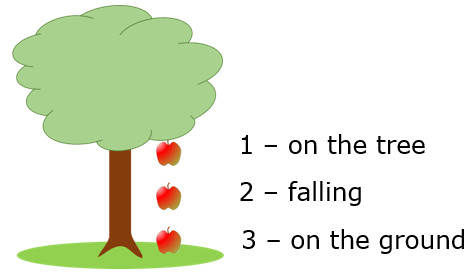
**Newton’s apple**

The drawing shows an apple falling from a tree.



When is gravity acting on the apple?

Put a tick (✓) in the box next to the best answer.

|  |  |  |
| --- | --- | --- |
| **A** | 1 only |  |
|  |  |  |
| **B** | 2 only |  |
|  |  |  |
| **C** | 3 only |  |
|  |  |  |
| **D** | 1 and 2 only |  |
|  |  |  |
| **E** | 1 and 3 only |  |
|  |  |  |
| **F** | 2 and 3 only |  |
|  |  |  |
| **G** | 1, 2 and 3 |  |

*Physics > Big idea PES: Earth in space > Topic PES1: Solar System and beyond > Key concept PES1.1: Gravity*

|  |
| --- |
| **Diagnostic question** |
| **Newton’s apple** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Gravity is the force that holds the Solar System together |
| Observable learning outcome: | * Describe how gravity acts on objects near to the Earth |
| Question type: | Diagnostic, simple multiple choice |
| Key words: | Gravity |

**What does the research say?**

It has been found that students do not always think that a force is needed to make something fall (Stead and Osborne, 1980; Ruggiero et al., 1985; Driver et al., 1994). Another common misunderstanding is that if an object is not moving, there is no force acting on it (Driver et al., 1994).

This question investigates whether students understand that the force of gravity is acting on an object in each of these situations.

**Ways to use this question**

Students should complete the question individually. This could be a pencil and paper exercise, or you could use an electronic ‘voting system’ or mini white boards and the PowerPoint presentation.

The answers to the question will show you whether students understood the concept sufficiently well to apply it correctly.

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.

*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**

G – gravity is acting in all positions

**How to respond - what next?**

In each position the force of gravity on the apple can be seen to have caused a change:

* In position 1 the force of gravity on the apple changes the shape of the branch it is hanging from, and also the shape of the apple (ever so slightly).
* In position 2 the force of gravity on the apple is increasing the speed of the apple.
* In position 3 the force of gravity on the apple changes the shape of the grass the apple is resting on, and also the shape of the apple.

If students have misunderstandings about identifying situations in which gravity is acting, it may be helpful to revise with them what forces do: ‘forces make things change’. The BEST diagnostic questions ‘Is it a force?’ and ‘What does this force do?’ in key concept ‘PFM1.1: What forces do’ can be used to do this.

Giving students the opportunity to describe how the force of gravity changes something in each of the three positions can help them to consolidate their understanding of gravity as a force that can act at a distance.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG), based on EPSE question F05-001

Images: Peter Fairhurst (UYSEG)

**References**

Driver, R., et al. (1994). *Making Sense of Secondary Science: Research into Children's Ideas,* London, UK: Routledge.

Ruggiero, S., et al. (1985). Weight, Gravity and air pressure: mental representations by Italian middle-school pupils. *European Journal of Science Education,* 7(2)**,** 181-194.

Stead, K. and Osborne, R. (1980). Gravity. Hamilton, New Zealand: LISP Working Paper 20, Science Education Research Unit, University of Waikato.