**What do cells need?**

**Animal cells**

The table shows some things that animals need to stay alive.

**To talk about in your group**

Where would you put the cards to complete the table?

|  |  |  |
| --- | --- | --- |
| **What animals need** | **Why animals need it** | **How animal cells use it** |
| Air |  |  |
| Water |  |  |
| Food |  |  |
|  |  |

**What do cells need?**

**Plant cells**

The table shows some things that plants need to stay alive.

**To talk about in your group**

Where would you put the cards to complete the table?

|  |  |  |
| --- | --- | --- |
| **What plants need** | **Why plants need it** | **How plant cells use it** |
| Air |  |  |
|  |  |
| Water |  |  |
|  |  |
| Light |  |  |
| Nutrients from soil |  |  |

*Biology > Big idea BCL: The cellular basis of life > Topic BCL3: Biochemistry > Key concept BCL3.2: Cellular respiration*

|  |
| --- |
| **Response activity** |
| **What do cells need?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Energy for life processes is provided by a chemical process called cellular respiration inside all living cells, which uses glucose (from food) as fuel. |
| Observable learning outcome: | Link living animals’ and plants’ need for oxygen and the presence of mitochondria in their cells to aerobic respiration. |
| Activity type: | Discussion, card-sort |
| Key words: | cell, requirements, life, living, respiration, nutrition, growth |

This activity can help develop students’ understanding by addressing the sticking-points revealed by the following diagnostic question:

* Diagnostic question: Animal cell needs

**What does the research say?**

At age 5-11 children are likely to learn that living things depend on their environment to survive, including that animals need a plentiful supply of air, water, and nutrients from food to keep them alive (Department for Education, 2013).

Learning about cellular respiration will be most effective if it helps students make connections between concepts with which they are already familiar (Seymour and Longden, 1991), for example to explain why cells (and therefore organisms) need oxygen from air and glucose from food, and how they get these fuels.

However, linking concepts in this way may be challenging for students, as they often lack experience in establishing meaningful connections between concepts – particularly at different levels of biological organisation, such as cellular explanations for phenomena observed at the organism level (Songer and Mintzes, 1994; Ummels et al., 2015). A study by Anderson and Sheldon (1990) found that even university students in the US did not connect food, oxygen, carbon dioxide and energy in a coherent conception of cellular respiration.

**Ways to use this activity**

Students should be provided with cards printed and cut out from the final page of these teacher notes. The animal card sort and the plant card sort should be completed separately. The cards should be provided in small boxes or tubs, one containing the cards for the “Why animals/plants need it” column, and the other containing the cards for the “What animal/plant cells do with it” column.

Students should complete this activity in pairs or small groups. The focus of the activity should be on group discussion to reach a consensus on where to place the cards. It is through the discussions that students can check their understanding and develop their explanations. Listening in to the conversations of each group will often give you insights into how your students are thinking.

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in the each group. For example, you may choose to select a student with strong prior knowledge as a scribe, and forbid them from contributing any of their own answers. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

After their discussions, each group should be prepared to report the key points of their discussion to another group, or to the class.

*Differentiation*

To ease the demand for some students, some parts of the table could be completed for them by pasting in the answers before printing the worksheets or showing the presentation.

**Equipment**

For each group:

* cards (printed and cut out from the end of this document)
* small boxes/tubs into which cards have been sorted according to which column of the table they fit into (optional)

**Expected answers**

*Animals*

|  |  |  |
| --- | --- | --- |
| **What animals need** | **Why animals need it** | **How animal cells use it** |
| Air | As a source of  oxygen. | As a fuel for cellular respiration. |
| Water | To store and transport dissolved substances. | Animal cells are filled up with it. |
| Food | As a source of  glucose. | As a fuel for cellular respiration. |
| As a source of carbohydrates, fats, proteins, vitamins and minerals. | To make new cells and materials for growth and repair. |

*Plants*

|  |  |  |
| --- | --- | --- |
| **What plants need** | **Why plants need it** | **How plant cells use it** |
| Air | As a source of  carbon dioxide. | It is needed for photosynthesis (a process that makes glucose). |
| As a source of  oxygen. | As a fuel for cellular respiration. |
| Water | To store and transport dissolved substances. | Plant cells are filled up with it. |
| For nutrition. | It is needed for photosynthesis (a process that makes glucose). |
| Light | Plants need to absorb energy. | It is needed for photosynthesis (a process that makes glucose). |
| Nutrients from soil | As a source of minerals. | To make new cells and materials for growth and repair. |

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

**References**

Anderson, C. W. and Sheldon, T. H. (1990). The effects of instruction of college non-majors' conceptions of respiration and photosynthesis. *Journal of Research in Science Teaching,* 27(6).

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Songer, C. J. and Mintzes, J. J. (1994). Understanding cellular respiration: an analysis of conceptual change in college biology. *Journal of Research in Science Teaching,* 31(6)**,** 621-637.

Ummels, M. H. J., et al. (2015). Designing and evaluating a context-based lesson sequence promoting conceptual coherence in biology. *Journal of Biological Education,* 49(1)**,** 38-52.

**Print and cut out cards for card-sort activity**

✁

*Cards for “Why animals need it” column:*

|  |  |  |
| --- | --- | --- |
| As a source of  oxygen. | To store and transport dissolved substances. | As a source of  glucose. |
| As a source of carbohydrates, fats, proteins, vitamins and minerals. |  |  |

*Cards for “How animal cells use it” column:*

|  |  |  |
| --- | --- | --- |
| As a fuel  for cellular respiration. | Animal cells are  filled up with it. | As a fuel  for cellular respiration. |
| To make new cells and materials for growth and repair. |  |  |

*Cards for “Why plants need it” column:*

|  |  |  |
| --- | --- | --- |
| As a source of  carbon dioxide. | As a source of  oxygen. | To store and transport dissolved substances. |
| For nutrition. | Plants need to absorb energy. | As a source of minerals. |

*Cards for “How plant cells use it” column:*

|  |  |  |
| --- | --- | --- |
| It is needed for photosynthesis (a process that makes glucose). | As a fuel  for cellular respiration. | Plant cells are  filled up with it. |
| It is needed for photosynthesis (a process that makes glucose). | It is needed for photosynthesis (a process that makes glucose). | To make new cells and materials for growth and repair. |