**Animal life**

  

Hippos, horses and humans are all examples of animals.

Which life processes take place in animals?

Tick **one** box for each process.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Processes** | | I am **sure** this is right | I **think** this is right | I **think** this is wrong | I am **sure** this is wrong |
| **1** | Nutrition |  |  |  |  |
| **2** | Growth |  |  |  |  |
| **3** | Respiration |  |  |  |  |
| **4** | Movement |  |  |  |  |
| **5** | Reproduction |  |  |  |  |
| **6** | Sensitivity |  |  |  |  |
| **7** | Excretion |  |  |  |  |

**Plant life**

  

Tomatoes, trees and tulips are all examples of plants.

Which life processes take place in plants?

Tick **one** box for each process.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Processes** | | I am **sure** this is right | I **think** this is right | I **think** this is wrong | I am **sure** this is wrong |
| **1** | Nutrition |  |  |  |  |
| **2** | Growth |  |  |  |  |
| **3** | Respiration |  |  |  |  |
| **4** | Movement |  |  |  |  |
| **5** | Reproduction |  |  |  |  |
| **6** | Sensitivity |  |  |  |  |
| **7** | Excretion |  |  |  |  |

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

|  |
| --- |
| **Diagnostic question** |
| **Animal life and plant life** |

**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: | Recall that all living organisms need energy for life processes, which is provided by cellular respiration. |
| Question type: | Confidence grid |
| Key words: | life processes, cellular respiration, nutrition, growth, , movement, reproduction, sensitivity, excretion |

|  |  |
| --- | --- |
| **P** | **PRIOR UNDERSTANDING**  This diagnostic question probes understanding of ideas that are usually taught at age 5-11, to aid transition from earlier stages of learning. |

**What does the research say?**

Students are likely to have learnt at primary school level that respiration is a characteristic process of living organisms, often as one of a list of processes introduced using the mnemonic MRS (C) GREN (movement, respiration, sensitivity, (control), growth, reproduction, excretion, nutrition).

A study of children aged 10-15 found that the characteristics most commonly used to justify the identification of things as being alive were nutrition, movement, breathing (but not “respiration”), and growth; only 36% of children aged 14-15 used cellular respiration as a criterion for life (Arnold and Simpson, 1979), despite the fact that cellular respiration must take place in all living cells to provide energy for life processes.

It can be difficult to convince children that even familiar living organisms, particularly plants, demonstrate all of these characteristics. There is some evidence that while most children regard animals as alive, only 30% of children aged 6, and 70-80% of children aged 12-15, regarded plants as alive (Stavy and Wax, 1989).

Students need to understand that plants are living, and that cellular respiration takes places in living plants cells all the time. Researchers have reported that the misunderstanding that cellular respiration does not take place in plants because they photosynthesise instead (“plants do photosynthesis, animals do respiration”) is frequent and extraordinarily persistent in secondary school students (Haslam and Treagust, 1987; Cañal, 1999; Maeng and Gonczi, 2019).

**Ways to use this question**

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

*Differentiation*

You may choose to read the question and the list of processes 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**

Students should recognise that **all** seven of the life processes take place in both animals and plants (and in all living organisms), even though sometimes these processes are not obvious.

**How to respond - what next?**

It has been suggested that learning about the characteristic processes of living organisms using the mnemonic MRS (C) GREN (movement, respiration, sensitivity, (control), growth, reproduction, excretion, nutrition) can lead to superficial rote learning (Brumby, 1982). For example, recalling that one of the Rs stands for the word “respiration” is unhelpful for conceptual development without the understanding that this refers to the process by which living organisms use food as fuel to provide energy for other life processes.

Therefore, it is essential to accompany this activity with a discussion about what students think each of the seven words means – in particular that “respiration” refers to a process that uses food as fuel to provide energy to stay alive.

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 (meaning making) through dialogue.

If students have misunderstandings about the characteristic processes of living organisms, and which organisms display them, it might be worth revisiting key concept BCL1.1 *Living, dead and never been alive* to further probe and consolidate their understanding. The following BEST ‘response activity’ could be used in follow-up to this diagnostic question to help students to explore some of the things that animals and – crucially – plants (which tend to appear quite static) need energy for:

* Response activity: Ball of energy

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