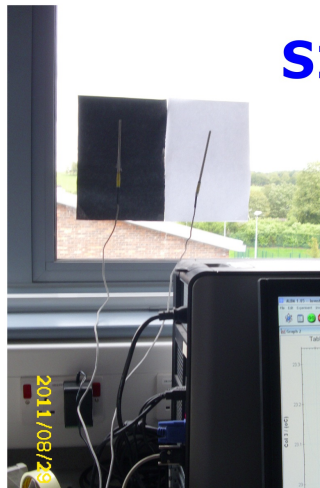


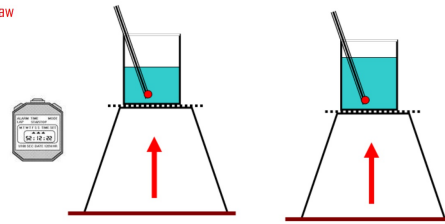
S1 Physics

HEAT THEORY



Copy Is there a difference between HEAT and TEMPERATURE?
• Surely they are the same thing?

Draw



	Small Mass	Large Mass
Start Temp (°C)	25	25
Final Temp (°C)	80	67
Increase in Temp (°C)	55	42

Conclusion

After 2 mins there was a temperature increase in each beaker. The smaller beaker had a higher increase in temperature as there was less mass of water to heat.

$$E_h \propto T \quad E_h \propto m$$

Temperature and heat are related. The heat caused a change in temperature but they are NOT the same thing.....

Copy

Temperature is how hot or cold something is.

It is measured in degrees Celsius (°C), or Kelvin (K).

Heat is a form of energy. (J)
Energy is measured in Joules.

Copy

Heat **always** travels from hot places to cold places.

hot → **cold**

Copy

Heat can be transferred (moved) in 3 different ways.

- **CONDUCTION**
- **CONVECTION**
- **RADIATION**

Usually heat travel in all 3 ways at once.



How is Heat Lost from houses?

How would we test in the lab?

How would it depend on ambient (air) temperature?

Can we do a test to find out?

Copy

CONDUCTION

Conduction occurs in solids.

Metals are good conductors.

Non metals, liquids and gases are bad conductors.

Bad conductors are good insulators.

complete

Type of rod
aluminium

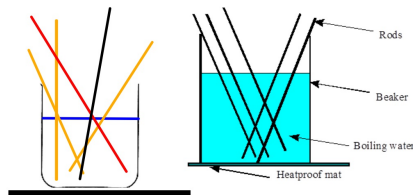
glass

copper

iron

brass

Which is hotter?



iron brass copper
glass aluminium

Answer the questions

Ingen-Hauze's apparatus.

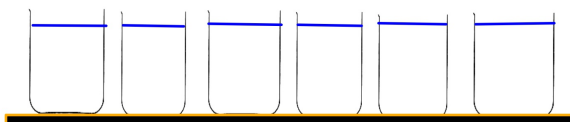
Thermal conductivity bars.



Describe what you did.
Describe what you think will happen.
Describe why this happened.

complete

Which beaker gets hotter?



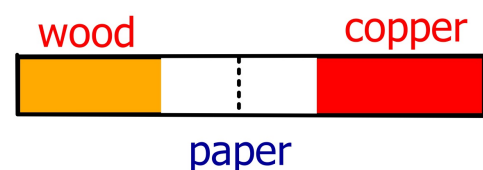
hottest

glass plastic polystyrene
aluminium ceramic copper

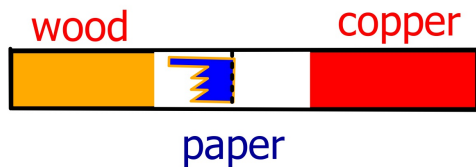
coldest

copy

Conduction is when the particles vibrate and pass the energy on to the next particle.



copy

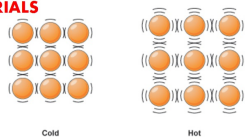
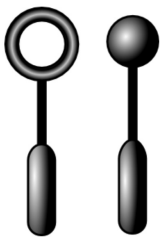


The paper burns by the wood and not the copper because the copper conducts the heat away and the paper over the copper is not hot enough to catch fire.

copy

The paper over the wood burns as the wood is an insulator and the heat cannot escape.

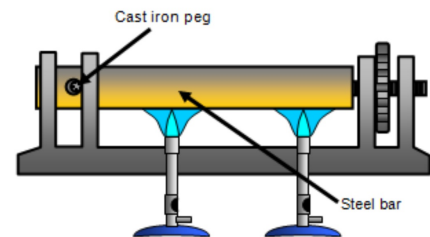
ANOTHER PROPERTY OF HEATING MATERIALS



EXPANSION

WARNING: you must cover the bar with a damp towel after switching off the bunsen and tightening the screw. **Teacher Demo**

copy the diagram



The bar is heated- it expands. An iron peg is placed in the slot and the screw tightened. As the bar cools it contracts and eventually the peg shatters in two. This shows the big forces involved in expansion and contraction. This is seen in bridge building!

copy

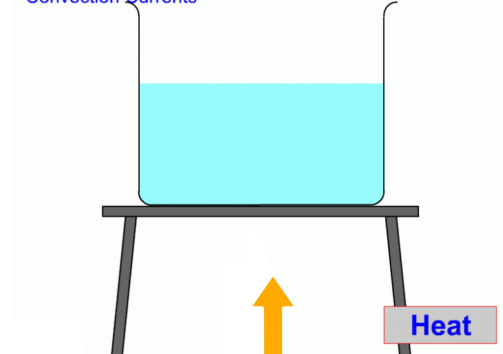
CONVECTION this occurs in liquids and gases.

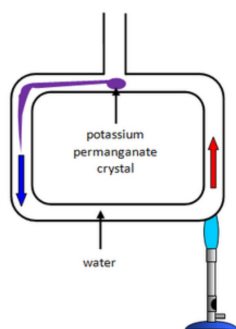
Here the molecules carry the energy with them. The particles spread out and the fluid becomes less dense.

This is why hot fluids rise.

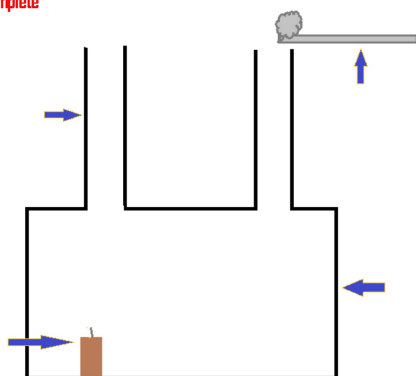
Copy and complete

Convection Currents

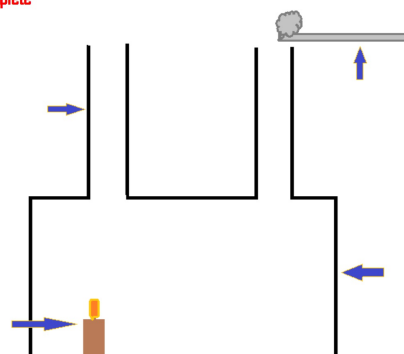




Copy and complete



Copy and complete



Cut out a paper spiral and hold it above the heater the way your teacher will show you.

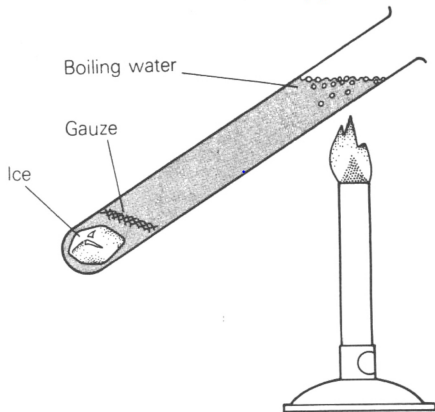
1. What does this experiment tell you about air above the candle?
2. Run along the corridor with the spiral and note the way it moves.
3. Is this the same or different than before?
4. Explain your answer.

All three states at once

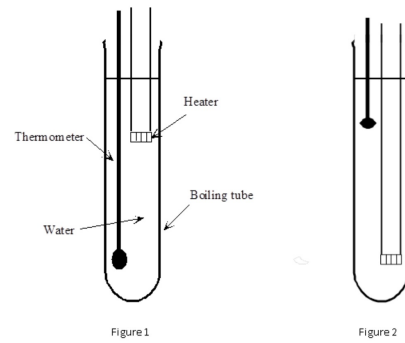


How can 3 states all occur in the same beaker at once?

Describe what would happen and why.



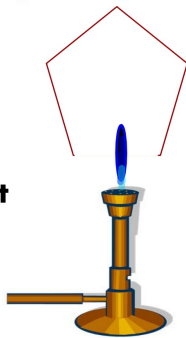
What would happen in these two tubes?



Copy the diagram and describe what happened

Ask your teacher to demonstrate making a hot air balloon.

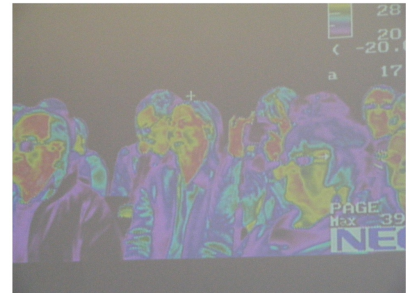
Describe what happens and why.



Copy

Radiation this is also called INFRARED radiation, this is heat travelling as waves.

The waves are very similar to light.



Copy

Heat travels from the Sun to Earth by radiation as these waves can travel through a vacuum, but radiation can travel through gases as well.

Copy

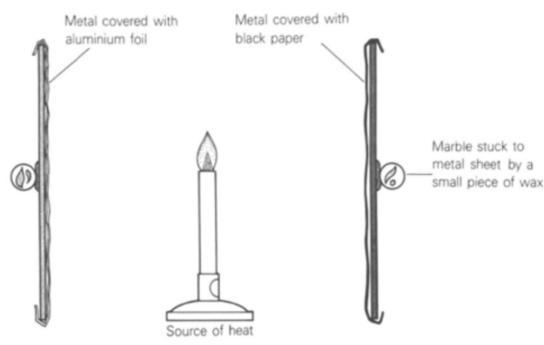
Radiation is affected by BLACK and SHINY surfaces.

Black surfaces absorb radiation better than shiny ones.

Shiny surfaces reflect radiation better than black.

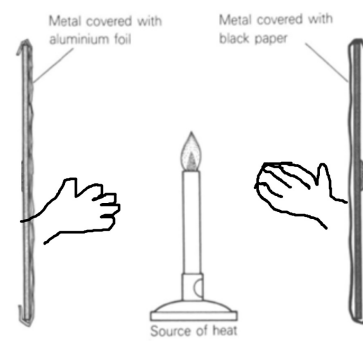
Black surfaces give out (emit) radiation better than shiny ones.

Copy and complete



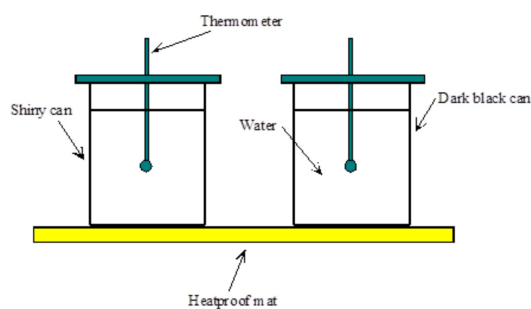
Copy and complete

Carefully, with your teachers help, place your hand between the source and screen

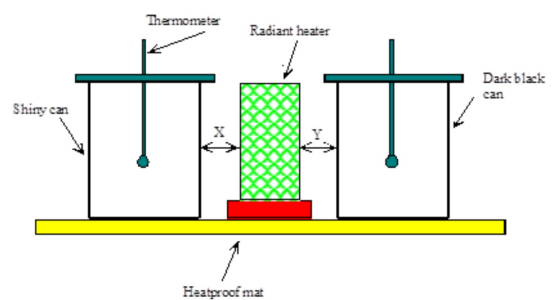


Which surface is reflecting the radiation most?

Copy and complete



Copy and complete



Advanced

Radiation is absorbed from the surroundings: some is re-radiated back to the surroundings. The radiation absorbed causes the temperature of the metal to increase, this heat is conducted through the can to its inside face, where it can be convected or radiated away depending on what is in the can.

If the can is shiny then the radiation will be mainly reflected away from the outside of the can, back into the surroundings.

As you can see from this, heat is a very complicated process and generally heat is travelling in many directions and in more than one method at once.

1. Why are you going to make the distances marked X and Y equal to each other?
2. Why can we not use a shiny glass beaker and a dull metal can?
3. Take the temperature of each can every minute after it passes 30°C until it reaches 40°C
4. Take that can away from the heater and keep taking its temperature every minute until it falls to 30°C .
5. Make a graph of the temperature against the time for each can on the same piece of graph paper.
6. How do the two graphs together prove what we are looking for?

Extension: something to try around the school as an additional task or homework piece

BLACK OR WHITE ABSORBERS

Mrs Hargreaves has a theory that black socks absorb more heat than white socks so are smellier at the end of the day.

could you design an experiment to prove it?

Is this a fair test?

