A4 · Ionic lattices and the properties they explain · Worked examples and practice

Name: _____ Date: _____

Worked examples

Read these first. There is one for each kind of question in this lesson.

Example 1 · Compare the melting points of two ionic compounds

Potassium chloride and potassium iodide are both ionic. A chloride ion is smaller than an iodide ion. Predict which has the higher melting point.

1. Write the ions of each compound, with charges: K^+ and Cl^-; K^+ and I^-.
2. Compare the charges: both have 1+ and 1−, so the charges are the same.
3. Compare the sizes: the chloride ion is smaller. Smaller ions sit closer and pull more strongly.
4. State which melts higher, and why: potassium chloride, because its ions are smaller.
5. Check: only one thing differs between the two compounds, the size.

Answer: Potassium chloride has the higher melting point.

Example 2 · Explain a property with the lattice

Explain why a solution of potassium chloride in water conducts electricity.

1. Water pulls the ions out of the lattice.
2. The ions spread through the water and are free to move.
3. Moving ions carry electricity.

Answer: The dissolved ions are free to move, so the solution conducts.

Practice

Questions 1 to 4 are easy. Questions 5 to 8 are medium. Questions 9 and 10 are harder.

EASY

1. What is a crystal lattice?

EASY

2. Name three properties of an ionic solid.

EASY

3. Crystals of potassium bromide are stirred into water and seem to vanish. Explain what happened to the ions.

EASY

4. In a crystal lattice, what surrounds each positive ion? Say what this means for the pull on each ion.

MEDIUM

5. Explain why an ionic solid has a high melting point.

MEDIUM

6. Solid sodium chloride does not conduct electricity. Melted sodium chloride does. Explain why.

MEDIUM

7. Sodium chloride and sodium bromide both have ions with charges 1+ and 1−. A chloride ion is smaller than a bromide ion. Predict which has the higher melting point. Explain.

MEDIUM

8. Sodium fluoride has the ions Na^+ and F^-. Magnesium oxide has the ions Mg^{2+} and O^{2-}. The ions are close in size. Predict which melts at the higher temperature. Explain.

HARDER

9. Calcium chloride is spread on icy roads. Name the property of ionic compounds that this use depends on. Then explain what happens to the ions.

HARDER

10. A solid is hard and shatters when hit. It has a high melting point. It conducts electricity only when melted or dissolved. Say what kind of compound it is. Then explain the last property.