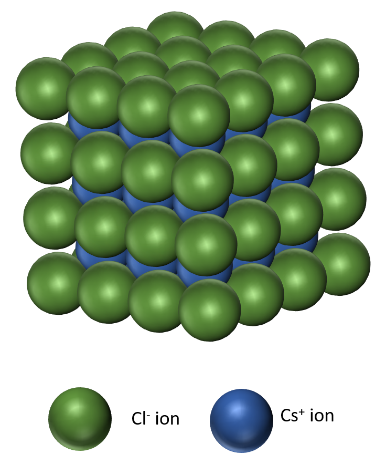
**Comparing lattices**

Sodium chloride and caesium chloride have different lattice structures.

A picture containing lined

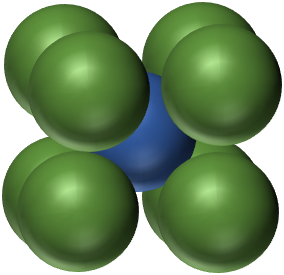
Description automatically generated

* 1. Count the number of chloride ions that surround a central sodium ion.

A picture containing indoor, green, dark

Description automatically generated

* 1. Count the number of chloride ions that surround a central caesium ion.



* 1. Explain why you think the two compounds have different arrangement of ions.

*Chemistry > Big idea CPS: Particles and structure > Topic CPS8: Ionic bonding > Key concept CPS8.1: Ionic lattice*

|  |
| --- |
| **Response activity** |
| **Comparing lattices** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Ionic bonding occurs due to the electrostatic attraction between oppositely charged ions in an ionic lattice. |
| Observable learning outcome: | Recognise that the number of ionic bonds formed by an ion is determined by the arrangement of ions in the lattice. |
| Activity type: | Challenge to thinking |
| Key words: | Ion, bond charge, lattice |

This activity can help develop students’ understanding by addressing the misunderstandings revealed by the following diagnostic question:

* Comparing ions

|  |  |
| --- | --- |
| **B** | **BRIDGING**  This activity explores ideas that are usually taught at age 16-19, to build a bridge to later stages of learning. |

**What does the research say?**

In their chapter on bonding Taber and Coll (2002) cite research by John Oversby (1996) which found that even after university teaching some post-graduate trainee teachers considered some alternative conceptions about ionic bonding to be acceptable. As discussed in a paper by Taber, Tsaparlis and Nakiboğlu (2012) the key misunderstanding was that an ionic bond only exists where an electron has been transferred. This leads to the further alternative conception that where electron transfer has not occurred, ions were held together by “forces of attraction” and not bonds. The trainee teachers also incorrectly deduced that ions could only bond to the number of counter ions allowed by their valency.

**Ways to use this activity**

This activity gives you the opportunity to explore and extend your students’ understanding through a structured teacher led discussion.

If using the print resource, you will need to ask students to decide whether the following statement is true or false.

*Sodium ions (Na+) and caesium ions (Cs+) form the same number of ionic bonds with chloride ions (Cl).*

You may wish to ask students to explain the reasoning behind their initial answer to the question before moving on to the ionic lattice diagrams which have been selected to challenge students’ thinking. This activity also provides an opportunity to bridge the gap to further study of unit cells and coordination numbers.

*Differentiation*

It may help some students to have a physical model of each structure to make counting the nearest neighbours easier. It could also be possible for students to construct the two structures using modelling material.

**Expected answers**

**1a** A sodium ion is surrounded by six chloride ions.

**b** A caesium ion is surrounded by eight chloride ions.

**c** The lattice structures are different because a caesium ion is larger than a sodium ion.

**Acknowledgments**

Developed by Helen Harden (UYSEG)

Images: Helen Harden and Peter Fairhurst (UYSEG)

**References**

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