**Attractive forces**

What give rise to the force of attraction between electrons and the nucleus?

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

|  |  |  |
| --- | --- | --- |
| **A** | magnetism |  |
|  |  |  |
| **B** | gravity |  |
|  |  |  |
| **C** | electric charge |  |
|  |  |  |

*Chemistry > Big idea CPS: Structure and properties > Topic CPS6: Periodic Table > Key concept CPS6.1: Atomic model*

|  |
| --- |
| **Diagnostic question** |
| **Attractive forces** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | The structure of an atom may be represented by an atomic model. |
| Observable learning outcome: | Identify the force of attraction between electrons and the nucleus as being due to electric charge. |
| Question type: | simple multiple choice |
| Key words: | magnetic, gravitational, electrostatic, electromagnetic |

**What does the research say?**

Research (Taber, 2013) compared student understanding of the components of a simple solar system and a simple atomic system. Nearly all students in the study could identify the type of force acting in the solar system (gravity) but only a small proportion of students named a type of electrical force in the case of an atomic system. Many answers were vague, but the most common responses were gravity or magnetism.

**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*

If a teaching assistant is supporting some students, it may be beneficial to provide suitable prompt questions.

**Expected answers**

C Electric charge

**How to respond - what next?**

A student who suggests that the force of attraction is due to gravity may hold a mental model of an atom that is analogous to the solar system. It may help to point out differences between the two, especially that the electrons and nucleus are electrically charged.

If students have misunderstandings about the type of force between the nucleus and electrons it may help to revisit ideas about static electricity (see key concept PEM1.4).

The following BEST ‘response activities’ could be used in follow-up to this diagnostic question:

* Forces of attraction

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**References**

Taber, K. S. (2013). Upper secondary students' understanding of the basic physical interactions in analogous atomic and solar systems. *Research in Science Education,* 43**,** 1377-1406.