**A single cell can…**

The drawing shows a single cell.

Parts of the cell have been cut away so that you can see inside the cell and its structures.

Look at the statements in the table.

Tick **one** box for each statement to show whether you think it’s right or wrong.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Statements** | I am **sure** this is right | I **think** this is right | I **think** this is wrong | I am **sure** this is wrong |
| **1** | A single cell can take in food and other nutrients. |  |  |  |  |
| **2** | A single cell can get energy from food. |  |  |  |  |
| **3** | A single cell can get rid of waste. |  |  |  |  |
| **4** | A single cell can make new cells. |  |  |  |  |
| **5** | A single cell can respond to its surroundings. |  |  |  |  |
| **6** | A single cell is a living thing. |  |  |  |  |

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

|  |
| --- |
| **Diagnostic question** |
| **A single cell can…** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Organisms are made up of one or more cells, which have common structures that carry out life processes. |
| Observable learning outcome: | Use ideas about cell structures and their functions to explain why a cell is a living thing. |
| Question type: | Confidence grid |
| Key words: | cell, life, living |

**What does the research say?**

Researchers have acknowledged that the cell is, when first introduced, an abstract concept. Dreyfus and Jungwirth (1988; 1989) note that most children will never see cells functioning, so the *living* (functional) cell remains an abstract idea even if they have become familiar with the structures of cells through light microscopy and pictures. The US Benchmark for 11 year-olds recommends that students watch videos of “living cells growing and dividing, taking in substances, and changing direction when they run into things” (AAAS Project 2061, 2009).

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

The answers to the question will show you whether students understand that cells carry out life processes and that a single cell is the smallest thing that can be alive, and will reveal the presence of common misunderstandings.

*Differentiation*

You may choose to read the statements 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**

All of the statements in the confidence grid are correct.

**How to respond - what next?**

Students who are confident that statements A-E are correct could be challenged to explain which life processes they relate to (e.g. nutrition, cellular respiration, excretion, reproduction and sensitivity), and to explain which cell structure(s) or organelle(s) enable it to do this.

If students have misunderstandings about whether cells can carry out life processes, or about which cell structures or organelles enable it to do this, the following BEST ‘response activity’ provides a structured small group discussion activity that could be used in follow-up to this diagnostic question to help students construct helpful explanations:

* Response activity: Match game! Substance-structure-function

If students struggle with the idea that a single cell is functional and active, and therefore alive, it may be helpful to challenge their thinking using videos that show living cells growing, dividing and moving. Some freely-accessible videos are available on the *Cell Image Library* website at:

* Cell division: <http://www.cellimagelibrary.org/browse/cellprocess/Cell%20Division?refresh_video=true>
* Cell movement: [http://www.cellimagelibrary.org/browse/cellprocess/Cell%20Migration%20&%20Motility?refresh\_video=true](http://www.cellimagelibrary.org/browse/cellprocess/Cell%20Migration%20%26%20Motility?refresh_video=true)

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

Images: cell outline and nucleus – UYSEG; mitochondria – pixabay.com/argzombies (3016868)

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