**The right structure for the job**

Each drawing shows a single cell.

|  |  |
| --- | --- |
| **A** | **B** |
| cell membrane | digestive system |
|  |  |
| **C** | **D** |
| lungs | mitochondria |
|  |  |
| **E** | **F** |
| nucleus | cell cytoplasm |
|  |  |

Which drawing shows the structure that…

1. …controls what can enter and leave the cell?
2. …lets the cell take in oxygen for respiration?
3. …lets the cell take in substances from food for respiration?
4. …lets the cell take in water?
5. …lets the cell get rid of waste carbon dioxide?

*Biology > Big idea BCL: The cellular basis of life > Topic BCL1: Cells > Key concept BCL1.4: Diffusion and the cell membrane*

|  |
| --- |
| **Diagnostic question** |
| **The right structure for the job** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Molecules move through the cell cytoplasm by diffusion, and some molecules can enter and leave a cell by diffusing through the cell membrane. |
| Observable learning outcome: | Use ideas about the needs and life processes of cells to explain the role of the cell membrane and why it must be selectively permeable. |
| Question type: | Simple multiple choice |
| Key words: | cell, membrane |

**What does the research say?**

Researchers have reported a number of misunderstandings that students have about cells, including a poor or no appreciation of size and scale (Arnold, 1983; Driver et al., 1994).

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). This could be related to the misunderstanding that substances such as oxygen and food/glucose are taken into cells by breathing or eating, respectively, rather than by diffusion through the cell membrane (Allen, 2014).

**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 and that the cell membrane controls what substances can enter and leave a cell.

*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 answer to all of the questions is: **A** – cell membrane.

**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, it may be worth revisiting the ‘response activity’ called *Cell structure job ads* that is provided as part of key concept BCL1.2 *Cells and cell structures*.

If students have misunderstandings about the function of the cell membrane, the following BEST ‘response activity’ could be used in follow-up to this diagnostic question:

* Response activity: Match game! The role of the cell membrane

Students who select drawings of cells containing digestive system or lungs 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.

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**References**

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