

# Physical Properties of Matter

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## CHAPTER

## 1

# Physical Properties of Matter

- Define physical property.
- Give examples of physical properties of matter.



Both of these people are participating in a board sport, but the man on the left is snowboarding in Norway while the woman on the right is sandboarding in Dubai. Snow and sand are both kinds of matter, but they have different properties. What are some ways snow and sand differ? One difference is the temperature at which they melt. Snow melts at  $0^{\circ}\text{C}$ , whereas sand melts at about  $1600^{\circ}\text{C}$ ! The temperature at which something melts is its melting point. Melting point is just one of many physical properties of matter.

## What Are Physical Properties?

**Physical properties** of matter are properties that can be measured or observed without matter changing to an entirely different substance. Physical properties are typically things you can detect with your senses. For example, they may be things that you can see, hear, smell, or feel.

**Q:** What differences between snow and sand can you detect with your senses?

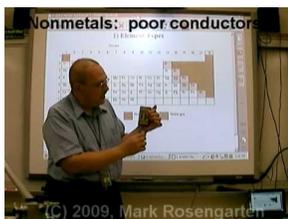
**A:** You can see that snow and sand have a different color. You can also feel that snow is softer than sand. Both color and hardness are physical properties of matter.

## Additional Physical Properties

In addition to these properties, other physical properties of matter include the state of matter. States of matter include liquid, solid, and gaseous states. For example at  $20^{\circ}\text{C}$ , coal exists as a solid and water exists as a liquid. Additional examples of physical properties include:

- odor
- boiling point
- ability to conduct heat
- ability to conduct electricity
- ability to dissolve in other substances

Some of these properties are illustrated in the **Figures 1.1, 1.2, 1.3, and 1.4.**



## MEDIA

Click image to the left or use the URL below.

URL: <https://www.ck12.org/flx/render/embeddedobject/54890>

### Chlorinated Water



### Bottled Water



## FIGURE 1.1

The strong smell of swimming pool water is the odor of chlorine, which is added to the water to kill germs and algae. In contrast, bottled spring water, which contains no chlorine, does not have an odor.

## Boiling Point



## FIGURE 1.2

Coolant is added to the water in a car radiator to keep the water from boiling and evaporating. Coolant has a higher boiling point than water and adding it to the water increases the boiling point of the solution.

**Q:** The coolant that is added to a car radiator also has a lower freezing point than water. Why is this physical property useful?

**A:** When coolant is added to water in a car radiator, it lowers the freezing point of the water. This prevents the water in the radiator from freezing when the temperature drops below  $0^{\circ}\text{C}$ , which is the freezing point of pure water.

**Q:** Besides being able to conduct electricity, what other physical property of copper makes it well suited for electric wires?

**A:** Copper, like other metals, is ductile. This means that it can be rolled and stretched into long thin shapes such as wires.

## Ability to Conduct Heat



**FIGURE 1.3**

This teakettle is made of aluminum except for its handle, which is made of plastic. Aluminum is a good conductor of heat. It conducts heat from the flames on the range to the water inside the kettle, so the water heats quickly. Plastic, on the other hand, is not a good conductor of heat. It stays cool enough to touch even when the rest of the teakettle becomes very hot.

### Summary

- Physical properties of matter are properties that can be measured or observed without matter changing to an entirely different substance. Physical properties are typically things you can detect with your senses.
- Examples of physical properties of matter include melting point, color, hardness, state of matter, odor, and boiling point.

### Review

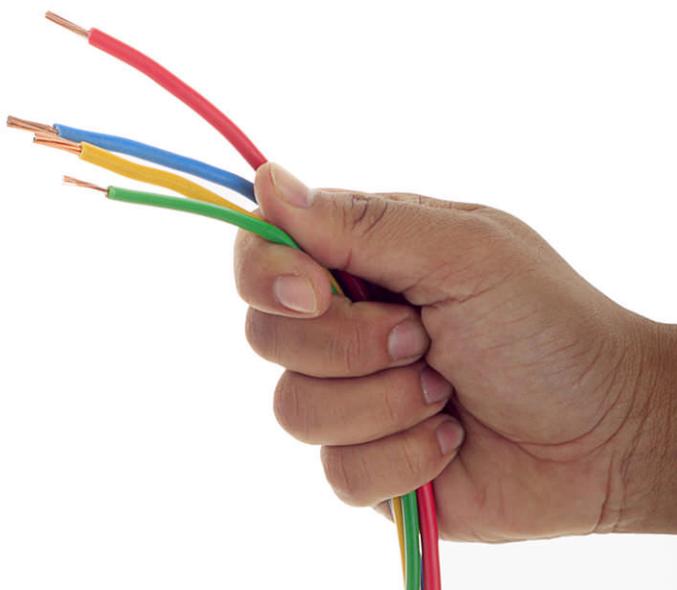
1. What is a physical property of matter?
2. List three examples of physical properties.
3. Compare and contrast two physical properties of apples and oranges.

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### References

1. Swimmer: Patrick Fitzgerald; Water bottle: Steven Depolo. [Odor of water](#) . CC BY 2.0
2. Flickr: EvelynGiggles, modified by CK-12 Foundation. [Antifreeze raises the boiling point of coolant](#) . CC BY 2.0
3. Jim D (Flickr: jkdevleer04). [Plastic and aluminum in a kettle conduct heat differently](#) . CC BY 2.0

## Ability to Conduct Electricity



**FIGURE 1.4**

Copper is a good conductor of electricity. That's why electric wires are often made of copper. They are covered with a protective coating of plastic, which does not conduct electricity.

4. Image copyright pokchu, 2013. [Copper wires can conduct electricity well](#) . Used under license from Shutterstock.com