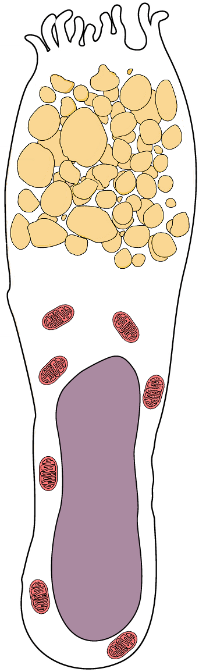
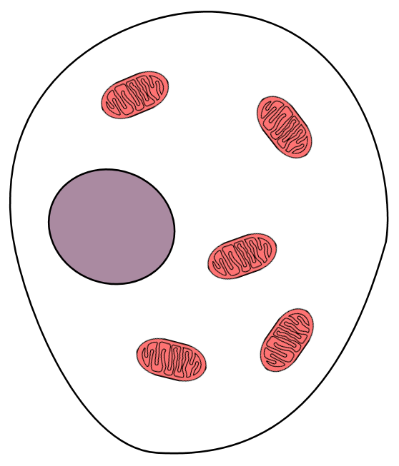
**Animal cell or plant cell?**



mucus vesicles

fatty insulation

mitochondria

nucleus

cytoplasm

cell membrane



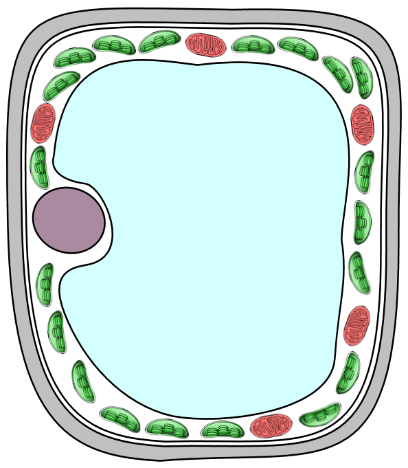
mitochondria

1. Which of these diagrams show **animal** cells?

|  |  |
| --- | --- |
| **A** | All of them. |
| **B** | Only some of them. |
| **C** | Only one of them. |
| **D** | None of them. |

1. How would you explain your answer to question 1?

**Animal cell or plant cell?**



cell wall

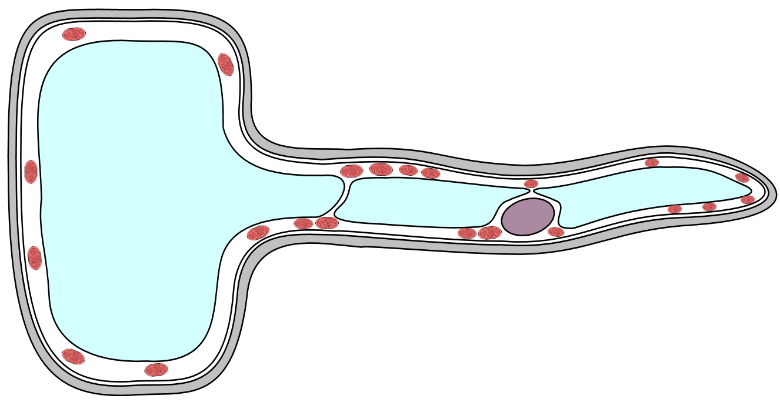
cytoplasm

nucleus

chloroplasts

cell membrane

vacuole





mitochondria

1. Which of these diagrams show **plant** cells?

|  |  |
| --- | --- |
| **A** | All of them. |
| **B** | Only some of them. |
| **C** | Only one of them. |
| **D** | None of them. |

1. How would you explain your answer to question 3?

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

|  |
| --- |
| **Diagnostic question** |
| **Animal cell or plant cell?** |

**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. |
| Question type: | Two-tier multiple choice |
| Key words: | cell, model |

**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 question**

Students should complete the questions individually. This could be a pencil and paper exercise, or you could use the PowerPoint presentation with an electronic voting system or mini white boards.

If necessary, prompt students to think about the common features of animal and plant cells and to use these features as criteria for deciding whether the cells depicted are animal or plant cells.

*Differentiation*

You may choose to read the questions to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Expected answers**

The four diagrams in the first set all depict animal cells. Likewise, the four diagrams in the second set all depict plant cells.

Students are not expected to identify the specific cell types, and the names of the cells have deliberately been omitted from the student-facing materials to avoid giving clues as to whether the cells are animal or plant; students should make their decisions based on the cell features. However, for the record the cells 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).

**How to respond - what next?**

Students who think that only the cheek epithelial cell is an animal cell, and that only the palisade mesophyll cell is a plant cell, may have the misunderstanding that all animal and plant cells have the same shape and structures as the typical model cells used to depict animal and plant cells.

If students have misunderstandings about what is represented by the typical model cells used to depict animal and plant cells, and about the limitations of these models, it may be useful to show students a range of animal and plant cells with various shapes and structures. Ask the students to describe or group the common features of the animal cells and of the plant cells. In this way, they build their own descriptive models of cells and can see that the models are generalised representations of a variety of different cells. The following BEST ‘response activity’ describes such an exercise and could therefore be used in follow-up to this diagnostic question:

* Response activity: What do they have in common?

Key concept BCL1.3 *Cell shape and size* provides diagnostic questions to further probe misunderstandings about cell shape and response activities to help students overcome them.

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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

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