Unit 2
Heat and Temperature

PART 1: How Humans Use Heat

Contents

1.What is Heat?

- Heat is a type of <u>energy.</u>
- Another word for heat is "Thermal Energy".
- You can have high levels of heat (feels hot) and low levels of heat (feels cold).
- Heat is a type of energy that can "move things", "melt things" and when taken away, it can "freeze things.

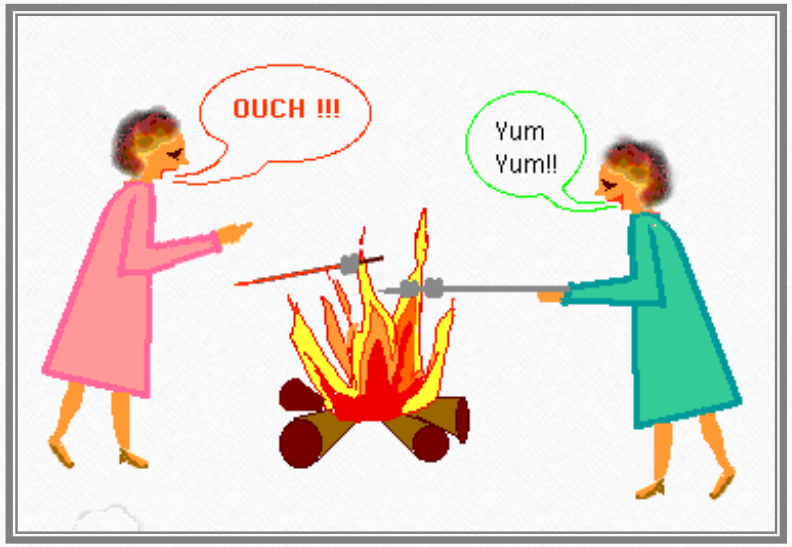
2. Heat Conductors vs Heat Insulators

Heat conductors are materials that pass heat easily through them. Metallic objects are excellent conductors.

Heat insulators are materials that block the flow of heat. Wood, Air, cotton, plastic, Styrofoam, Fiberglass, and rubber are excellent heat insulators.

Good Insulators are "Bad Conductors"!

Good conductors are "Bad Insulators"!



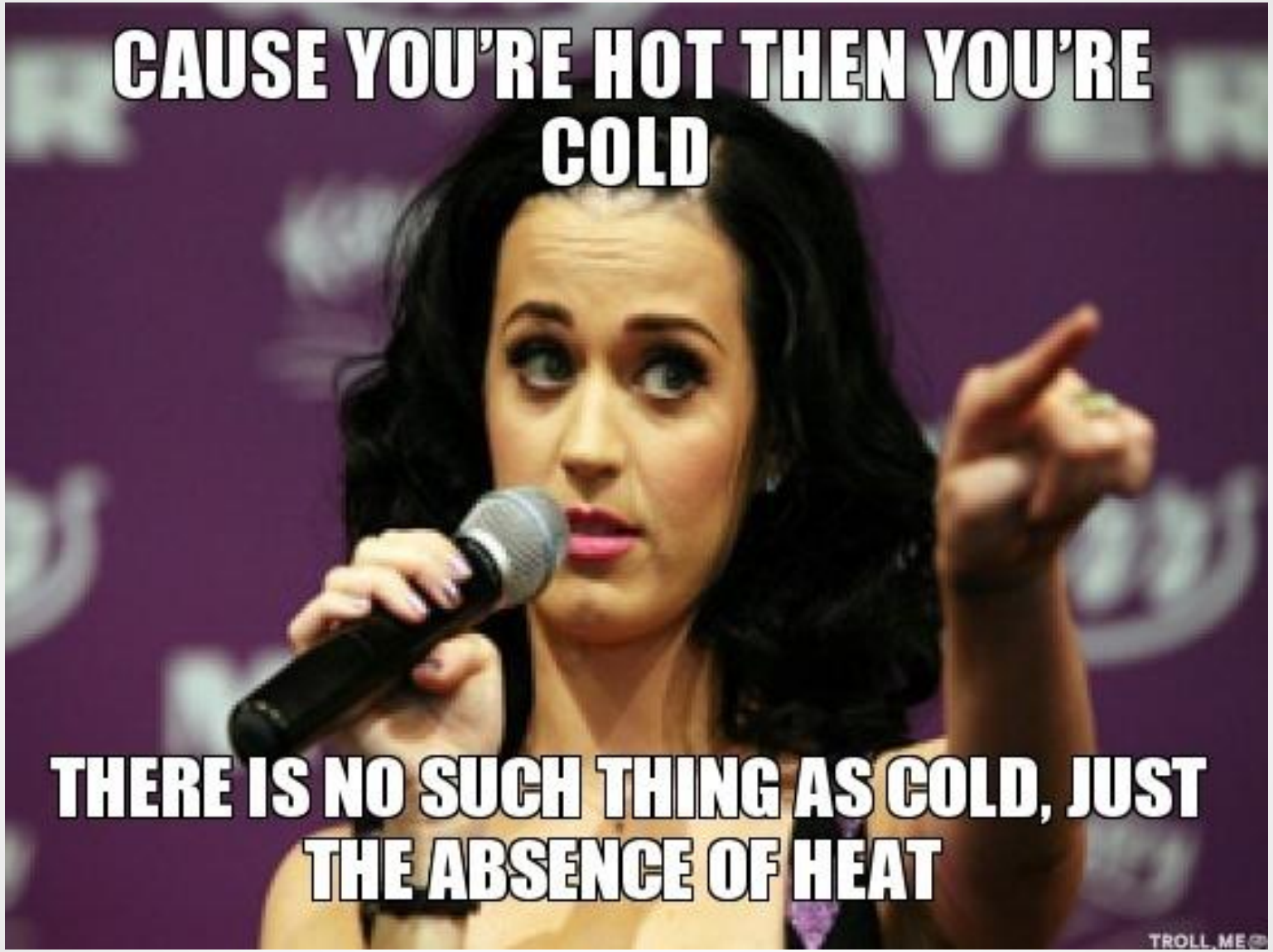
Which of these rods is a conductor of heat and which rod is an insulator of heat?

3. Does Hot and Cold Really Exist?

- No!
- Hot and cold are just sensations that our skin feels.
- Things <u>feel hot</u> to us when <u>heat</u> <u>enters</u> our skin.
- Things <u>feel cold</u> to us when heat <u>leaves</u> our skin.
- An ice cube isn't really cold, it is just really good at <u>stealing heat away</u> from your skin.
- A stove top is not really hot, it is just really good at passing heat <u>into</u> your skin because it is a good conductor of heat (metal).

Katy Perry agrees.

There is no such thing as cold.



Kid Burns His Bottom

The metal slide and the grass are at the same temperature. The metal slide is a good Conductor of heat. Meanwhile, the grass is a great Insulator of heat.

Which material do you think passed its heat to the boy's bottom?

2. Human Uses of Heat

A. Hair Dryers

B. Clothing Dryers

C. Oven Mittens

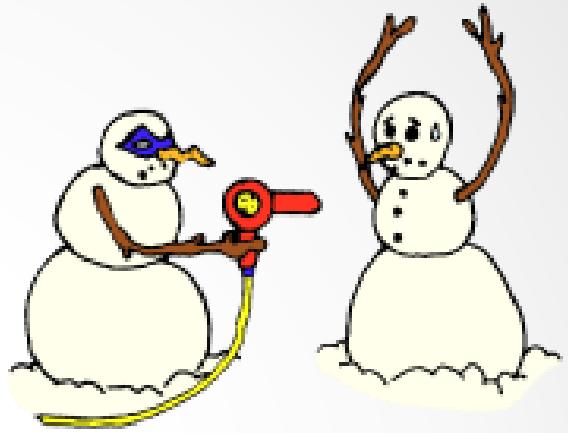
D. Snow Suits

E. Warm(???) Blankets

F. Ice Coolers

2. Human Uses of Heat

A. Hair Dryers

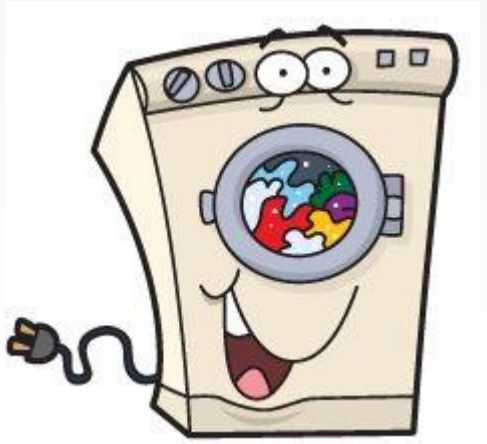


- **Problem:** Humans need needed to dry their hair quickly. Towel drying took too long.
- **Solution:** Convert Electricity into heat. Then pump it into wet hair.
- Hair dryers heat up water causing water to evaporate.
- Adding heat to snow causes the snow to melt. No kidding, Genius.

- **Key Point Here: "Blow dryers Add Heat to Stuff"**

2. Human Uses of Heat

B. Clothing Dryer



- **Problem:** Hanging wet clothes took too long to dry.
- **Solution:** Convert electricity into heat and pump it into the wet clothing.
- Adding heat to water causes water to evaporate.

- **Key Point Here: "Clothing dryers Add Heat to Stuff"**

2. Human Uses of Heat

C. Oven Mittens

- **Problem:** humans kept burning their hands on the stove.
- **Solution:** Create a mitten using a fabric that BLOCKS the flow of heat into your hand.

- **Key Point Here: "Oven Mitts BLOCK heat flow".**

Oven mitts are excellent Insulators **.**

3. Human Uses of Heat

D. Snow Suit

- **Common Misconception:** It feels cold in the winter because the cold enters your body making you shiver. This Is WRONG!
- **The Truth:** It only "feels" cold outside because your body LOSES heat quickly. Losing body heat makes you feel cold.
- **Solution:** Create a suit using materials that block heat from leaving your body.

- **Key Point Here: "Snow Suits BLOCK heat flow".**

Snow Suits are excellent Insulators **.**

3. Human Uses of Heat

E. Blankets

We are warm, but Not because the blankets are warm.

- **Common Misconception:** Blankets are warm.
- But aren't they?
- Nope!
- Blankets are the same temperature as other objects around them.
- **The Truth:** Blankets are good insulators. They block the flow of heat. The heat that your body makes is trapped by the blanket and so the heat stays close to your skin. That is why you feel warm.
- **Solution:** Use insulating fabrics to make a blanket.

- **Key Point Here: "Blankets BLOCK heat flow".**

Blankets are excellent Insulators **.**

4. Human Uses of Heat

-F. Thermos/Ice Cooler

- **Common Misconception:** Coolers keep things cold because they trap the cold inside. WRONG!
- **The Truth:** Coolers and thermoses work by blocking heat from entering the cooler. If heat enters the cooler it would absorb into the ice/drinks causing them to melt/warm up.
- **Solution:** Create a box using materials that BLOCK the flow of heat.

- **Key Point Here: "Ice Coolers/Thermoses BLOCK heat flow".**

Ice Coolers are excellent Insulators **.**

5. How Do We Generate Heat?

- One way to generate heat is to <u>burn</u> fuel.
  - ✓ Our bodies burn sugar and fat fuel to make heat.
  - ✓ We can <u>burn</u> wood (fuel) to make heat.
  - ✓ We can <u>burn</u> fossil fuels such as oil, gas, and coal.
- Heat can also be made using friction. Ex. Rubbing hands together will heat them up.
- We can also change ANY TYPE of energy into heat.
  - ✓ Ex. Electricity can turn into heat,
  - ✓ chemical reactions produces heat,
  - ✓ sound energy produces heat,
  - ✓ Movement Energy produces heat,
  - ✓ Objects crashing together produces heat.
  - ✓ <u>All types</u> of Energy can produce heat.

6. How Do We **Move** Heat from One Place To Another?

- **Moving heat from one place to another is important. Otherwise how would we ever be able to share the heat?**

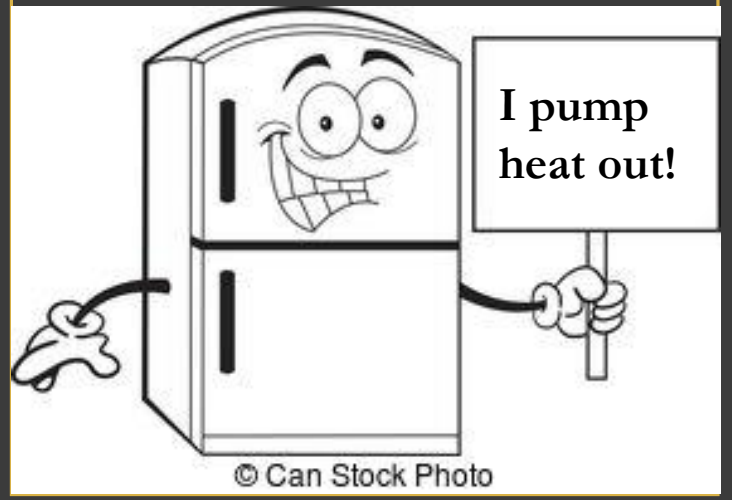
- **We can move heat using solids that are good** Conductors **. Metals are excellent at conducting heat and moving it from one place to another**

- **We can also move heat using liquids and gases, but they move heat a little bit differently. More on this later.**

7. How Do We Control Heat?

- Controlling heat is important so that a space doesn't get too hot or too cold.
- Your furnace heats your home. But what controls your furnace so that it does not overheat or underheat your house?
- It has a type of "brain". This brain is called a thermostat. (See pictures on the left) Thermostats sense the temperature of the room.
- If the room gets too cold, the thermostat detects this and tells the furnace to turn ON.
- If room gets too hot, the thermostat detects this and tells the furnace to turn OFF.
- The room stays at a stable temperature.

8. Do We Ever Have To <u>Remove</u> Heat? Yes!



- **Why are refrigerators cold?**
- **Is it because they pump cold air in?**
- **No!**
- **Remember, there is no such thing as cold or hot. There is only more heat and less heat.**
- **Refrigerators are big boxes that are able to pump heat out. With less heat inside, it <u>feels cold</u>.**
- **Ever feel the coils at the back of a refrigerator? Notice how they feel warm. That is because heat is always being pumped out.**

4. Ever Wonder Where your hot water comes from?

- Hot Water heaters in your basement fill up with cold water and then it heats it up.
- Most water heaters can heat 1 gallon of water per minute. Mindblowing! How do they do it?
- A burner at the base of the tank heats a thin windy metal rod that goes up through the center of the tank.
- Why a metal rod? Because metals are great Conductors of heat. The hot metal rod passes the heat to the water surrounding it.
- The heater tank has a thick layer of Styrofoam to stop the heat from escaping from the tank.

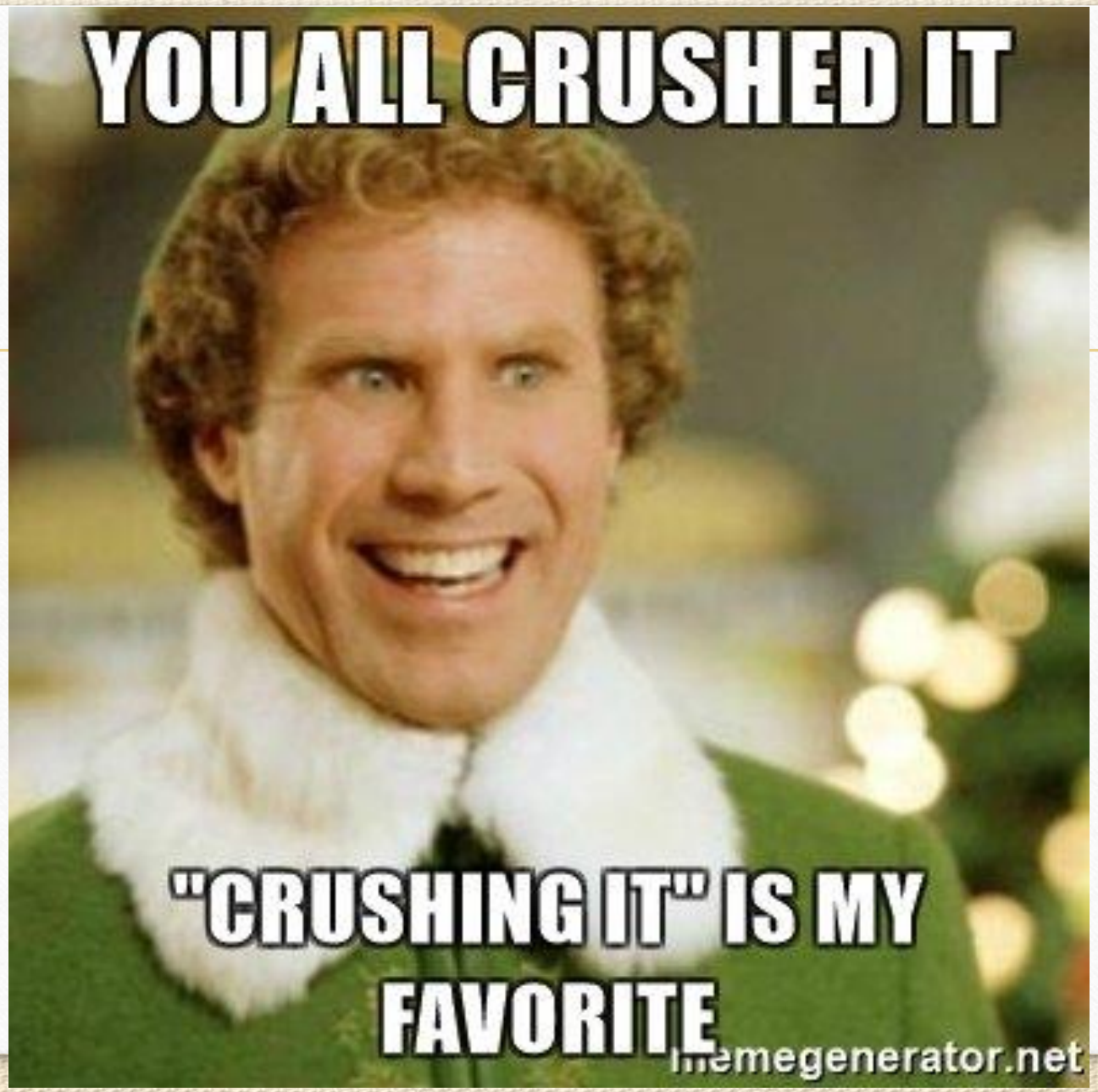
4. This is How a Hot Water Heater Works.

Click the pic

#MindBlown

4. If Water Heaters Didn't Exist.

#Notfun


YOU ALL CRUSHED IT
"CRUSHING IT" IS MY FAVORITE
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