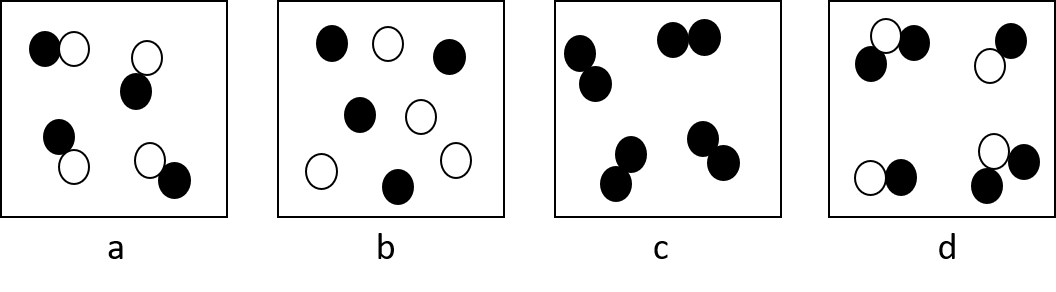
**Element, mixture or compound?**

1. Which of the following diagrams represent one or more compounds?



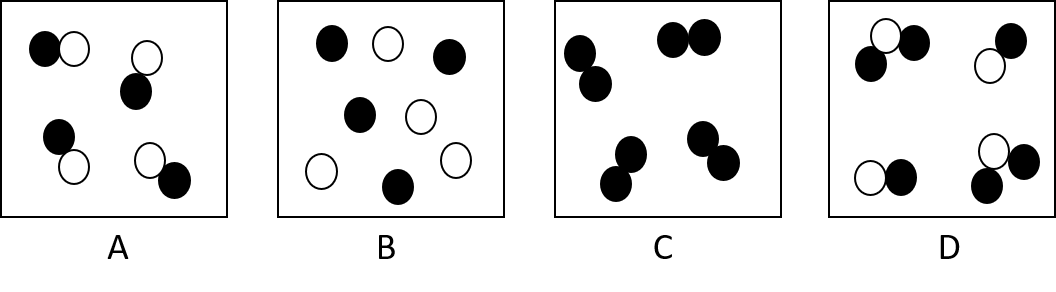
A a, b and d

B a, c and d

C a and d

D c only

1. Which statement best describes what this diagram represents?



A a single compound

B a mixture of elements

C a mixture of compounds

D a mixture element and compounds

*Chemistry > Big idea CPS: Particles and structure> Topic CPS2: Elements and compounds > Key concept CPS2.1: Atoms and molecules*

|  |
| --- |
| **Diagnostic question** |
| **Element, mixture or compound?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | The properties of elements and compounds arise from the structural arrangement of their constituent atoms. |
| Observable learning outcome: | Distinguish particle diagrams for elements, mixtures and compounds. |
| Question type: | simple multiple choice |
| Key words: | element, mixture, compound, atom, molecule |

**What does the research say?**

Research carried out through the Children’s Learning in Science Project (Briggs and Holding, 1986) showed that a large proportion of students failed to appreciate that two circles in contact represented atoms that were linked-up (combined). Instead, they regarded the atoms as being intermingled in some way. This led to confusion for students in distinguishing a diagram showing a single compound made up of molecules containing two different types of atom with another diagram showing a mixture of atoms of two elements.

Whereas some students focused on the diagram showing two different types of atoms in order to identify a compound, a small proportion considered that a diagram of a diatomic element represented a compound. These students had recalled the need for atoms to be joined in order to form a compound but not that these atoms must be different.

A very small proportion of students confused a representation of a single compound with an element explaining that the ‘molecules were the same’.

**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.

**Expected answers**

1. C
2. C

**How to respond - what next?**

If students have misunderstandings about how different elements and compounds are represented in diagrams, it may help to clarify any common misunderstandings about the diagrams before providing further opportunity to practise. The following BEST ‘response activities’ could be used in follow-up to this diagnostic question:

* Diagram practice

**Acknowledgments**

Developed by Helen Harden (UYSEG), from an idea by the Children’s Learning in Science Project.

Images: Helen Harden

**References**

Briggs, H. and Holding, B. (1986). *Children's Learning in Science Project. Aspects of secondary students' understanding of elementary ideas in chemistry: Full repoty.* [Online]. Available at: <https://www.stem.org.uk/elibrary/resource/26944>.