

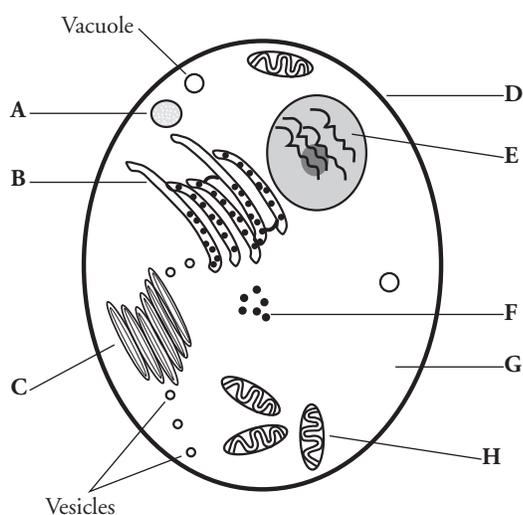
Organelles in Eukaryotic Cells

What are the functions of different organelles in a cell?

Why?

The cell is the basic unit and building block of all living things. Organisms rely on their cells to perform all necessary functions of life. Certain functions are carried out within different structures of the cell. These structures are called **organelles**.

Model 1 – How Is a Cell Like a Factory?



Part of factory	Cell organelle	Function
Control room (E)	Nucleus	Contains and protects genetic material (DNA)
Factory manager	DNA/chromosomes	Information for making proteins
Assembly workers (F)	Ribosomes	Make proteins
Production line (B)	Endoplasmic reticulum (ER)	Transports and finishes proteins and other biological molecules
Custodians (A)	Lysosomes	gets rid of waste
Power generators (H)	Mitochondria	provides energy
Shipping department (C)	Golgi apparatus	packs and transports
Factory interior (G)	Cytoplasm	Space for work to be done
Items to be shipped	Vesicles	Cellular package containing products such as protein
Warehouse for storage of products	Vacuole	stores molecules
Loading dock	Pores/gated channels	Points of entry and exit for materials
Security fence (D)	Cell membrane	controls entry and exit

1. Using the letters from the table in Model 1, label the cell diagram with the organelle names.
2. According to the table,
 - a. what substance is analogous to a factory manager?
DNA
 - b. in what organelle would this substance be found?
Nucleus
3. Using the information in Question 2, which cell organelle controls the activities of the entire cell?
Nucleus
4. Which organelle generates energy to power cellular activities?
Mitochondria
5. Which organelle is responsible for assembling proteins?
Ribosomes
6. Once proteins have been assembled, to which organelle would they go next?
Rough ER
7. Into what organelle might the cellular products be placed?
Vacuole



8. Fill in the missing functions of cellular organelles in the table in Model 1.

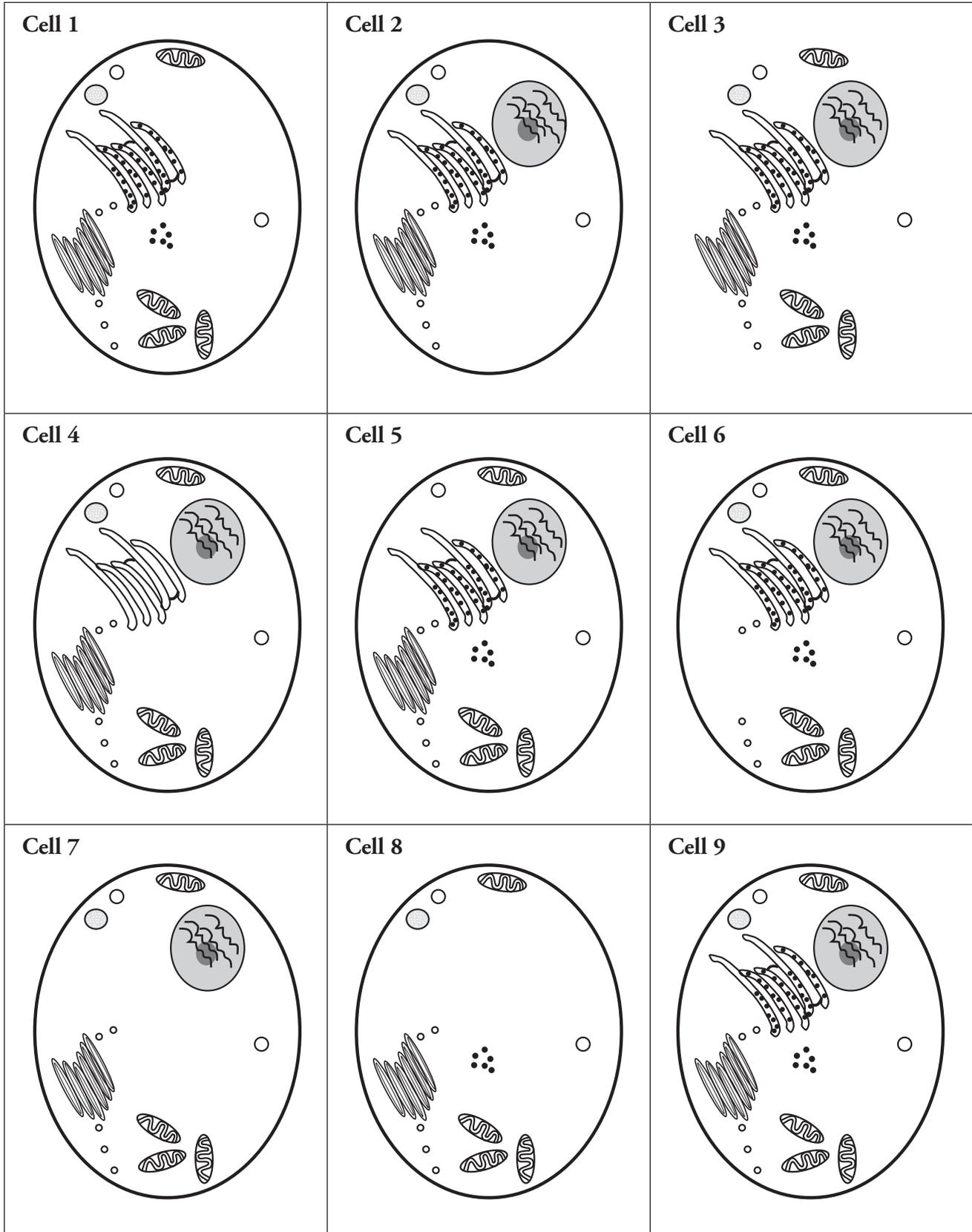


9. Starting with instructions from the factory manager (DNA/chromosomes), create a flow chart to show how a protein is produced and shipped from a cell.

DNA in Nucleus → Rough ER → Golgi → Cell Membrane



Model 2 – Animal Cells with Organelle(s) Removed



10. Study the cells in Model 2. Which cell is not missing any organelles compared to Model 1?

Cell 9

11. Look carefully at Cell 2 in Model 2. Compared to Model 1, what kind of organelle is missing?

Mitochondria

12. Using grammatically correct sentences, describe why Cell 2 would not function normally.

Cell 2 would not have energy to function.

13. Which two cells in Model 2 will have difficulty containing and getting rid of wastes within the cell? Why?

Cells 5 and 6 because they are missing lysosomes.

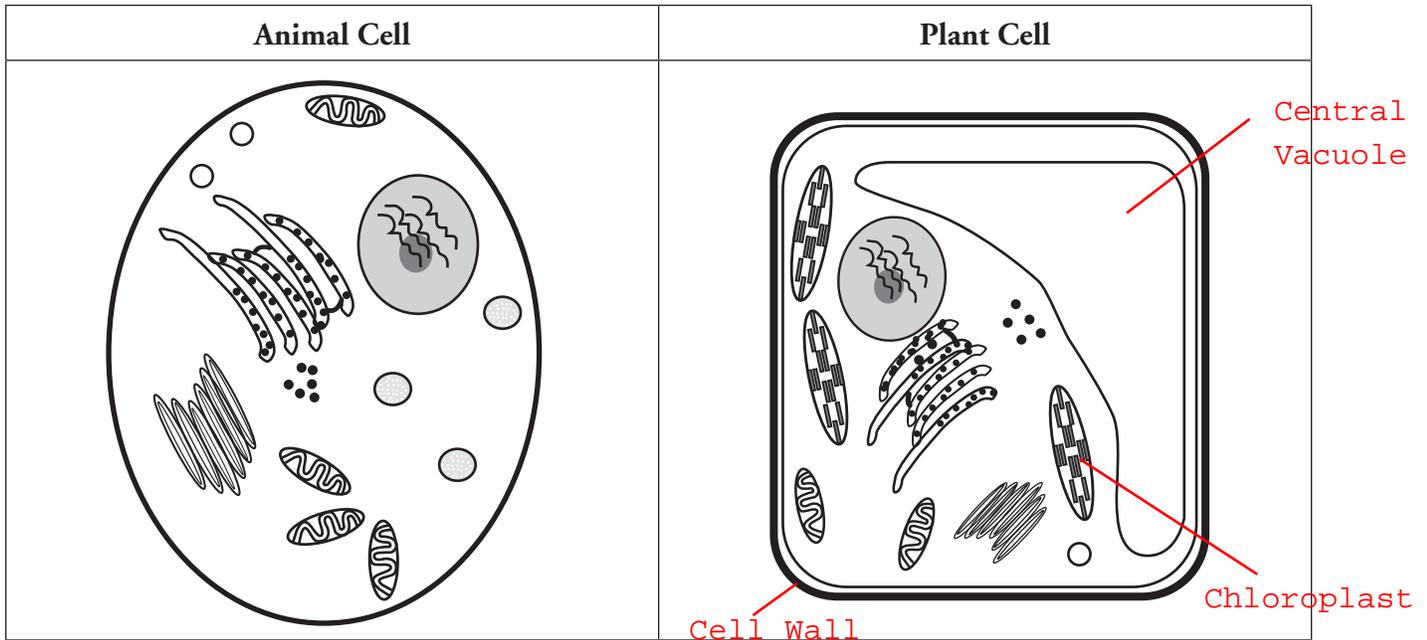
14. Cell 1 is missing one organelle. List as many reasons as possible why Cell 1 will not survive.

Cell one has no nucleus or DNA. Thus, it will not be able to create proteins or control any actions or properties of the cell.

15. Cell 4 and Cell 7 will not be able to synthesize a major biological molecule. What molecule is this?

These cells have no ribosomes. Consequently, they will not be able to build any proteins.

Model 3 – Animal Cell vs. Plant Cell



16. Do both cells in Model 3 have a nucleus?

Yes

17. Do both cells in Model 3 have mitochondria?

Yes

18. Describe at least three differences between the animal and plant cells shown in Model 3.

Plant cells have a cell wall, chloroplasts and a large vacuole. Additionally plant cells are more of a box shape because of their rigid cell wall.

Read This!

Plant cells have three organelles not found in animal cells. They include the cell wall, large central vacuole, and plastids (including chloroplasts).



19. Complete the table below using the three plant organelles mentioned in the *Read This!* box.

Organelle	Function
Vacuole	Fluid-filled organelle stores water, enzymes, and waste products. Size of this organelle can change.
Cell Wall	Supports and protects the cell.
Chloroplasts	Some store food or pigments; some convert light energy to chemical energy in the form of organic compounds.

20. Label each of these three organelles on the plant cell diagram in Model 3.



21. Individually, in one grammatically correct sentence, describe why it is necessary for plants to have chloroplasts.

Plants have chloroplasts to produce carbohydrate because they have no other way to get food.

22. As a group, reach a consensus on the answer to Question 21. Record the answer below.

N/A

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 plant would dehydrate and wilt (shriveled).

24. Describe the appearance of the vacuole in a well-watered plant. What effect would this have on the cell wall of the plant?

The vacuole would be full and large not shriveled. The plant would be plump, not wilted.

25. Using your response to Question 24, construct an explanation for why a plant has both a rigid cell wall and a cellular membrane.

The cell wall keeps the shape of the cell and plant. The cell membrane controls the entry and exit of nutrients and waste.

Extension Questions

Read This!

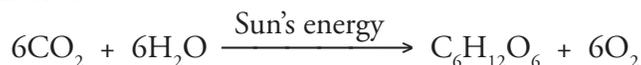
All cells undergo cellular respiration for the production of energy. Energy is necessary for all metabolic activity within the cell.

The formula for cellular respiration is



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

The formula for photosynthesis is



26. Study the information given in the *Read This!* box.

a. In what organelle does cellular respiration occur?

Mitochondria

b. Do plant and animal cells both have this structure?

Both plant and animal cells need energy/ATP.

27. In what organelle does photosynthesis occur? Do plant and animal cells both have this structure?

Chloroplasts which are only found in plant cells.

28. Using the equations above, explain the relationship between mitochondria and chloroplasts.

Chloroplasts make carbohydrates and mitochondria convert the carbohydrates into energy/ATP.

29. Plants have both mitochondria and chloroplasts; they can produce their own glucose to fuel cellular respiration. Animal cells, on the other hand, have only mitochondria. If an animal eats only meat what would be its source of glucose?

The glucose that has not been broken down yet in the animal tissue. This would probably not be a sufficient source of glucose.

30. Where in the human body would you find cells with a large number of mitochondria? Why?

I would expect a lot of mitochondria in muscle tissue. Muscles take a lot of energy to contract, the mitochondria supply energy.