

# CONDUCTION

Name \_\_\_\_\_

<b>Fluid</b> A liquid or a gas (or a plasma).
<b>Vacuum</b> A space with no molecules, nothing
<b>Electromagnetic Wave</b> <ul style="list-style-type: none"><li>• Oscillating electric and magnetic energy.</li><li>• The only thing that can move through a vacuum.</li><li>• Radio waves, microwaves, infrared waves, visible light, ultraviolet, X-ray, gamma ray.</li></ul>

1. What is the physics word for *nothing*?
2. What is the physics word for all phases of matter except a solid?

## Heat transfer:

- When heat energy flows from one thing to another thing.
- One thing will go up in temperature, the other thing will go down.
- Heat usually transfers one of three ways: conduction, convection, and radiation.

<b>Heat Conduction</b>  Heat transfer through touching, Molecules on the surfaces collide and exchange kinetic energy.	<b>Examples</b>  - When you touch something and it is cold - When you touch something and it is hot!
<b>Heat Convection</b>  Heat transfer through fluid motion. Hot fluids rise, cold fluids fall.	<b>Examples</b>  - Above a heater it is warm because warm air rises. - Below a heater it is often cold
<b>Heat Radiation</b>  Heat transfer through an electromagnetic wave The only way that heat moves through a vacuum.	<b>Examples</b>  - The sun sends heat to the earth through electromagnetic waves (radiation) - Fire and other very warm things that light up bright red.

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3. Which is the only way that heat can travel through a vacuum?

4. Which type of heat transfer involves fluid motion?

5. Which type of heat transfer involves things *touching*.

## Heat Conduction

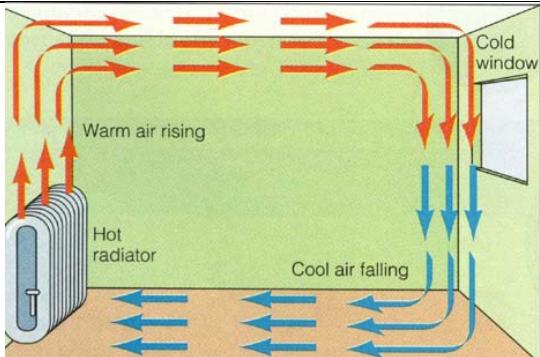


Touching ice: heat leaves your hands.



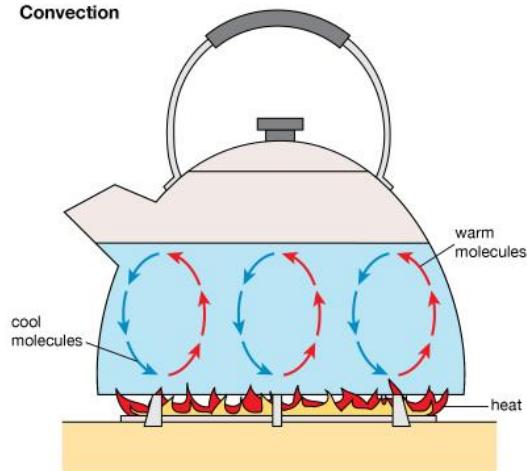
Heat goes into the chicken.

## Heat Convection



Warm air is rising, and cold air is falling.

## Convection

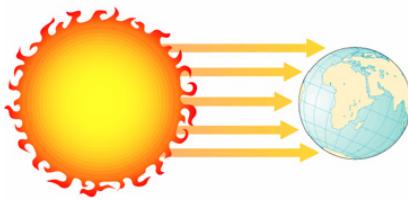


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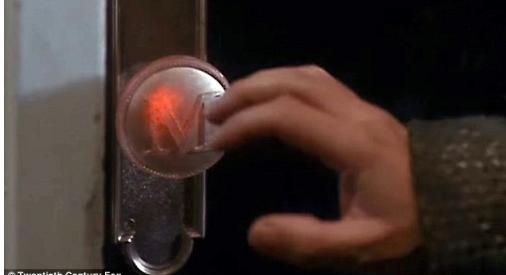
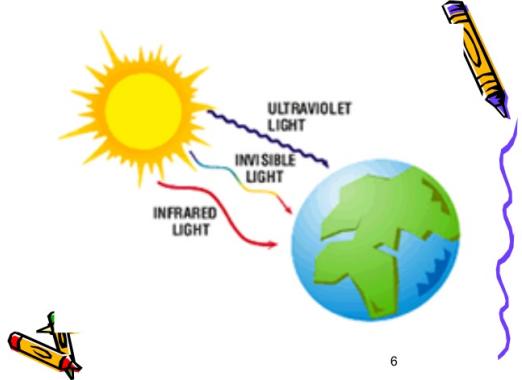
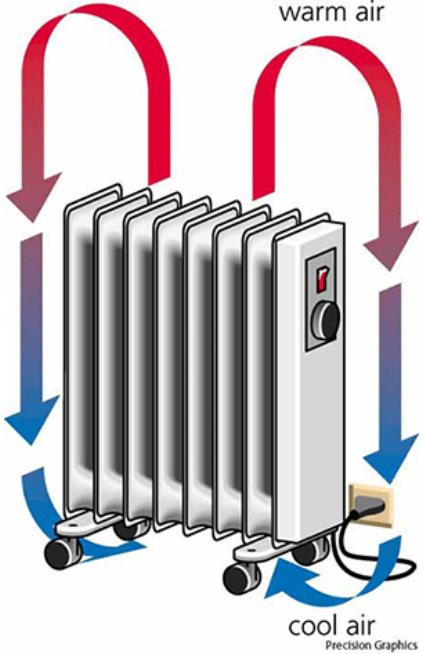
Water is also a fluid, so water can have convection also.

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Heat Radiation	
 <p>The sun sends heat to the earth through electromagnetic waves.</p>	 <p>A heat lamp.</p>

For each picture, write if it is *conduction*, *convection*, or *radiation*:

<p>6.</p>  <p>© Twentieth Century Fox</p>	<p>7.</p>  <p>6</p>
<p>8.</p>  <p>warm air</p> <p>cool air</p> <p>Precision Graphics</p>	<p>9.</p> 

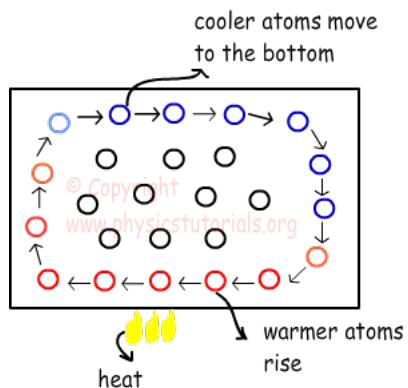
# CONDUCTION

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10.



11.



For each statement, write if it is *conduction*, *convection*, or *radiation*

12. Warm air coming out the heater:

13. Chicken touches a frying pan:

14. Heat from a microwave oven:

15. Heat that travels from the sun to the earth:

16. Drink a cold cup of water, and heat leaves you:

17. Warm water rises to the top of a pot of boiling water:

18. Give 2 real life examples of CONDUCTION:

19. Give 2 real life examples of CONVECTION:

20. Give 2 real life examples of HEAT RADIATION:

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## FIRE: all three types of heat transfer in one!

If you actually touch a fire, it is heat conduction:



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The air above a fire is warm because of heat convection:

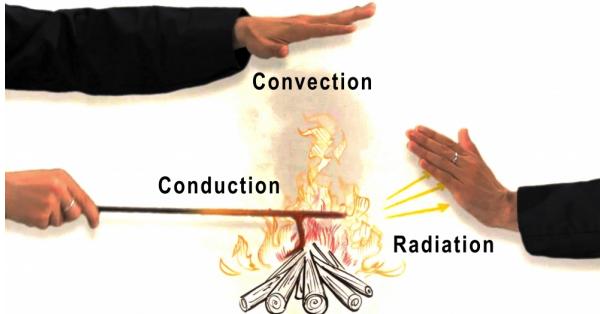


But the main way we are heated by fire is that it *radiates* heat in all directions. You can tell it is *radiating heat* because it is giving off so much LIGHT (electromagnetic waves!)



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A summary:



For each statement, write if it is *conduction*, *convection*, or *radiation*

21. You touch a fire:

22. Heat rises out the top of a fire:

23. Heat emanating out of the fire in all directions:

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## More conceptual Questions:

24. Imagine you are going to a football game in December.

It is really really cold.

You need to sit on a metal bleacher. How will it feel?

Is this....

- A. conduction
- B. convection
- C. radiation

Which of these things is happening?

A. heat is leaving your body

B. cold is entering your body

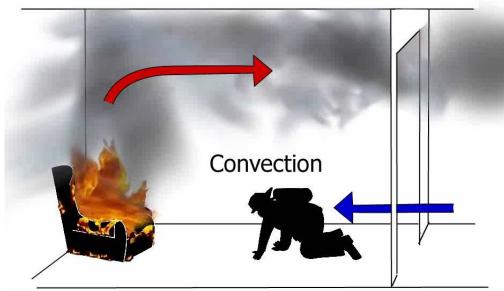
Why?



If you are smart, you brought a cushion!

How does the bleacher cushion keep you from freezing?

25.



In a fire, you are supposed to “Stop-Drop-and Roll”

Why do you need to *drop*?

Why is it important to be low and close to the ground?

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**26.** There are 7 types of electromagnetic wave!

Write them down in order from longest wavelength to shortest wavelength:

In physics, all seven of these are called RADIATION!

Note: when people say the word “radiation” in everyday life, they usually mean something scary and dangerous.

In physics, radiation is *not all bad*. (only three types are dangerous: ultraviolet, X-Ray, and gamma ray.)

**27.** What are some things that are *definitely not dangerous* that still count as *radiation* in physics class?

**28.** Things that are *radiating heat* are often bright red!



Which of the seven types of electromagnetic wave are they giving off?

**29.** A fire can heat you in all three ways, but typically, it heats by radiation. How can you tell that a fire is *radiating heat*?