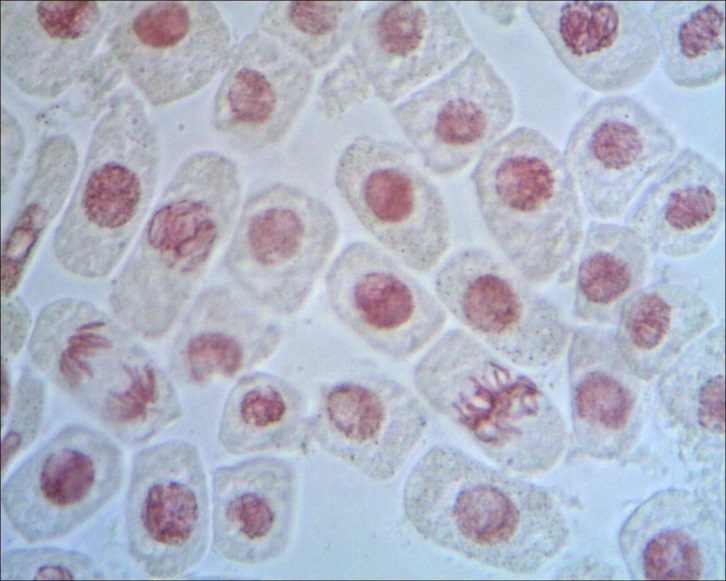
**Too small to see?**

The picture shows cells from the root of an onion plant.



Which statement about cells is true?

|  |  |
| --- | --- |
| **A** | All cells are too small to be seen without a microscope. |
| **B** | Most cells are too small to be seen without a microscope. |
| **C** | All cells can be seen with the naked eye. |
| **D** | Most cells can be seen with the naked eye. |

*Biology > Big idea BCL: The cellular basis of life > Topic BCL1: Cells > Key concept BCL1.3: Cell shape and size*

|  |
| --- |
| **Diagnostic question** |
| **Too small to see?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Cells are usually too small to be seen without a microscope, but have a range of three-dimensional shapes and sizes. |
| Observable learning outcome: | Recall that most (but not all) cells are too small to be seen without a microscope. |
| Question type: | Simple multiple choice |
| Key words: | cell, microscope |

**What does the research say?**

A number of researchers have reported that children aged 11-16 lack an appreciation of size and scale, and that this impacts their understanding of the relative sizes of cells and other biological structures (e.g. Arnold, 1983; Dreyfus and Jungwirth, 1988; Driver et al., 1994).

Dreyfus and Jungwirth (1989) acknowledge that the cell is, when first introduced, an abstract concept. When introducing ideas about cells, several sources advocate starting with hands-on light microscopy of cells from a range of tissues and organisms, to enable students to build their own understanding of the size of cells and what they look like (AAAS Project 2061, 2009; Skinner, 2011).

**Ways to use this question**

Students should complete the question 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.

*Differentiation*

You may choose to read the question 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**

**B** Most cells are too small to be seen without a microscope.

**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.

If students think that all or most cells can be seen with the naked eye, they could be given a selection of tissues and allowed to compare the appearance of the tissues when observed with their eyes, a hand lens, and a light microscope. The response activity ‘What is it made of?’ from key concept BCL1.2 *Cells and cell structures* provides and outline approach to using a light microscope.

For students who select option **A** (“All cells are too small to be seen without a microscope”), the following BEST ‘response activity’ could be used to challenge their thinking by demonstrating that while most cells are too small to be seen without a microscope there are some exceptions that can be seen with the naked eye:

* Response activity: Giant cells

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

Images: cellimagelibrary.org/Shoba Shanti (43552)

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