Name: _____ Date: _____

# Why Salt Melts Ice

Circle group

After a winter storm, road crews spread salt on icy streets. Before long, the ice starts to melt. This seems odd, since salt is not warm. The answer is in how water freezes.

Pure water freezes at zero degrees Celsius, or thirty-two degrees Fahrenheit. At that temperature, water molecules slow down and lock into the neat pattern of a crystal. Even in solid ice, a very thin film of liquid water usually covers the top. Molecules are always leaving the crystal and joining it again.

When salt touches the ice, it dissolves in that thin film. This makes salty water, called brine. The salt gets in the way. Water molecules that try to rejoin the crystal keep bumping into salt. So fewer of them can lock into place. Meanwhile, molecules keep breaking away from the ice. The balance tips toward melting. The freezing point of the mix drops below zero. Ice that was fine at thirty degrees Fahrenheit is now too warm to stay solid.

The melting takes heat from the surroundings. That is why a mix of ice and salt feels very cold. People use this trick in the kitchen. To make homemade ice cream, they pack ice and salt around the container. The cold brine freezes the cream.

Salt has limits. Road salt works well only down to about fifteen degrees Fahrenheit. On the coldest days, crews often spread sand. Sand does not melt ice, but it gives tires and shoes something to grip.

## Questions

**1. At what temperature does pure water freeze?**

_____

_____

**2. What is brine?**

_____

_____

**3. What happens to the freezing point of water when salt dissolves in it?**

_____

_____

**4. Why does a mix of ice and salt feel very cold?**

_____

_____

**5. How can salt melt ice when salt is not warm?**

_____

_____

**6. Why do crews sometimes spread sand instead of salt on very cold days?**

_____

_____

## Words to know

molecules: the tiny particles that make up water and other matter
crystal: a solid whose particles are arranged in a regular pattern
dissolves: mixes completely into a liquid and seems to disappear
brine: water that has a lot of salt in it
freezing point: the temperature at which a liquid turns solid

## Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

# Why Salt Melts Ice

Triangle group

After a winter storm, road crews spread salt on icy streets, and before long the ice begins to melt. This seems strange, because salt is not warm. The explanation lies in how water freezes.

Pure water freezes at zero degrees Celsius, or thirty-two degrees Fahrenheit. At that temperature, the water molecules slow down enough to lock into the regular pattern of a crystal. Even in solid ice, however, a very thin film of liquid water usually covers the surface, and molecules are constantly leaving the crystal and rejoining it.

When salt touches the ice, it dissolves in that thin film and makes salty water, called brine. The dissolved salt gets in the way. Water molecules that try to rejoin the crystal keep bumping into salt particles, so fewer of them can lock into place. Meanwhile, molecules on the ice continue to break away. The balance tips toward melting, and the freezing point of the mixture drops below zero. Ice that was perfectly happy at thirty degrees Fahrenheit finds itself too warm to stay solid.

The melting itself takes heat from the surroundings, which is why a mix of ice and salt feels very cold. People use this trick in the kitchen. When making homemade ice cream, they pack ice and salt around the container, and the chilly brine freezes the cream.

Salt has limits. Common road salt works well only down to about fifteen degrees Fahrenheit. On the coldest days, crews often spread sand instead, which does not melt the ice but gives tires and shoes something to grip.

## Questions

**1. At what temperature does pure water freeze?**

_____

_____

**2. What is brine?**

_____

_____

**3. What happens to the freezing point of water when salt dissolves in it?**

_____

_____

**4. Why does a mix of ice and salt feel very cold?**

_____

_____

**5. How does salt melt ice if salt is not warm?**

_____

_____

**6. Why do road crews sometimes spread sand instead of salt on very cold days?**

_____

_____

## Words to know

molecules: the tiny particles that make up water and other matter
crystal: a solid whose particles are arranged in a regular pattern
dissolves: mixes completely into a liquid and seems to disappear
brine: water that has a lot of salt in it
freezing point: the temperature at which a liquid turns solid

## Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

# Why Salt Melts Ice

Square group

Following a winter storm, road crews scatter salt across icy streets, and before long the ice begins to melt. This appears puzzling, because salt is certainly not warm, but the explanation lies in the way that water freezes.

Pure water freezes at zero degrees Celsius, or thirty-two degrees Fahrenheit. At that temperature, the water molecules slow down sufficiently to lock into the orderly pattern of a crystal. Even in solid ice, however, an extremely thin film of liquid water generally coats the surface, and molecules are constantly escaping from the crystal and rejoining it.

When salt touches the ice, it dissolves in that thin film and forms salty water, called brine. The dissolved salt interferes with the process. Water molecules attempting to rejoin the crystal repeatedly collide with salt particles, so fewer of them manage to lock into place, while molecules on the ice continue to break away. The balance shifts decisively toward melting, and the freezing point of the mixture falls below zero. Ice that was perfectly content at thirty degrees Fahrenheit suddenly finds itself too warm to remain solid.

The melting itself absorbs heat from the surroundings, which explains why a mixture of ice and salt feels bitterly cold. People exploit this effect in the kitchen. When making homemade ice cream, they pack ice and salt around the container, and the frigid brine freezes the cream.

Salt does have limitations. Common road salt works effectively only down to about fifteen degrees Fahrenheit. On the very coldest days, crews frequently spread sand instead, which does not melt the ice but does give tires and shoes something to grip.

## Questions

**1. At what temperature does pure water freeze?**

_____

_____

**2. What is brine?**

_____

_____

**3. What happens to the freezing point of water once salt has dissolved in it?**

_____

_____

**4. Why does a mixture of ice and salt feel bitterly cold?**

_____

_____

**5. How can salt melt ice even though salt is not warm?**

_____

_____

**6. Why do crews frequently spread sand rather than salt on the coldest days?**

_____

_____

## Words to know

molecules: the tiny particles that make up water and other matter
crystal: a solid whose particles are arranged in a regular pattern
dissolves: mixes completely into a liquid and seems to disappear
brine: water that has a lot of salt in it
freezing point: the temperature at which a liquid turns solid

## Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

# For the teacher: Why Salt Melts Ice

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

### Circle: Why Salt Melts Ice

Easier · 247 words · Flesch-Kincaid grade 4.6

1. Zero degrees Celsius, or thirty-two degrees Fahrenheit.
2. Salty water.
3. It drops below zero.
4. The melting takes heat from the surroundings.
5. It lowers the freezing point, so ice that was cold enough to stay solid is now too warm to stay solid.
6. Salt stops working well in extreme cold, but sand still helps tires and shoes grip.

### Triangle: Why Salt Melts Ice

This passage · 260 words · Flesch-Kincaid grade 7.5

1. Zero degrees Celsius, or thirty-two degrees Fahrenheit.
2. Salty water.
3. It drops below zero.
4. The melting takes heat from the surroundings.
5. It lowers the freezing point, so ice that was cold enough to stay solid is now too warm to stay solid.
6. Salt stops working well in extreme cold, but sand still helps tires and shoes grip.

### Square: Why Salt Melts Ice

Harder · 270 words · Flesch-Kincaid grade 10

1. Zero degrees Celsius, or thirty-two degrees Fahrenheit.
2. Salty water formed when salt dissolves in the thin film of liquid on the ice.
3. It falls below zero.
4. The melting absorbs heat from the surroundings.
5. It lowers the freezing point, so ice that was cold enough to stay solid is now too warm to remain solid.
6. Salt stops working effectively in extreme cold, but sand still gives tires and shoes something to grip.