

**HANDS-ON LAB****Analyzing the Properties of Compounds**

Differences in the structures of compounds at the atomic level cause the differences that are observed at the macroscopic scale. One physical property that varies widely among different materials is melting point. As such, melting point is an example of a physical property that scientists can use to identify an unknown compound. Other physical properties, such as density, boiling point, and electrical conductivity, can also be analyzed to help verify the identity of the compound.

Knowing physical properties of compounds also allows scientists to identify possible uses of the compound. Additionally, knowing these properties allows scientists to properly store and handle compounds and can help determine how to clean up or dispose of the material in the event of a spill.

RESEARCH QUESTION How does a compound's atomic-level structure influence its use in natural or human-designed systems?

MAKE A CLAIM

In this lab you will compare the melting points of three common substances: citric acid, $C_6H_8O_7$; paraffin wax, $C_{31}H_{64}$; and table salt, NaCl. Which one do you think will have the highest melting point? Which one will have the lowest? Explain.

MATERIALS

- indirectly vented chemical splash goggles, nonlatex apron, nitrile gloves
- aluminum foil
- Bunsen burner
- citric acid, small amount
- paraffin wax, small amount
- permanent marker
- ring stand, ring, and clamp
- salt, small amount
- spatula or scoop
- striker
- wire gauze

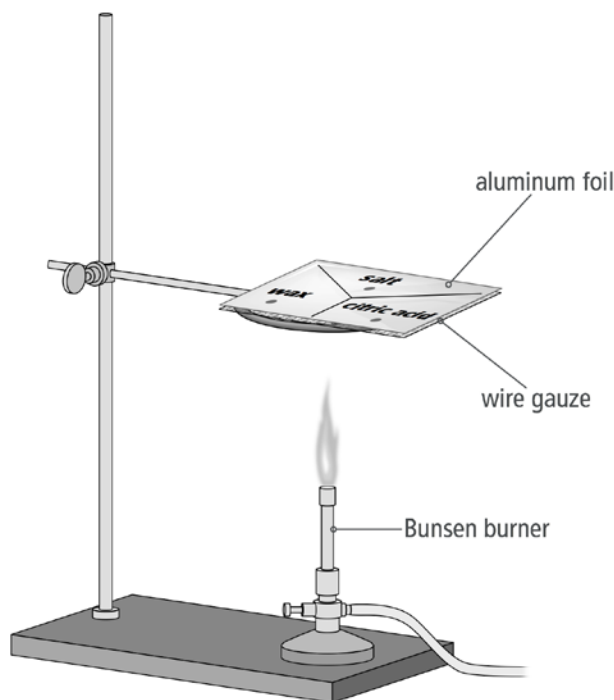
**SAFETY INFORMATION**

- Wear indirectly vented chemical splash goggles, a nonlatex apron, and nitrile gloves during the setup, hands-on, and takedown segments of the activity.
- Secure loose clothing, wear closed-toe shoes, and tie back long hair.
- Use caution when working with Bunsen burners because this heat source can seriously burn skin and clothing.
- Never eat any food items used in a lab activity.
- If you get a chemical in your eye, use an eyewash station immediately.
- Never pour chemicals, either used or unused, back into their original containers. Dispose of chemicals according to your teacher's instructions.
- Wash your hands with soap and water immediately after completing this activity.

COLLECT DATA

Construct a data table in your Evidence Notebook to record the findings from your investigation. Your data table will record the melting order of the three substances. It should do so with both qualitative and quantitative data. Consider how you will determine when a substance begins to melt and whether or not it matters how long it takes to melt completely. Have your teacher approve your data table and data-collection plans.

Figure 1: Experimental setup



CARRY OUT THE INVESTIGATION

1. Use a marker to divide a square piece of aluminum foil into three sections. Label the sections *salt*, *wax*, and *citric acid*. Fold the edges up to keep melted wax from spilling.
2. Use a spatula to transfer a very small (less than pea-sized) amount of each substance onto the foil. Be sure to clean and dry the spatula between each substance.
3. Set up a ring stand as shown in **Figure 1**. Adjust the ring's height so that the Bunsen burner can fit under it.
4. Place a piece of wire gauze on top of the ring, and carefully place the aluminum foil on top of the gauze.
5. Secure loose clothing and tie back hair. Light the Bunsen burner, and carefully place it under the wire gauze. Observe the order in which the substances melt. Record the melting order in the data table.
6. Turn off the Bunsen burner immediately after the first two substances have melted. Dispose of your materials as instructed by your teacher.

ANALYZE

Choose one of the substances tested in the lab, and sketch the particles in the substance before, during, and after being heated.

DRAW CONCLUSIONS

The melting point of a substance is related to the strength of attractive forces between the particles that make up that substance. Write a conclusion that addresses each of the points below.

Claim Which substance tested in this investigation has the strongest attractive forces between its particles? Which substance has the weakest?

Evidence Give specific examples from your data to support your claim.

Reasoning Explain how the evidence you gave supports your claim. Describe, in detail, the connections between the evidence you cited and the argument you are making.