

Name: _____

Class: _____

Experiment worksheet

3.5 Metal cations and non-metal anions combine to form ionic compounds

Pages 78–79 and 197

Experiment 3.5: Conductivity of ionic compounds

Aim

To investigate the electrical conductivity of two ionic compounds as a solid and in aqueous solution.

Materials

- Large sodium chloride crystals
- Coarse sea salt crystals
- Small Petri dish
- 4 V battery or other 4 V DC power source
- Ammeter
- Wires with alligator clips
- 2 graphite electrodes
- 3 × 100 mL beakers
- Large spatula
- Glass stirring rod
- Paper towel

Method

- 1 Set up the electrical circuit as shown in Figure 1. Have your teacher check that it is correct before proceeding. Ensure that you know how to use the ammeter and its scales correctly.



Figure 1 Experiment set-up.



Name: _____

Class: _____

- 2 Using the spatula, place the largest sodium chloride crystal onto the Petri dish, then touch each end with an electrode, making sure that the two electrodes do not touch each other. Does the crystal conduct electricity? If it doesn't appear to, connect the wire to the more sensitive scale on the ammeter. Does a reading register now? Record your result.
- 3 In a 100 mL beaker, place half a large spatula of sodium chloride crystals and add 50 mL of water. Stir to dissolve the crystals.
- 4 Place the electrodes into this solution, again ensuring they do not touch each other. Does the solution conduct electricity? If it doesn't appear to, connect the wire to the more sensitive scale on the ammeter. Does a reading register now? Record your result.
- 5 Turn off the power supply and rinse the electrodes with fresh tap water, then dry them with a paper towel.

Inquiry

What if large coarse sea salt was used?

- 1 Write a hypothesis for your question.

- 2 What is your independent variable?

- 3 What is your dependent variable?

- 4 List three variables that you will need to control. How will you control them?

- 5 Record your observations in a table.

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Name: _____

Class: _____

Results

Devise a simple table or spreadsheet in which to record your results.

Discussion

- 1 Sea salt is a mixture of different ionic compounds, including sodium chloride. What can you conclude about the ability of solid ionic compounds to conduct electricity, whether they are pure or mixed together?

- 2 What effect does dissolving an ionic compound in water have on its ability to conduct electricity?

- 3 To conduct electricity, a substance must have charged particles that can move about. Suggest an explanation for your findings.

- 4 The melting point of sodium chloride is 801°C , so it is not practical to melt it in the school laboratory. Predict whether molten sodium chloride would conduct electricity and justify your answer.

Conclusion

- 5 What do you know about the conductivity of ionic compounds?
