**Organ or organelle?**

Each drawing shows a single cell.

|  |  |
| --- | --- |
| **A** | **B** |
| cell membrane | digestive system |
|  |  |
| **C** | **D** |
| lungs | mitochondria |
|  |  |

Which drawing shows the structure that…

1. …lets the cell take in oxygen?
2. …lets the cell take in food and other nutrients?
3. …lets the cell get energy from food?
4. …lets the cell get rid of waste?

**Organ or organelle?**

Each drawing shows a single cell.

|  |  |
| --- | --- |
| **A** | **B** |
| nucleus | digestive system |
|  |  |
| **C** | **D** |
| brain | mitochondria |
|  |  |
| **E** | **F** |
| chloroplasts | cell cytoplasm |
|  |  |

Which drawing shows the structure that…

1. …lets a plant cell make its own food?
2. …controls processes in the rest of the cell?
3. …stores the instructions used to make new cells?

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|  |
| --- |
| **Diagnostic question** |
| **Organ or organelle?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Organisms are made up of one or more cells, which have common structures that carry out life processes. |
| Observable learning outcome: | Identify subcellular structures and their functions. |
| Question type: | Simple multiple choice |
| Key words: | cell, organelle, organ |

**What does the research say?**

Researchers (Arnold, 1983; Dreyfus and Jungwirth, 1988; Driver et al., 1994) have reported a number of misunderstandings that students have about cells, including:

* poor or no appreciation of size and scale
* animistic and anthropomorphic views, including that cells and cell organelles can have faces, limbs, internal organs or the ability to speak.

Dreyfus and Jungwirth (1988) found that many 16-year-olds struggled to explain how cells carry out life processes. Many of the students thought that cells contain macroscopic organs such as a digestive tract (e.g. for nutrition) or lungs (e.g. for respiration). Even students who could identify the correct cell organelles could not explain how they carry out their functions, especially how the nucleus ‘controls’ the structure and functions of a cell.

**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.

The answers to the questions will show you whether students understand that cells do not have organs but specific structures that enable them to carry out life processes.

*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**

1. A – cell membrane
2. A – cell membrane
3. D – mitochondria
4. A – cell membrane
5. E – chloroplasts
6. A – nucleus
7. A – nucleus

**How to respond - what next?**

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs. Responses often work best when the activities involve paired or small group discussions, which encourage social construction of new ideas through dialogue.

If students have misunderstandings about which cell structures are associated with particular functions and processes, the following BEST ‘response activity’ could be used in follow-up to this diagnostic question:

* Response activity: Cell structure job ads

Key concept BCL1.4 *Diffusion and the cell membrane* provides further diagnostic questions to probe specific misunderstandings about the function of the cell membrane, and response activities to help students overcome them.

Students who select drawings of cells containing digestive system, lungs or brain may have misunderstandings about the size and scale of cells, and the hierarchical organisation of multicellular organisms as cells, organs and organ systems. Topic BCL2 *From cells to organ systems* provides diagnostic questions to further probe these misunderstandings and response activities to help students overcome them.

**Acknowledgments**

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Images: cell outline – UYSEG; digestive system – pixabay.com/Elionas2 (1463369); lungs – pixabay.com/Clker-Free-Vector-Images (37824); mitochondria – pixabay.com/argzombies (3016868); chloroplasts – pixabay.com/Clker-Free-Vector-Images (35023); nucleus – UYSEG; brain – pixabay.com/holdentrils (512758)

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