

Song of the Ionic Compound



Introduction

How science-savvy are most musicians? Can a singer tell the difference between an ionic and covalent compound when dissolved in solution?

Concepts

- Covalent compounds
- Ionic compounds
- Flow of electrons

Background

In covalently bonded compounds, valence electrons are shared between the constituent atoms. In order to gain a stable outer electron shell, nonmetals will share electrons. Atoms do not always share electrons equally in a covalent bond. Some elements have a greater attraction than other elements for the shared electrons. The property of attracting electrons in a covalent bond is called an atom's electronegativity.

An ionic compound is formed when elements gain or lose electrons to form ions with a stable number of valence electrons, according to the octet rule. When atoms gain or lose electrons, they become ions, atoms with an electrical charge. When dissolved in water, ionic compounds separate into positively charged ions called cation and negatively charged ions called anions. It is this charge that allows electricity (electrons) to flow in a solution containing an ionic compound.

Materials

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| Beakers, 250-mL, 4 | Sugar, 100 g |
| Music source with external speaker, battery operated | Water, distilled or deionized |
| Salt, 100 g | Wire cutters |

Safety Precautions

Although the materials in this experiment are considered nonhazardous, please use all normal laboratory safety precautions. Only use battery operated devices. Do not use a music source that plugs into an outlet. Wash hands thoroughly with soap and water after performing laboratory experiments.

Preparation

1. Place about 100 g of the salt into a 250-mL beaker.
2. Place about 100 g of the sugar into another 250-mL beaker.
3. Fill the remaining two beakers half-full with distilled water.
4. Cut one of the speaker wires so that the circuit is not complete and the speaker will not play.

Procedure

1. Turn on the radio or CD player and touch the disconnected speaker wires together to show the students that the speaker will play when the circuit is completed.
2. Ask students if water conducts electricity. Most will probably answer "yes." However, pure water is a covalently bonded molecule and will not conduct electricity.
3. Submerge the two speaker wires into the water, about an inch apart. If water conducts electricity then the stereo should play. Does it?
4. Hold up the two beakers containing sugar and salt.
5. Ask the students if they can tell which beaker contains salt and which one contains sugar. Can they tell?
6. Ask students if they think that their favorite artist can tell the difference between the salt and sugar in the beakers. This

might be a good time to remind them that sugar is a covalent compound and salt is an ionic compound.

7. Reassure them that musical artists can tell the difference between ionic and covalent compounds. They will remain quiet if the compound is covalent and they will sing if the compound is ionic.
8. Add sugar to the water and stir to dissolve as much sugar as possible until no more will go into solution.
9. Based on the result of adding sugar to the water and the absence of sound, ask the students to determine whether the substance added was ionic or covalent, salt or sugar.
10. Rinse the speaker wires with distilled water.
11. Submerge the two speaker wires into the other beaker of distilled water, about an inch apart.
12. Add salt to the water and stir to dissolve as much salt as possible.
13. Based on the result of adding salt to the water and the increase in volume, ask the students to determine whether the substance added was ionic or covalent, salt or sugar.

Disposal

It is recommended that you consult your local school board and/or municipal regulations for proper disposal methods that may apply before proceeding.

Tips

- Splitting one of the leads on a small DC light connected to a battery will also work. The light should be illuminated in the presence of an ionic compound but not for a covalent compound.
- Speaker wire may be obtained at many super stores or hobby stores.

Materials for *Song of the Ionic Compound* are available from Flinn Scientific Canada Inc.

Catalogue No.	Description
SJ0064	Sodium Chloride, Laboratory Grade, 2 kg
SJ0135	Sucrose, Laboratory Grade, 1 kg

Consult www.flinnsci.ca or your *Flinn Scientific Canada Catalogue/Reference Manual* for current prices.