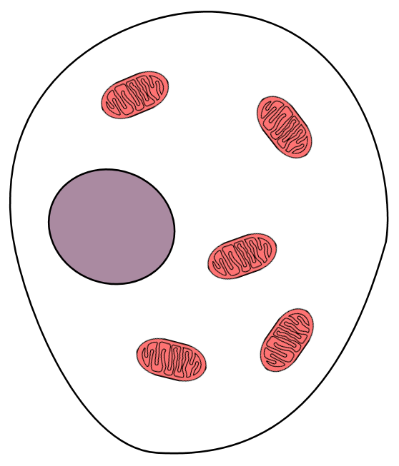
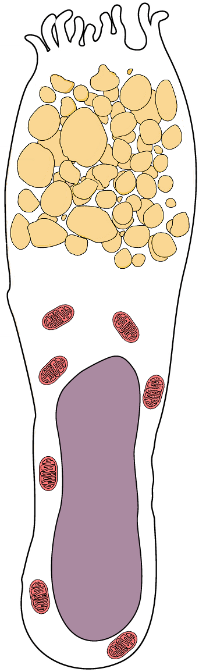
**What do they have in common?**

The diagrams show different types of **animal** cells.



cell membrane

mitochondria

fatty insulation

mucus vesicles

mitochondria

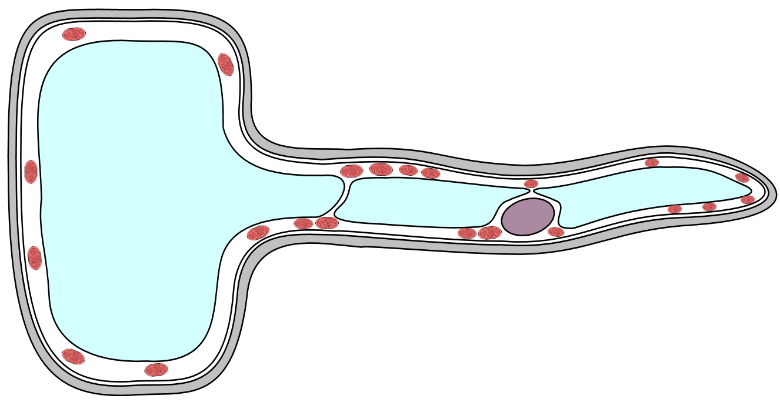
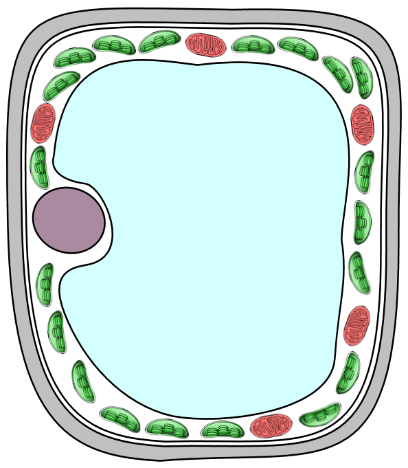
nucleus

cytoplasm

Which structures do most of the animal cells have in common?

**What do they have in common?**

The diagrams show different types of **plant** cells.





cytoplasm

cell wall

nucleus

chloroplasts

mitochondria

vacuole

cell membrane

Which structures do most of the plant cells have in common?

**To do**

Write the cell features in the correct place in the diagram.

Features usually found in **plant** cells

Features usually found in **animal** cells

Features usually found in **both** types of cells

*Biology > Big idea BCL: The cellular basis of life > Topic BCL1: Cells > Key concept BCL1.2: Cells and cell structures*

|  |
| --- |
| **Response activity** |
| **What do they have in common?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Organisms are made up of one or more cells, which have common structures that carry out life processes. |
| Observable learning outcome: | Describe the features and the limitations of the animal and plant cell models. |
| Activity type: | Discussion, modelling |
| Key words: | cell, model |

This activity can help develop students’ understanding by addressing confusion over what is represented by the typical model cells used to depict animal and plant cells, and about the limitations of these models, as revealed by the following diagnostic question:

* Diagnostic question: Animal cell or plant cell?

**What does the research say?**

Researchers have acknowledged that the cell is, when first introduced, an abstract concept (Dreyfus and Jungwirth, 1988; 1989).

Clément (2007) notes that “the cell concept is generally introduced by two juxtaposed drawings, a plant cell and an animal cell” with the common features of animal and plant cells labelled, and that the plant cell is generally polygonal and adjacent to other cells while the animal cell is more rounded in shape and isolated. If students are not presented with a greater variety of images of cells it could introduce or reinforce the misunderstanding that all animals cells and all plants cells have the same shape and structures as these two archetypal depictions; Clément found this misunderstanding persisting in students up to undergraduate level.

Clément also noted that the differences between types of animal cells (e.g. epithelium, neuron, sperm cell) may appear to be more pronounced that the differences between an animal cell and a plant cell (e.g. an epithelial cell from a human check and a spongy mesophyll cell from a plant leaf) – especially when depicted using cross-sectional line diagrams.

It may be helpful for students to understand that the archetypal, textbook depictions of animal and plant cells are *models*. Not all animal plant and cells have exactly the same shape or structures as those depicted in the models; but the models are a useful description of the common features of animal and plant cells.

**Ways to use this activity**

Students should complete this activity in pairs or small groups, and the focus should be on discussion (it is through the discussions that students can check their understanding and rehearse their explanations). Students should work together to follow the instructions on the worksheet or the presentation.

Giving each group one worksheet to complete between them is helpful for encouraging discussion, but each member should be able to report back to the class. Listening in to the conversations of each group will often give you insights into how your students are thinking.

The names of the cell features and the Venn diagram outline could be printed and cut up to make cards for a sorting activity. Or the names could be projected with students voting on where each feature should be placed.

**Expected answers**

Students are not expected to identify the specific cell types, but for the record they are:

|  |  |  |  |
| --- | --- | --- | --- |
| *Animal cells* | | | |
|  |  |  |  |
| Cheek epithelial cell | Columnar epithelial (goblet) cell | Nerve cell | Sperm cell |

|  |  |  |  |
| --- | --- | --- | --- |
| *Plant cells* | | | |
|  |  |  |  |
| Spongy mesophyll cell | Palisade mesophyll cell | Guard cells | Root hair cell |

These different types of cells are intended to illustrate that not all animal and plant cells have the same shape and structures as models used to describe the general features of animal and plant cells. For example, the shapes are very different – they do not all conform to the generally-rounded animal cell model and the generally-polygonal plant cell model. In addition, some cells lack features included in the models (e.g. even though they are plant cells, root hair cells do not have chloroplasts because they are found underground where there is no light), and some cells have additional features not included in the models (e.g. mucus vesicles in the goblet cell).

Features usually found in **animal** cells

Features usually found in **both** types of cells

nucleus

cytoplasm

mitochondria

cell membrane

Features usually found in **plant** cells

chloroplasts

cell wall

vacuole

**Acknowledgments**

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Images: mitochondria – Wikimedia Commons/Nevit (adapted by UYSEG); neuron – Wikimedia Commons/Quasar Jarosz (adapted by UYSEG); goblet cell – Wikimedia Commons/OpenStax College (adapted by UYSEG); spermatozoon – Wikimedia Commons/Mariana Ruiz Villarreal (adapted by UYSEG); chloroplasts – pixabay.com/Clker-Free-Vector-Images (35023) (adapted by UYSEG); all other drawings – UYSEG

**References**

Clément, P. (2007). Introducing the cell concept with both animal and plant cells: a historical and didactic approach. *Science & Education,* 16(3-5)**,** 423-440.

Dreyfus, A. and Jungwirth, E. (1988). The cell concept of 10th graders: curricular expectations and reality. *International Journal of Science Education,* 10(2)**,** 221-229.

Dreyfus, A. and Jungwirth, E. (1989). The pupil and the living cell: a taxonomy of dysfunctional ideas about an abstract idea. *Journal of Biological Education,* 23(1)**,** 49-55.