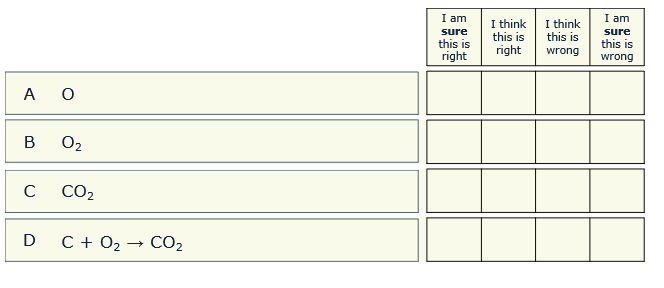
**Chemical formula?**

1. Which of the following shows a chemical formula?

*Tick a box to show how confident you are that each answer is right or wrong.*



*Chemistry > Big idea CPS: Particles and structure > Topic CPS2: Elements and compounds Key concept CPS2.2: Symbols and formulae*

|  |
| --- |
| **Diagnostic question** |
| **Chemical formula?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | A chemical formula provides information on the composition of a substance. |
| Observable learning outcome: | Recognise a chemical formula. |
| Question type: | confidence grid |
| Key words: | chemical formula |

**What does the research say?**

A research study (Al-Kunifed, Good and Wandersee, 1993) found that many students misunderstandings about chemical formulae related to previous every day and mathematical experience.

A chemical symbol was interpreted by some students in the same terms as a symbol met in day-to-day life. These students perceived a chemical formula as simply an abbreviation used because it would take chemists ‘too long to write out the words’. A proportion of students thought that a chemical formula was a chemical equation. This may be due to a prior concept of a (mathematical) formula.

Other students thought that only compounds have a formula (and hence that O2 was not a formula).

Whilst this study was relatively small in scale, a review of the empirical research (Taskin and Bernholt, 2012) details many similar misunderstandings found in more recent research.

**Ways to use this question**

Whilst initially students should complete this activity individually, further learning may be supported by discussion, in pairs or as a whole class, about the reasons behind students’ confidence in each answer.

*Differentiation*

Some students may need support in understanding how to complete the confidence grid.

**Expected answers**

O2 and CO2 are both examples of a chemical formula.

**How to respond - what next?**

A student who is confident that option A is a chemical formula is likely to have confused the term chemical formula with element symbol.

Labelling option B as ‘wrong’ but C ‘correct’ implies that a student may think that a formula only applies to a compound. It may be worth checking their understanding of what O2 represents.

At this early stage students are not expected to have formally met a chemical equation, however they may have seen one. Confidence that option D is correct suggests that the student may be applying mathematical prior knowledge of a formula to a chemistry context.

If students have misconceptions about what constitutes a chemical formula, this may be reinforced through future teaching.

**Acknowledgments**

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Images: None

**References**

Al-Kunifed, A., Good, R. and Wandersee, J. (1993). Investigation of high school chemistry students' concepts of chemical symbol, formula and equations: Students' prescientific conceptions. ERIC Document ED376020.

Taskin, V. and Bernholt, S. (2012). Students' understanding of chemical formulae: A review of empirical research. *International Journal of Science Education,* 36(1)**,** 157-185.