What Carries Current?

Test whether dissolving in water makes a substance conductive.

CHE.8.4 "Design, conduct, and communicate the results of experiments to test the conductivity of common ionic and covalent compounds in solution."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the steps that make the test fair, circle each conductivity reading, and number two statements the team could use in its conclusion.

The Science Fair Claim

1. At a school science fair, a student claims that any substance that disappears in water will carry an electric current. Mara's team designs a test using four clear cups: distilled water, sodium chloride solution, sodium bicarbonate solution, and sucrose solution. They dissolve 2.0 g of each solid in a separate 100 mL portion of distilled water; the fourth cup holds 100 mL of distilled water alone. The team uses a low-voltage conductivity probe, never a wall outlet. They keep probe depth and water volume the same and rinse and dry the probe between cups to prevent contamination.

2. Before testing, the team predicts that sodium chloride and sodium bicarbonate will conduct because their dissolved particles include mobile ions. They predict that sucrose will not conduct detectably because its dissolved molecules remain neutral. The probe reads 0.0 millisiemens per centimeter for distilled water, 31.0 for sodium chloride solution, 14.0 for sodium bicarbonate solution, and 0.0 for sucrose solution. These readings describe conductivity, not how quickly each solid dissolved. Each cup is tested three times; repeat readings vary by less than 1.0 millisiemens per centimeter. The team records every reading, not just the strongest one.

3. The team reports that both tested ionic compounds conducted in water, while the tested covalent compound did not conduct detectably. Dissolving alone therefore did not predict conductivity in this test. Sodium chloride and sodium bicarbonate separate into charged ions in water; dissolved sucrose remains as neutral molecules. The team also notes a limit: one covalent compound cannot represent every covalent compound, since some covalent substances form ions when mixed with water. If a sample gives an unexpected reading, they would repeat it with clean equipment and compare it with the distilled-water baseline before changing their explanation.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why did the team test distilled water alone, and how should they use its reading when interpreting the solutions?

2. Suppose the team did not rinse the probe after testing sodium chloride solution. How might that affect the sucrose result?

3. Write one sentence comparing the two ionic solutions with the sucrose solution. Include all three readings.

4. Why does the sucrose result not prove that every covalent substance gives a 0.0 reading in water?

3 YOUR TURN

Your own words

Design a new experiment to compare magnesium sulfate, an ionic solid, with glycerol, a covalent liquid, in water. In 5 to 6 sentences, give a prediction, a safe and fair procedure, the readings you would record, and how you would report a conclusion without inventing results.

What Carries Current?

PART 1 · READ AND MARK

Underline the steps that make the test fair, circle each conductivity reading, and number two statements the team could use in its conclusion. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why did the team test distilled water alone, and how should they use its reading when interpreting the solutions?	**Distilled water provides a baseline reading of 0.0 millisiemens per centimeter. The team can compare each solution's reading with that baseline.**
2	Suppose the team did not rinse the probe after testing sodium chloride solution. How might that affect the sucrose result?	**Sodium chloride left on the probe could enter the sucrose solution and raise its reading, making the test unfair.**
3	Write one sentence comparing the two ionic solutions with the sucrose solution. Include all three readings.	**Sodium chloride solution read 31.0 and sodium bicarbonate solution read 14.0 millisiemens per centimeter, while sucrose solution read 0.0 millisiemens per centimeter.**
4	Why does the sucrose result not prove that every covalent substance gives a 0.0 reading in water?	**The team tested only one covalent compound, and some covalent substances form ions when mixed with water.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I predict magnesium sulfate solution will conduct more than glycerol solution because it supplies mobile ions. I will mix 2.0 g of each substance separately with 100 mL of distilled water and prepare a third cup of distilled water alone. I will use a low-voltage probe, not a wall outlet, and hold its depth constant in each cup. I will rinse and dry the probe between cups and test each cup three times. I will record all conductivity readings in millisiemens per centimeter and compare each solution with the water baseline. I will report whether the measured readings support my prediction and note that my conclusion applies only to the substances tested.

Accept equivalent explanations of baseline, contamination, and the limits of the conclusion. In Part 3, accept other controlled quantities and recording methods if the procedure compares solutions fairly and does not present predicted readings as measured results.