the site of photosynthesis where plants take energy from the sun and make sugars/glucose*
22. Have everyone read their answer to question 15. As a group, rewrite the answer combining all of your answers.
23. The central vacuole stores water. What would happen to the size of the central vacuole if a plant does not have enough water? *The central vacuole stores water. What would happen to the size of the central vacuole if a plant does not have enough water? It would shrink*
24. Describe the appearance of the vacuole in a well-watered plant. What effect would this have on the cell wall of the plant? *Vacuole would expand and take up most of the space inside the cell. This would create internal pressure on the cell wall*
25. Using your response to question 18, construct an explanation for why a plant has both a rigid cell wall and a cellular membrane. *Plants need a cell wall as well as a cell membrane because the wall will provide structure and support to keep a plant upright. If there were no cell wall the cell would burst as the vacuole expands.*
26. In what organelle does cellular respiration occur? Do plants and animals both have that structure? *Mitochondria. Both plants and animals have mitochondria*
27. In what organelle does photosynthesis occur? Do plants and animals both have that structure? *Chloroplasts. Only plants have chloroplasts*
28. Using the equations above, explain the relationship between mitochondria and chloroplasts. *Plants use sunlight and CO<sub>2</sub> to produce glucose/sugars and O<sub>2</sub>. Mitochondria use O<sub>2</sub> and sugars/glucose to produce ATP. The products of one reaction become the reactants of the other*
29. Plants have both mitochondria and chloroplasts so they can produce their own source of glucose to fuel cellular respiration, whereas animal cells have only mitochondria. If an animal eats only meat what would be their source of glucose? *Animals that eat meat must get their glucose from the animals they eat. Animals eat plants, which transfers the glucose from the plant to their body tissues. When these animals are then eaten their body tissues are broken down to provide a source of glucose.*
30. Where in the human body would you find cells with more mitochondria? Why? *Muscle cells, they need energy for continued movement*