Name: _____ Date: _____

How a Thermos Keeps Soup Hot for Hours

Circle group

A bowl of soup can stay hot for hours in a lunch bag. The secret is a vacuum flask. Many people call it a thermos. It stops heat from getting out in three ways.

Heat can move in three ways. It can pass through solid things. This is called conduction. It can ride along in moving air or liquid. This is called convection. It can also cross empty space as rays you cannot see. This is called radiation. A flask stops all three.

A flask is like a bottle inside another bottle. Between the two walls, almost all of the air is pumped out. This empty gap is called a vacuum. With so little air in it, almost nothing can carry heat out. The soup cannot easily pass its warmth to the outside.

The inner bottle often has a shiny coating, like a mirror. Shiny things bounce heat rays back. So the warmth goes back toward the soup.

The stopper closes the one opening where warm air could drift out.

The flask works the other way too. Cold lemonade stays cool, because heat from the outside air has a hard time getting in.

Questions

1. What do many people call a vacuum flask?

_____

_____

2. What are the three ways that heat can move?

_____

_____

3. What is pumped out from between the two walls?

_____

_____

4. Why does the empty gap stop heat?

_____

_____

5. What does the shiny coating do with heat rays?

_____

_____

6. Why does cold lemonade stay cool in a flask?

_____

_____

Words to know

vacuum: an empty space with almost no air in it
conduction: heat moving through a solid thing
convection: heat carried along by moving air or liquid
radiation: heat that crosses space as invisible rays
coating: a thin layer spread over a surface

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: _____

How a Thermos Keeps Soup Hot for Hours

Triangle group

A bowl of soup can stay hot for hours inside a lunch bag, and it almost seems like magic. The secret belongs to the vacuum flask, which many people call a thermos. It blocks heat in three different ways.

Heat can travel in three ways. It can pass through solid things, which is called conduction. It can ride along in moving air or liquid, which is called convection. It can also cross empty space as invisible rays, which is called radiation. A flask has a defense against each one.

A flask is built like a bottle inside another bottle. Between the two walls, almost all of the air has been pumped out. This empty gap is called a vacuum. With so little air in the gap, almost nothing is there to carry heat out by conduction or convection. The soup has a hard time passing its warmth to the outside.

That leaves radiation. To stop it, the inner bottle often has a shiny, mirror-like coating. Shiny surfaces bounce heat rays back instead of letting them escape, so much of the warmth is sent back toward the soup.

The stopper matters too. It closes the one opening where warm air could drift out. The same design works the other way around. A flask of cold lemonade stays cool because heat from the outside air has trouble getting in.

Questions

1. What do many people call a vacuum flask?

_____

_____

2. What are the three ways that heat can travel?

_____

_____

3. What has been pumped out from between the two walls of a flask?

_____

_____

4. Why does the empty gap slow down heat?

_____

_____

5. What does the shiny coating do with heat rays?

_____

_____

6. Why would a flask of cold lemonade stay cool?

_____

_____

Words to know

vacuum: an empty space with almost no air in it
conduction: heat moving through a solid thing
convection: heat carried along by moving air or liquid
radiation: heat that crosses space as invisible rays
coating: a thin layer spread over a surface

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: _____

How a Thermos Keeps Soup Hot for Hours

Square group

A bowl of soup can remain steaming hot for hours inside a lunch bag, which almost seems like magic. The secret belongs to the vacuum flask, which many people call a thermos, and it works by blocking heat in three different ways.

Heat is able to travel in three distinct ways. It can pass directly through solid materials, a process known as conduction. It can be carried along by moving air or liquid, which is called convection. It can also cross empty space in the form of invisible rays, which is called radiation. A well-made flask has a defense against each of these routes.

The flask is constructed like a bottle tucked inside another bottle. Between the two walls, nearly all of the air has been pumped away, leaving an empty gap known as a vacuum. Since so little air remains in that gap, almost nothing exists there to carry heat outward by conduction or convection, and the soup struggles to pass its warmth to the outside world.

That leaves radiation. To stop it, the inner bottle frequently has a shiny, mirror-like coating. Shiny surfaces bounce heat rays back instead of letting them slip through, so a good share of the warmth is sent straight back toward the soup.

Even the stopper plays a part, because it seals the one opening where warm air could otherwise drift out. The same clever design also works in reverse. A flask filled with cold lemonade stays cool for a long while, since heat from the surrounding air has trouble finding a way in.

Questions

1. What name do many people use for a vacuum flask?

_____

_____

2. Which three ways can heat travel, according to the passage?

_____

_____

3. What has been pumped away from the gap between the two walls?

_____

_____

4. Why does the vacuum make it hard for heat to leave by conduction or convection?

_____

_____

5. What happens to heat rays when they reach the shiny coating?

_____

_____

6. Why can the same design keep cold lemonade cool?

_____

_____

Words to know

vacuum: an empty space with almost no air in it
conduction: heat moving through a solid thing
convection: heat carried along by moving air or liquid
radiation: heat that crosses space as invisible rays
coating: a thin layer spread over a surface

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: How a Thermos Keeps Soup Hot for Hours

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

Circle: How a Thermos Keeps Soup Hot for Hours

Easier · 193 words · Flesch-Kincaid grade 2.9

1. A thermos.
2. Conduction, convection and radiation.
3. Almost all of the air.
4. There is almost nothing in it to carry the heat.
5. It bounces them back toward the soup.
6. Heat from the outside air has a hard time getting in.

Triangle: How a Thermos Keeps Soup Hot for Hours

This passage · 228 words · Flesch-Kincaid grade 4.8

1. A thermos.
2. Conduction, convection and radiation.
3. Almost all of the air.
4. There is almost nothing in it to carry heat by conduction or convection.
5. It bounces them back toward the soup.
6. Heat from the outside air has trouble getting in.

Square: How a Thermos Keeps Soup Hot for Hours

Harder · 262 words · Flesch-Kincaid grade 7.2

1. A thermos.
2. Conduction, convection and radiation.
3. Nearly all of the air.
4. Almost nothing is left in the gap to carry the heat.
5. They bounce back toward the soup.
6. Heat from the surrounding air has trouble finding a way in.