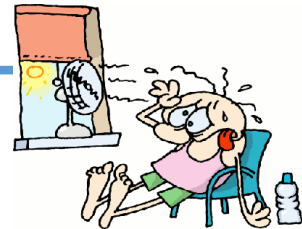
Intermediate Science 7

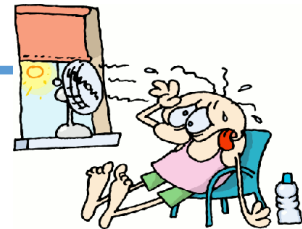
Unit 2: Heat



Intermediate Science 7

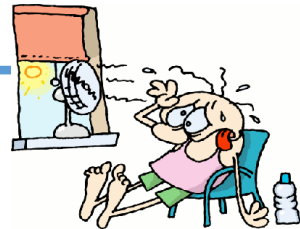
Unit 2: Heat

Topic 1: Introduction to Temperature



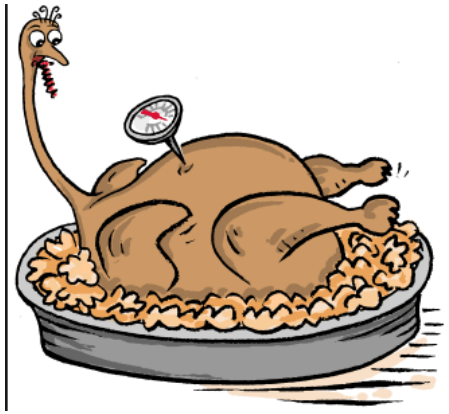
What is Temperature?

Temperature refers to how hot or cold something is.



How Does Temperature Affect Your Daily Life?

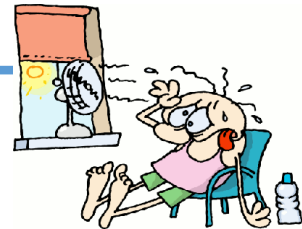
Daily temperature changes



Cooking temperatures

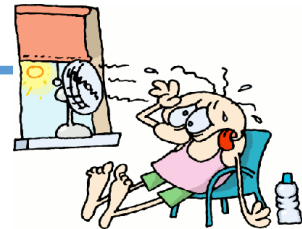
Refrigeration temperatures

Average temperatures in different geographic areas

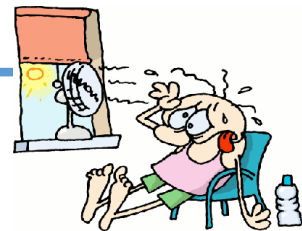


An Experiment: Is the Human Body A Good Thermometer

- Place one hand in cold water, one hand in “hot” water for 1 minute. Then at the same time put both hands in the luke warm water. Describe what each hand feels.

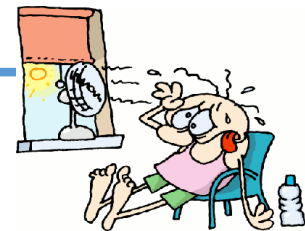


Complete Activity 4-1 A
“Boiling Hot, Freezing Cold”
Page 111



Complete The Survey

	Your Prediction(°C)	Subject 1 Prediction(°C)	Subject 2 Prediction(°C)	Subject 3 Prediction(°C)
Human body				
Boiling Point of water				
Freezing ing Point of water				
Room temperature				
Outside temperature				
Inside a refrigerator				

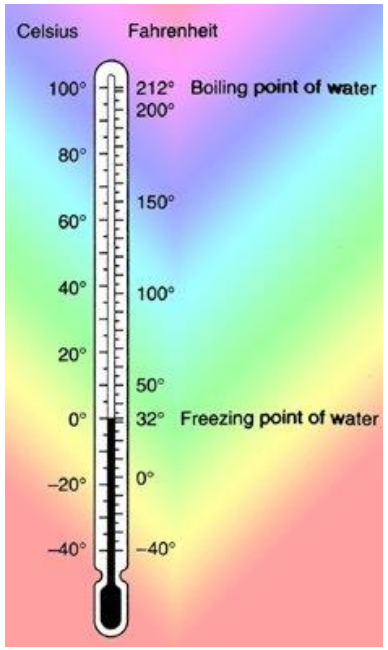


Standard Temperatures

Human Body

Average Human Body is 37 oC

Water



Boiling Point of Water is 100 oC

Freezing point of Water is 0 oC

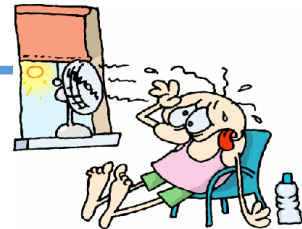
Room Temperature

Comfortable room Temperature is 21 oC

Intermediate Science 7

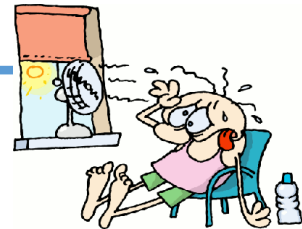
Unit 2: Heat

Topic 2: Measuring Temperature

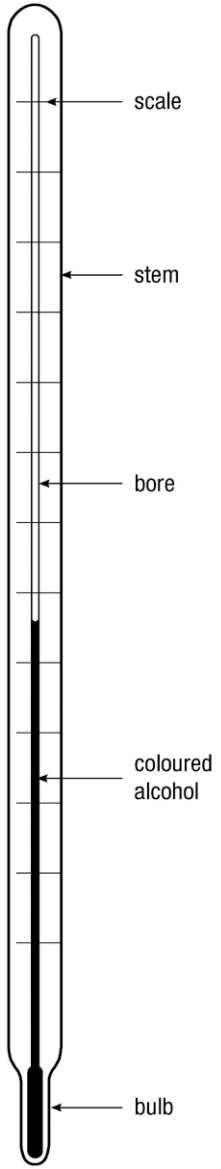


What Is A Thermometer

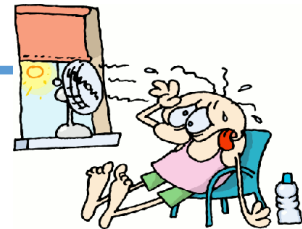
Thermometer: Mechanical or electrical device for measuring temperature. It measures temperature, by using materials that change in some way when they are heated or cooled.



PARTS OF A THERMOMETER



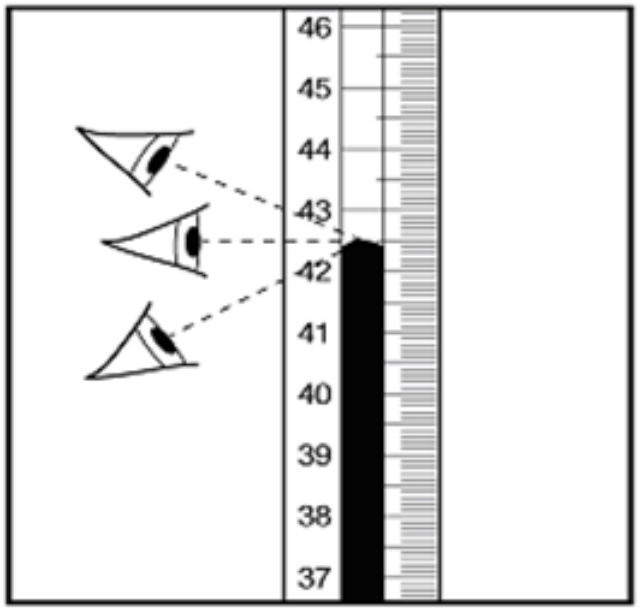
Scale: A series of equally measured sections that are marked and numbered for use in measurement.

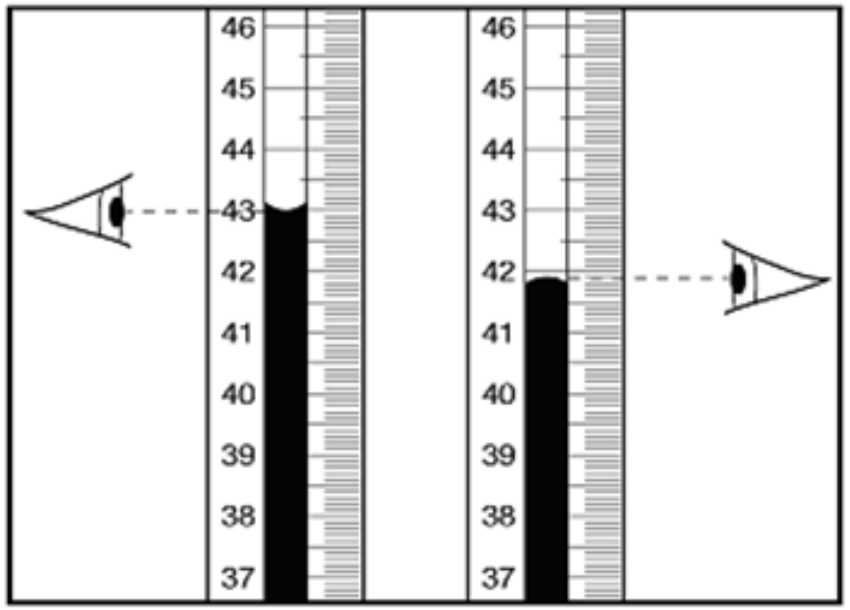


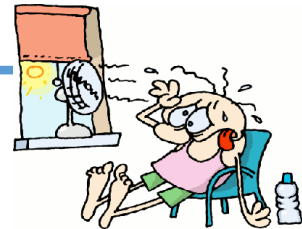
READING A THERMOMETER

- When experimental measurements are made, errors caused by carelessness (like misreading a number on the scale) can occur. The most common errors are parallax errors and reading errors

A parallax error occurs when your eye is not placed directly opposite the scale where the reading is being taken. When reading liquid levels, your eye must be lined up with the top or bottom of the meniscus.



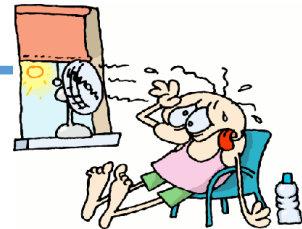




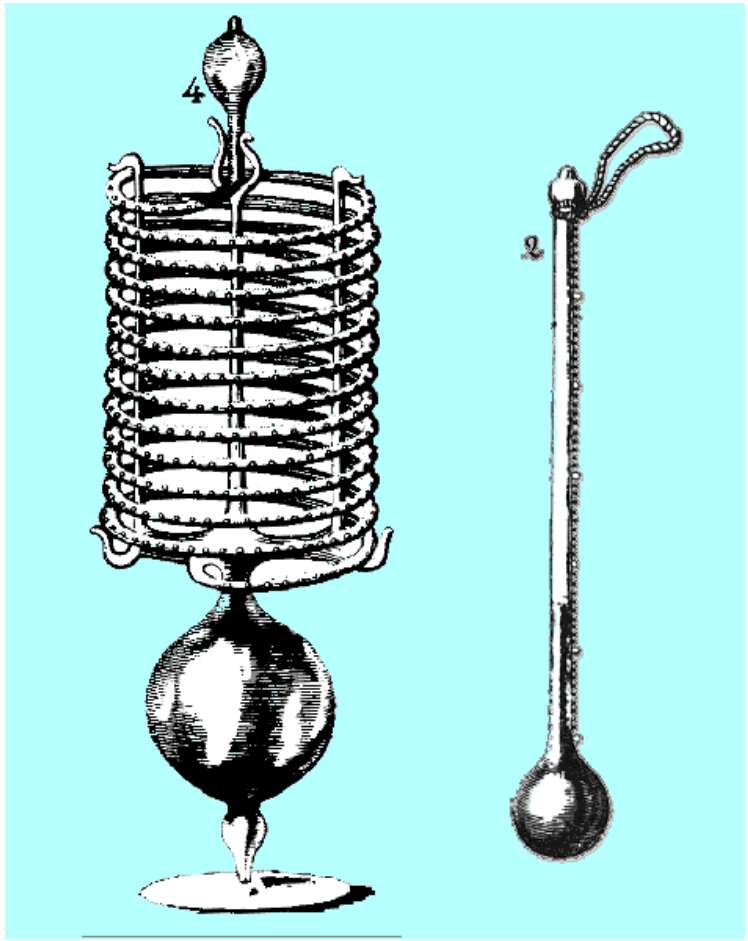
Thermometers Of The Past

1. Galileo's Air Thermoscope (1593):

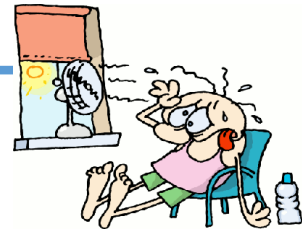
As the air heats, the liquids drops and rises when air is cooled. It was not considered a thermometer because it did not have a scale.



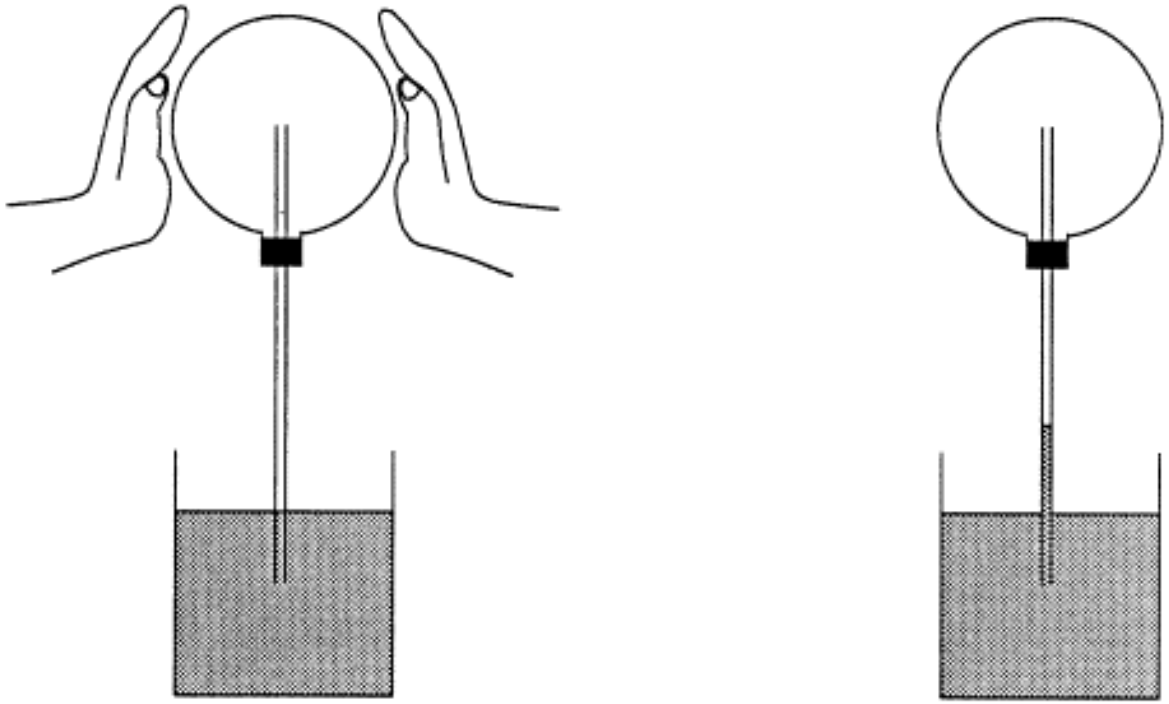
2. Early Liquid Thermometer:



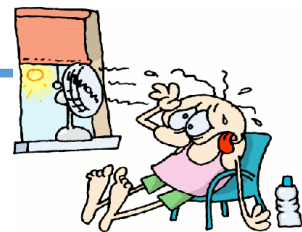
Liquid rising up the tube shows the temperature is rising.



A Demo…



Activity 4-1A
“Building a Thermoscope”
Page 121



Temperature Scales

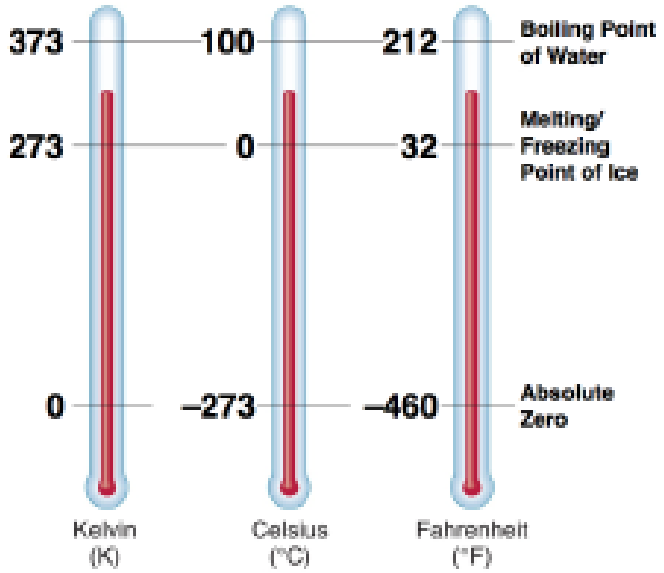
Scales are necessary for temperatures to be accurate and comparable.

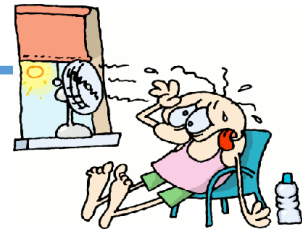
Most thermometers have been designed (calibrated) by scientist using two very important points:

1) The boiling point of water (100 o C)
2) The freezing point of water (0 o C)

3 commonly used scales are:

1. Fahrenheit
2. Celsius
3. Kelvin

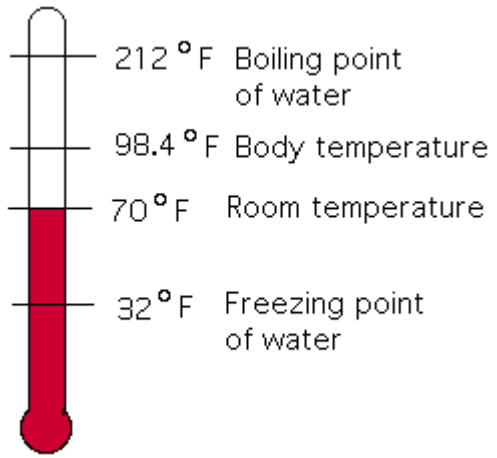


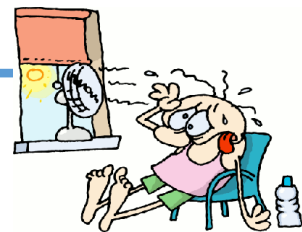


1. Fahrenheit

Fahrenheit developed the first modern thermometer in 1714

Fahrenheit is a temperature scale that bases the boiling point of water at 212 and the freezing point at 32.



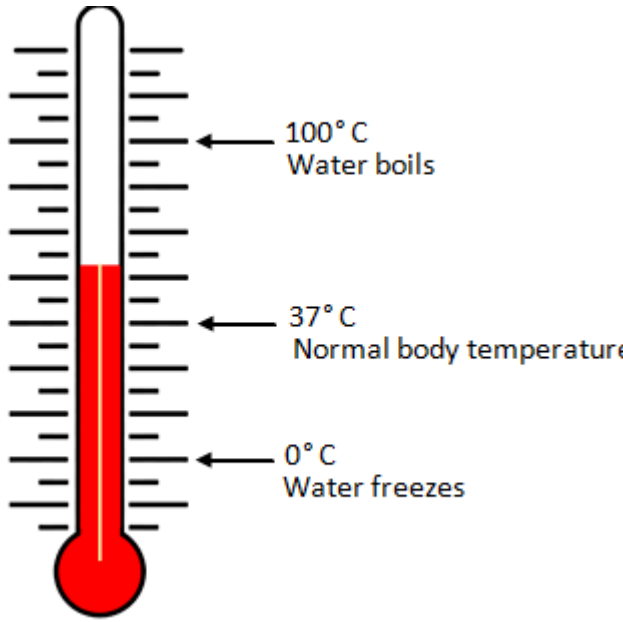


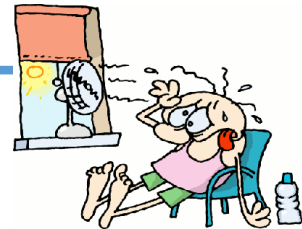
2. Celsius

Andres Celsius developed this temperature scale 1742

Celsius is a measurement of temperature in which 0 degrees represents the freezing point of water, and 100 degrees represents water's boiling point at the standard atmosphere

This temperature scale is used today in Canada and many other countries



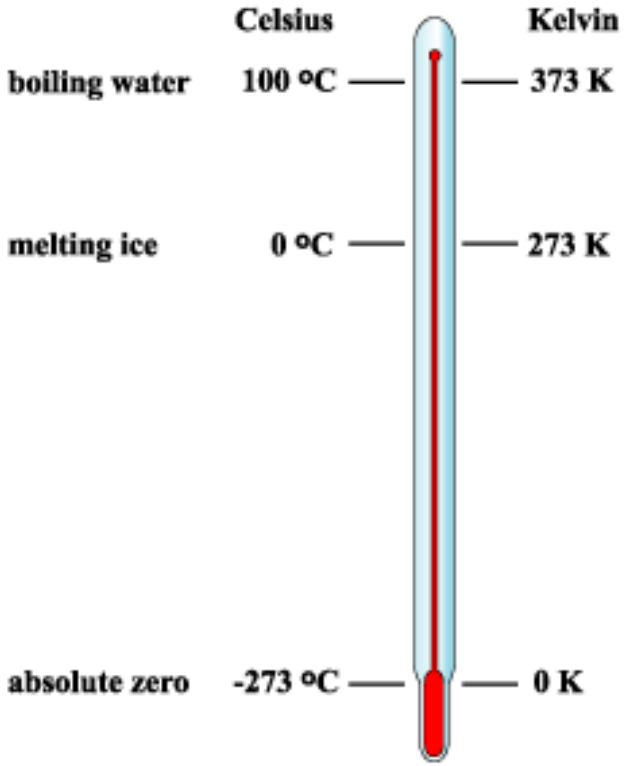


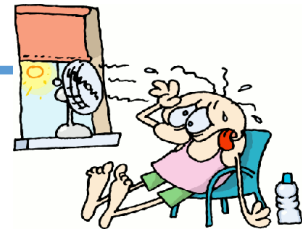
3. Kelvin

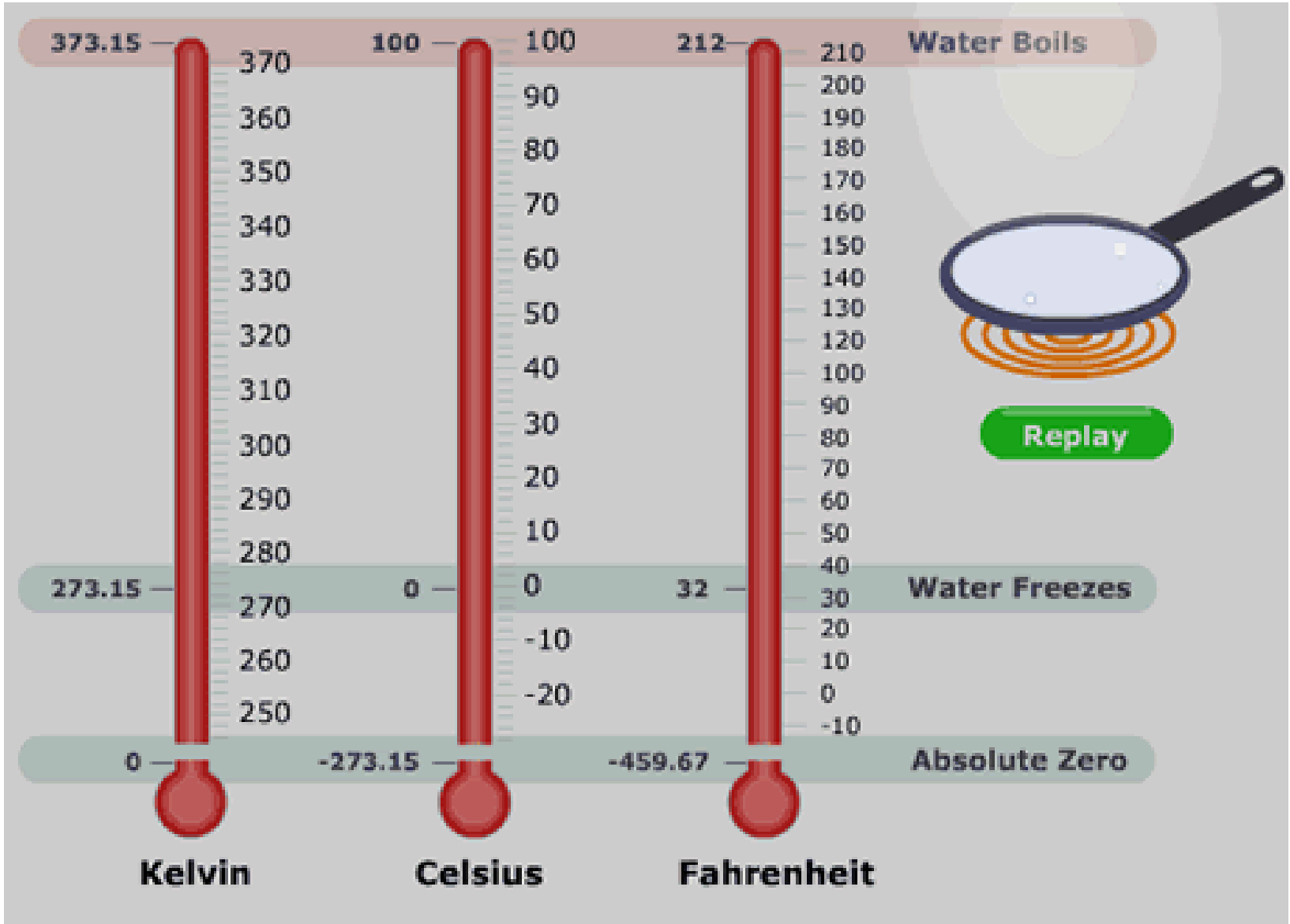
- Developed by William Thomson (Lord Kelvin)

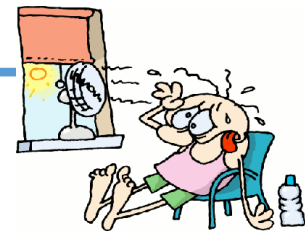
- Kelvin is a measurement of temperature in which 273.16 K represents the freezing point of water, and 373.16 represents water's boiling point

-Each unit on this scale, called a Kelvin rather than a degree






373.15
100
212
Water Boils
370
360
350
340
330
320
310
300
290
280
270
260
250
100
90
80
70
60
50
40
30
20
10
0
-10
-20
210
200
190
180
170
160
150
140
130
120
100
90
80
70
60
50
40
30
20
10
0
-10
Replay
273.15
0
32
Water Freezes
0
-273.15
-459.67
Absolute Zero
Kelvin
Celsius
Fahrenheit



Three Important Parts Of A Thermometer

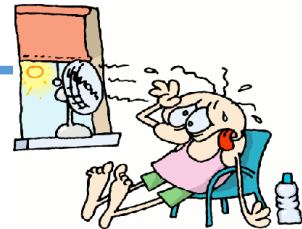
-most thermometers have these three parts:

i**) SENSOR** – a material which is affected by the change in temperature ex. water gets heated

ii) -the sensor produces a **SIGNAL** – information about the temperature ex. water rising up/down the tube

iii) -the signal affects a **RESPONDER** – light, pointer, or other mechanism that use the signal

ex. water is read on the scale

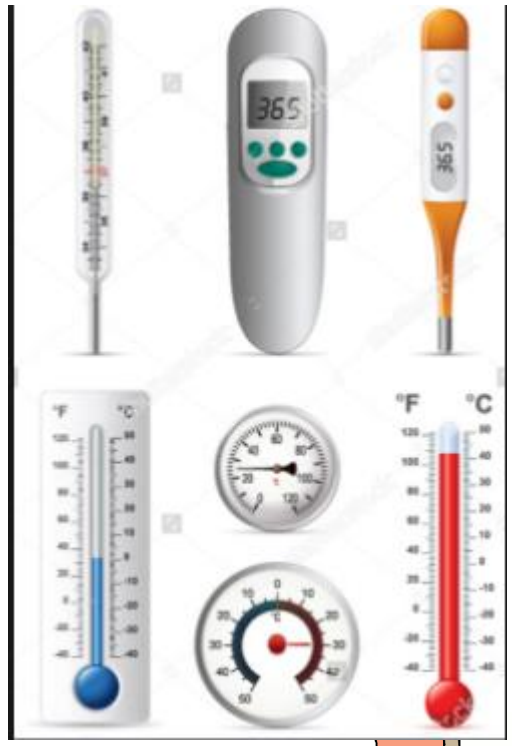


The Right Device for the Job

Measuring different extremes of temperatures means using different types of devices to measure these extremes. The thermometers used for this purpose have:

Some various instruments used to measure temperature, including

(i) liquid-in-glass thermometer
(ii) thermocouple
(iii) resistance thermometer
(iv) bimetallic strip (thermostat)
(v) infrared thermometer

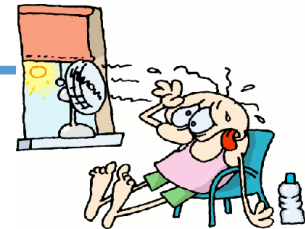


1. Liquid-in-glass Thermometer

The lab thermometer contains colored alcohol rather than mercury for safety.

They include those used to determine the temperature in or outside a building, to measure the temperature of the body, and for cooking

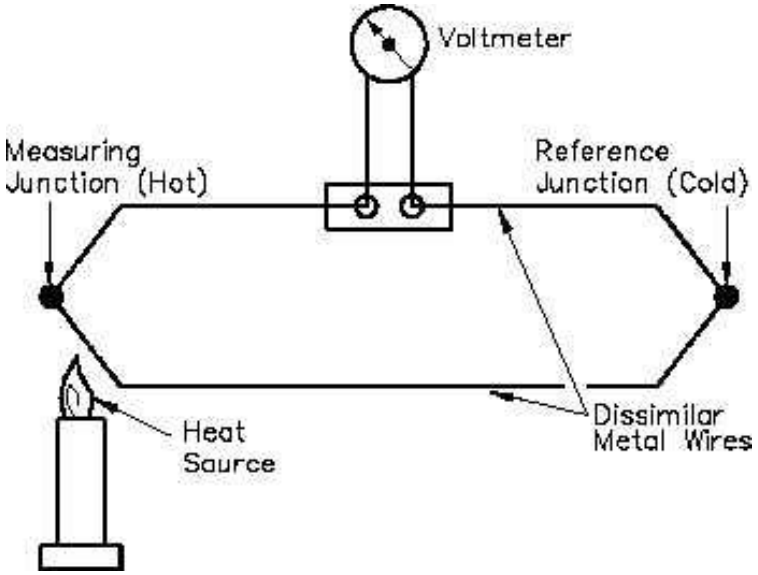
When the temperature goes up, the volume of the liquid expands and the liquid rises. A temperature scale is on the outside of the thermometer.



2. Thermocouple

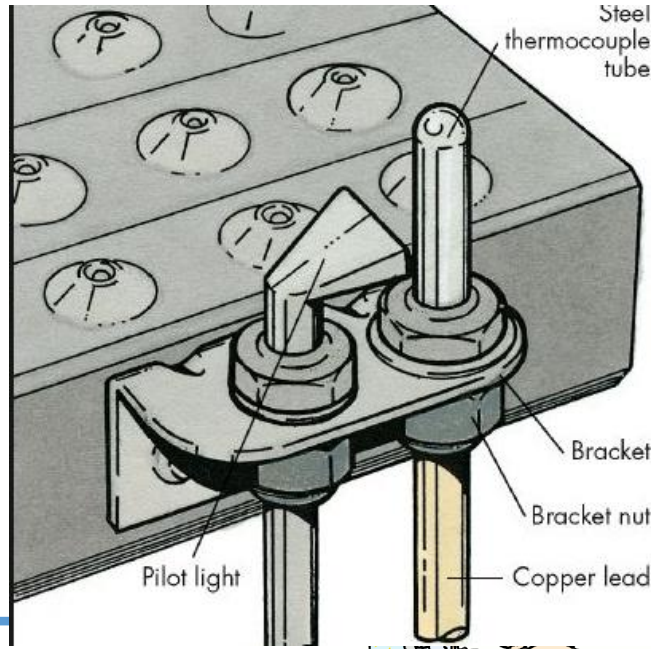
Made of two wires of different metals.

A temperature difference causes a current to flow through the wires. This current is measured by a meter



Can measure higher temperatures than typical thermometers

Thermocouples are widely used in science and industry because they're generally very accurate and can operate over a huge range of really hot and cold temperatures. Used for measurements in furnace, gas turbine, and diesel engines



3. Resistance Thermometer

-(digital thermometers)

-sensors used to measure temperature

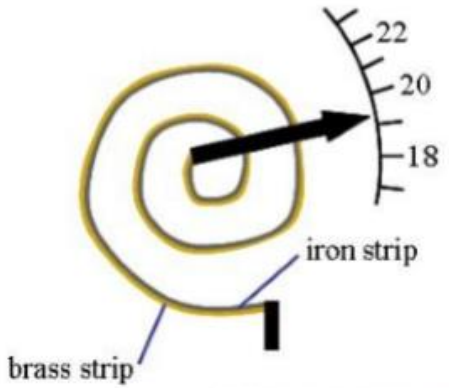
-Digital thermometers measure temperature by means of a slender device called a probe. The probe is made of either a metal, such as copper or platinum.
Temperature changes cause a large variation in the electrical resistance of these materials

Digital thermometers are used in industry and in the home, in applications including food preparation, manufacturing, medical and scientific testing and procedures.

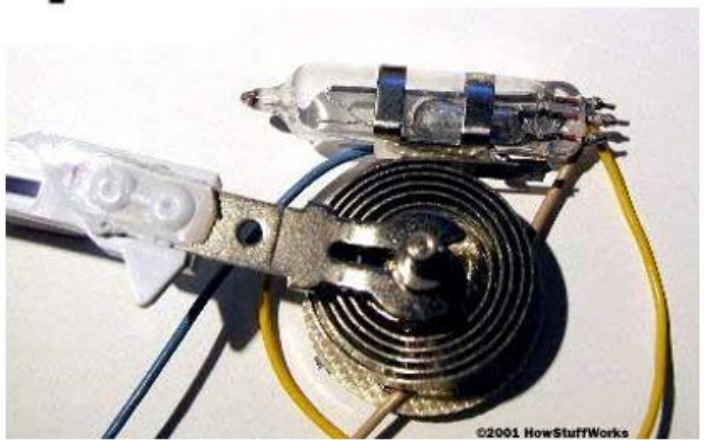
4. Bimetallic Strip (thermostat)

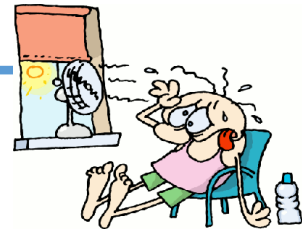
Made of two different metals fused together.

These metals expand and contract at different rates causing the strip to bend when heated.

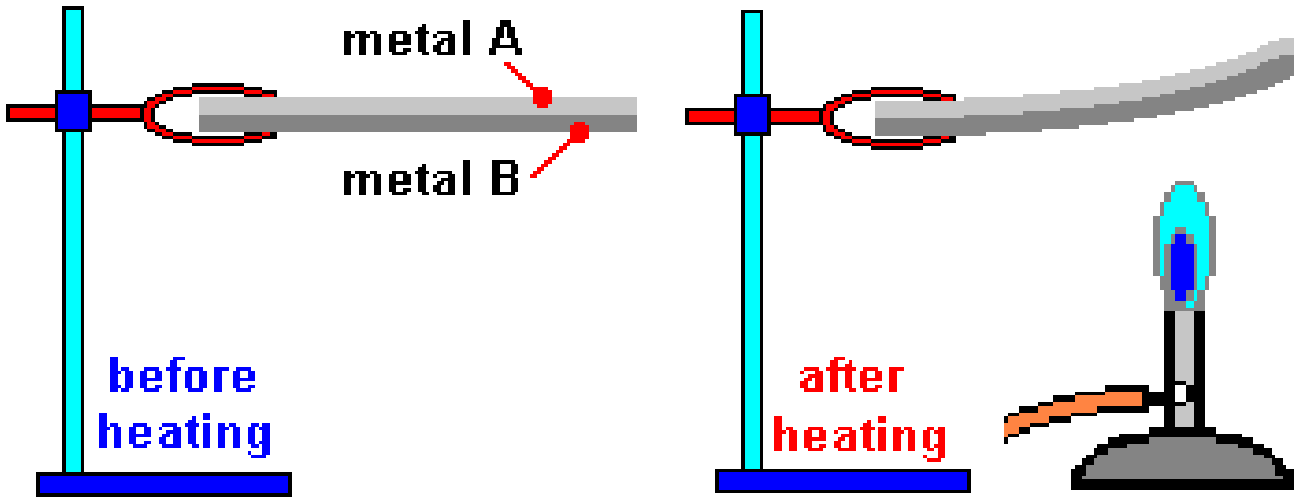


Thermostat

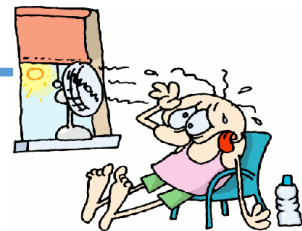




A Demo…



Heating and Cooling a Bimetallic Strip

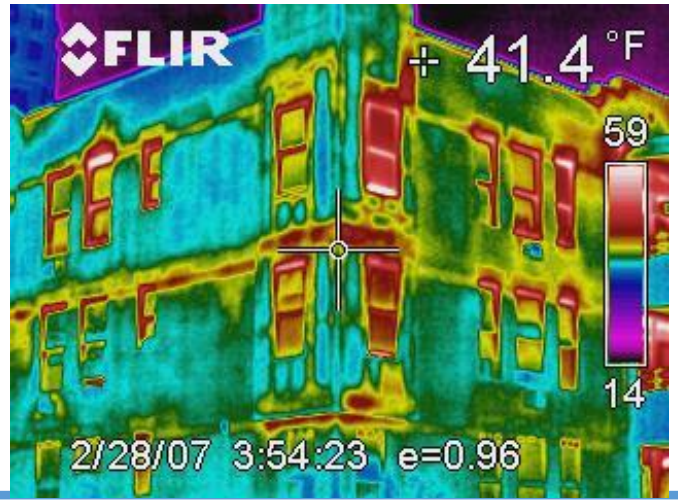


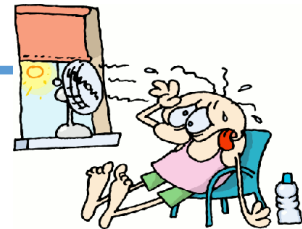
5. Infrared Thermometer

-Converts infrared radiation into colors that can interpret a temperature difference.

-Measurement can be taken from a distance, without making contact with the object

-Can be used to measure heat loss in your home

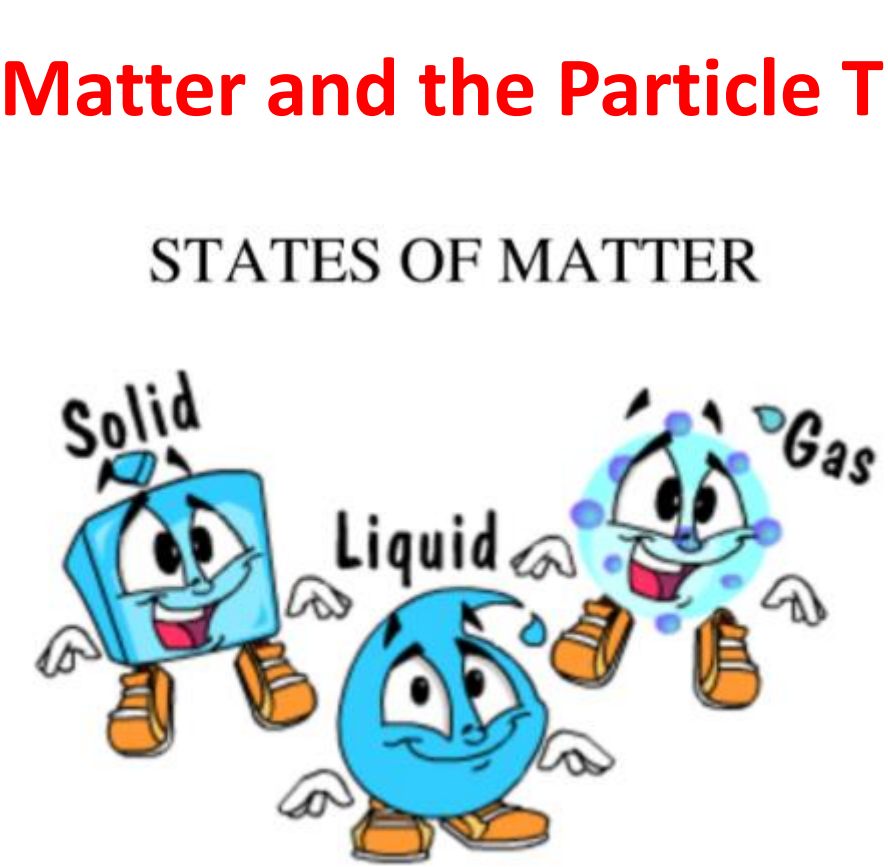


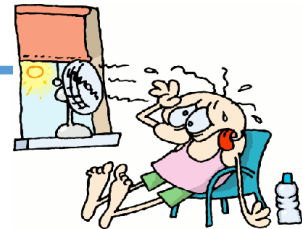


Intermediate Science 7

Unit 2: Heat

Topic 3: Matter and the Particle Theory





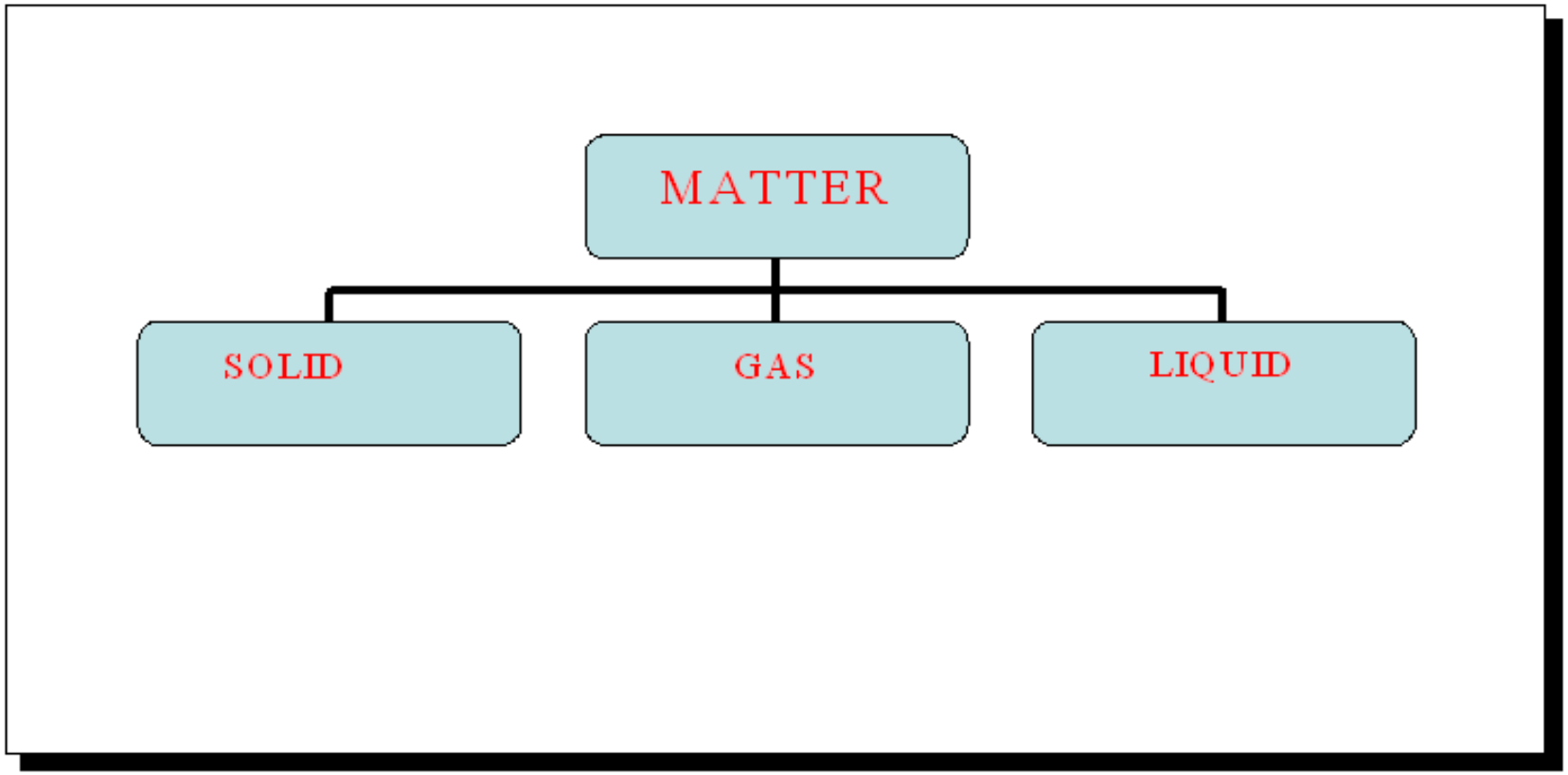
TOPIC 1: OBSERVING MATTER

Matter is anything that has mass or takes up space.

Examples: Books, humans, Oxygen, water…etc.

Non Examples: Heat, Light Gravity…etc

Three States of Matter



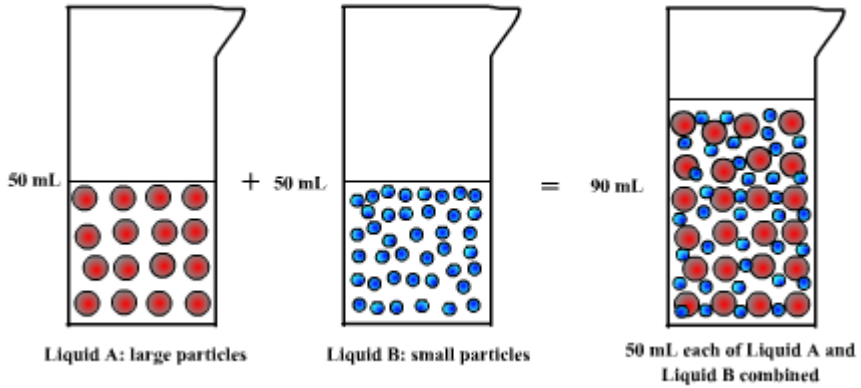
Welcome to the Particle Theory

1. **All matter is made up of very small particles.**
2. **All particles in a pure substance are the same**
   - **Different substances contain different particles.**

3. **Particles are attracted to each other.**

- They can have a strong attraction or a weak attraction**.**

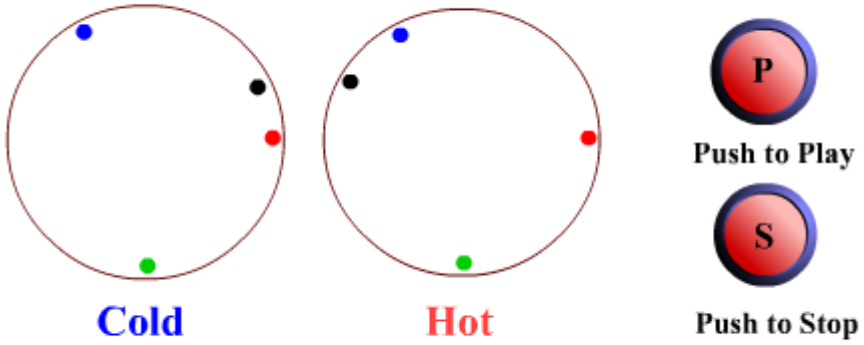
4. **There are spaces between all particles**



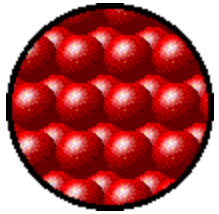
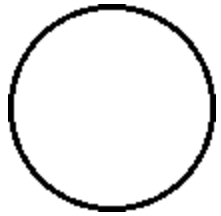
5. Particles are always moving.

When particles gain energy, (heat up) they move faster.

When they lose energy, (cool down) they move slower



Solid, Liquid and Gas

SOLID	LIQUID	GAS
		
Definite Volume	Definite Volume	No definite Volume
Definite Shape	No Definite Shape	No Definite Shape
are held tightly and packed fairly close together	are fairly close together with some attraction between them	have little attraction between them
- they are strongly attracted to each other	are able to move around in all directions	are free to move in all directions

you could remember S T A M P

S - space between particles

T - Tiny particles

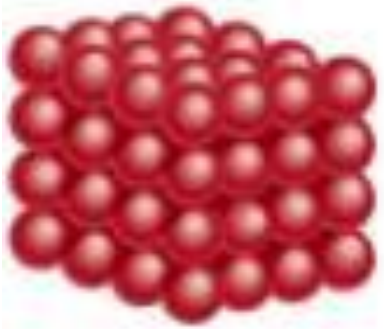
A - Attractive forces

M – Moving

P - Pure substance particles same

States of Matter

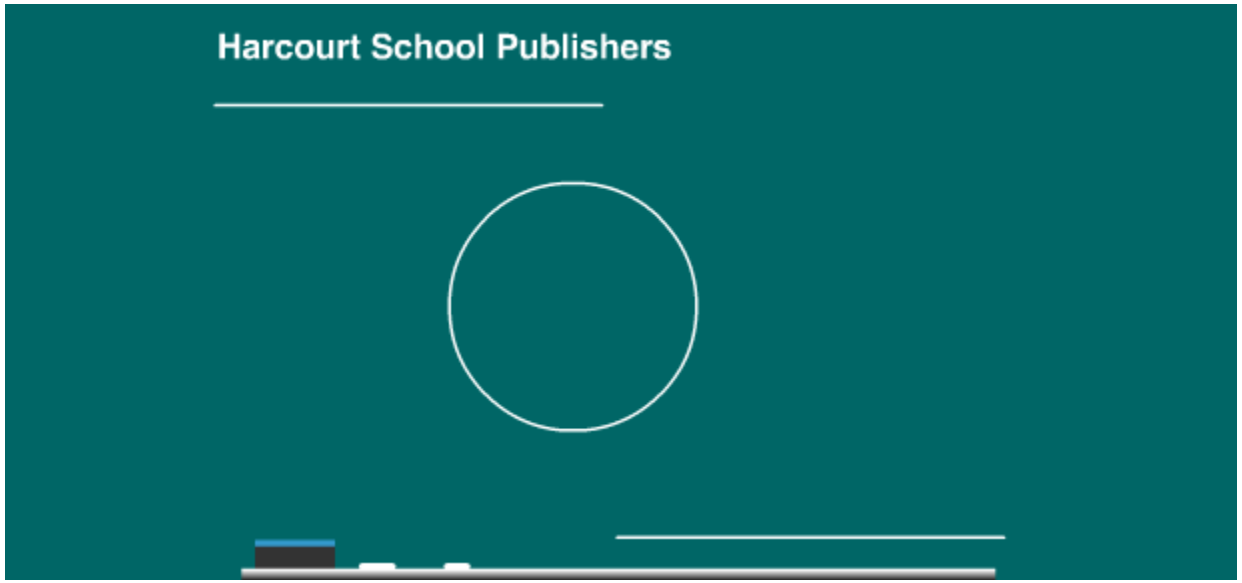
Solid



Liquid

Gas

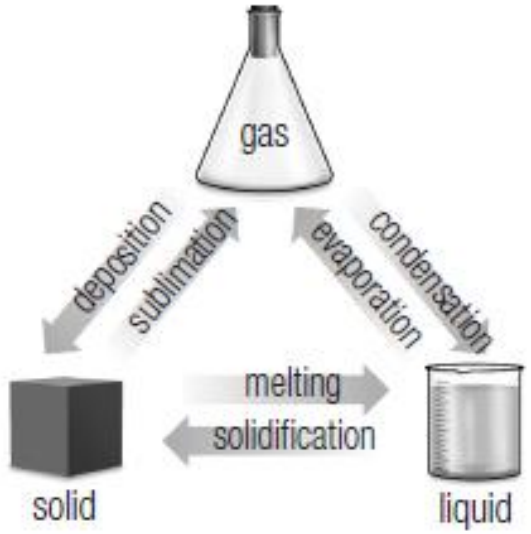
Solid, Liquid and Gas Particles Up Close

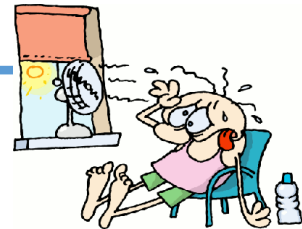


Intermediate Science 7

Unit 2: Heat

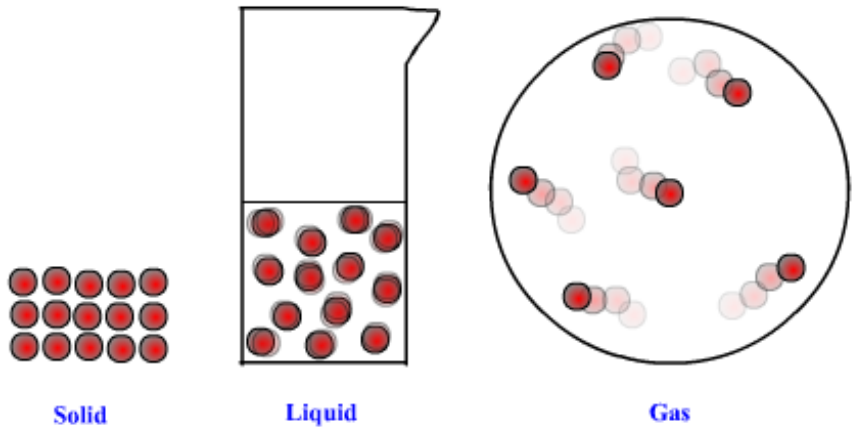
Topic 4: Changes In State of Matter



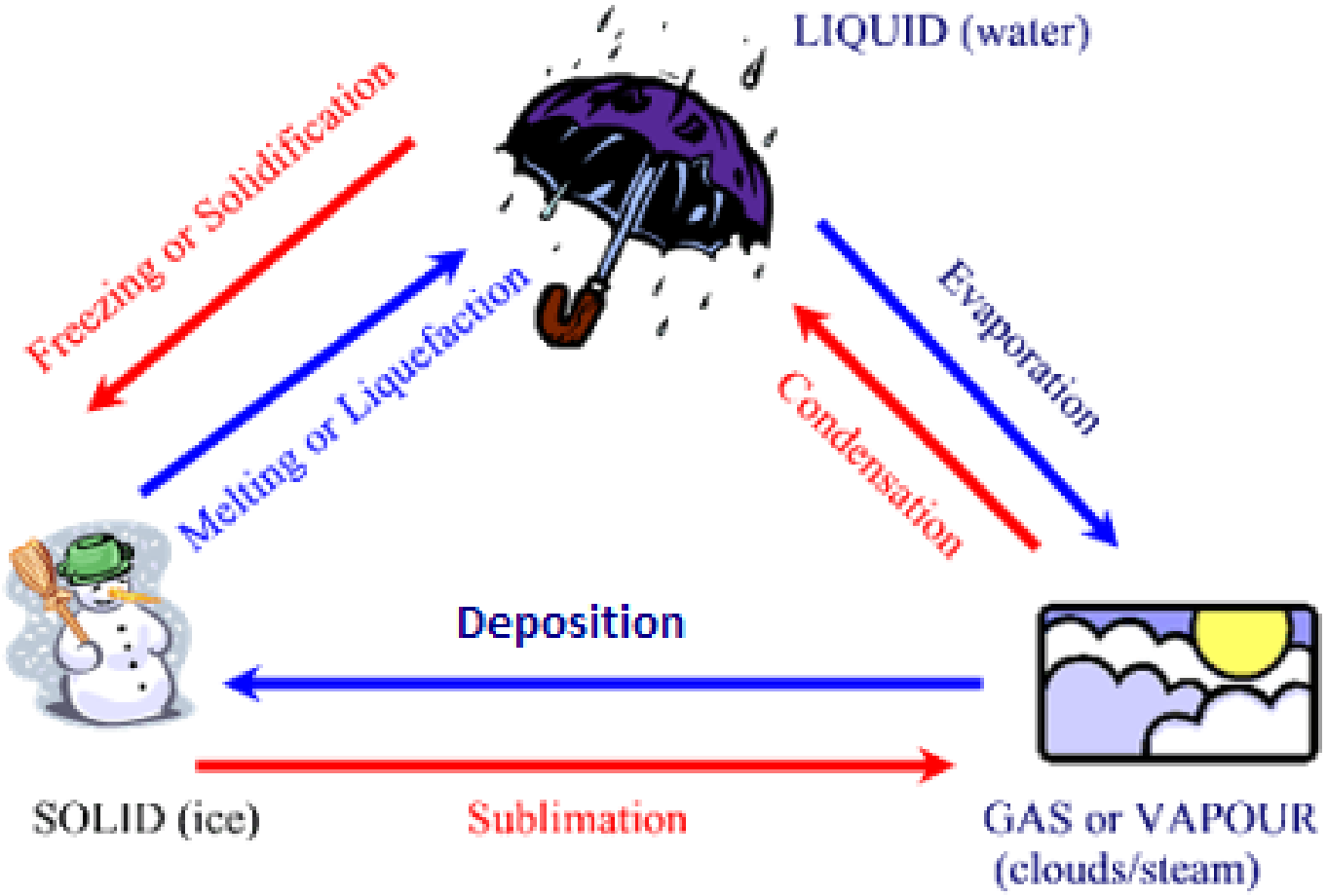


Changes in States of matter

When enough heat is added to a solid, it will eventually melt and become a liquid. More energy will result in it becoming a gas as the boiling point is reached. As particles gain energy they move faster, require more space
And therefore spread out (their volume Increases).



Changes In States of Matter



Changes of State

1. **Melting**: changing from a solid to a liquid.
   - Animation of ice melting.
2. **Freezing**: changing from a liquid to a solid.
3. **Sublimation:** changing directly from a solid to a gas. Ex: dry ice used in a smoke machine
4. **Deposition** changing directly from a gas to solid. Ex: snowflake forming,
5. **Evaporation:** changing from a liquid to a vapour.
6. **Condensation:** changing from a gas to a liquid.

Changes In States Of Matter

CHANGE	FROM	TO	EXAMPLE
Sublimation	solid	gas	Moth crystals disappear when left in a closet for several days
Deposition	gas	solid	frost forms on a car's windshield
Melting	solid	liquid	An ice cube turns into water when left out of the freezer
Solidification (Freezing)	liquid	solid	bottle of water will turn into ice if left in the freezer
Condensation	gas	liquid	Drops of water form on the mirror when taking a hot shower
Evaporation	liquid	gas	Rain dries up when the sun comes out