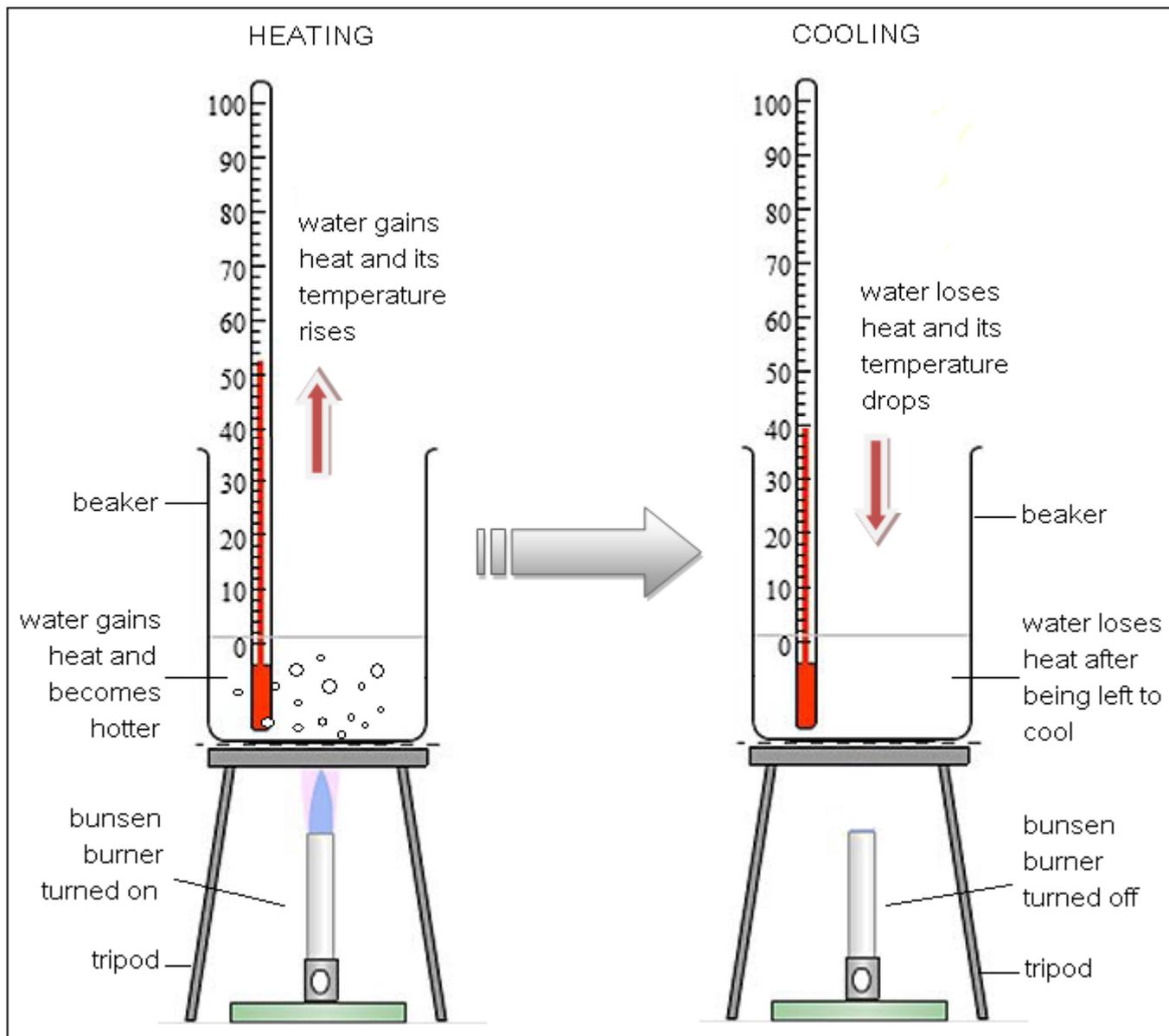


## WHAT IS HEAT?

- ♥ Heat is a form of energy.

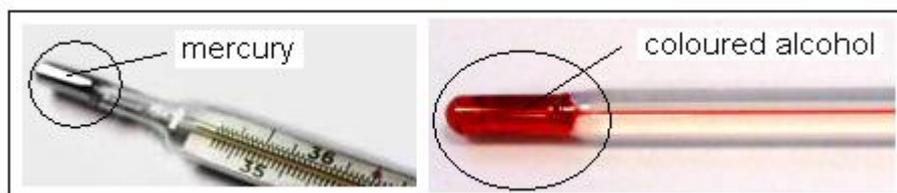
## WHAT IS TEMPERATURE?

- ♥ Temperature is the degree of hotness or coldness of a substance or environment.



## WHAT IS THERMOMETER?

- ♥ A thermometer is a special instrument to measure temperature accurately.
- ♥ It is a sealed 'glass tube' that contains either mercury or alcohol.
- ♥ Why use mercury or alcohol? Because both are sensitive to heat and will expand when heated and contract when they are cooled.



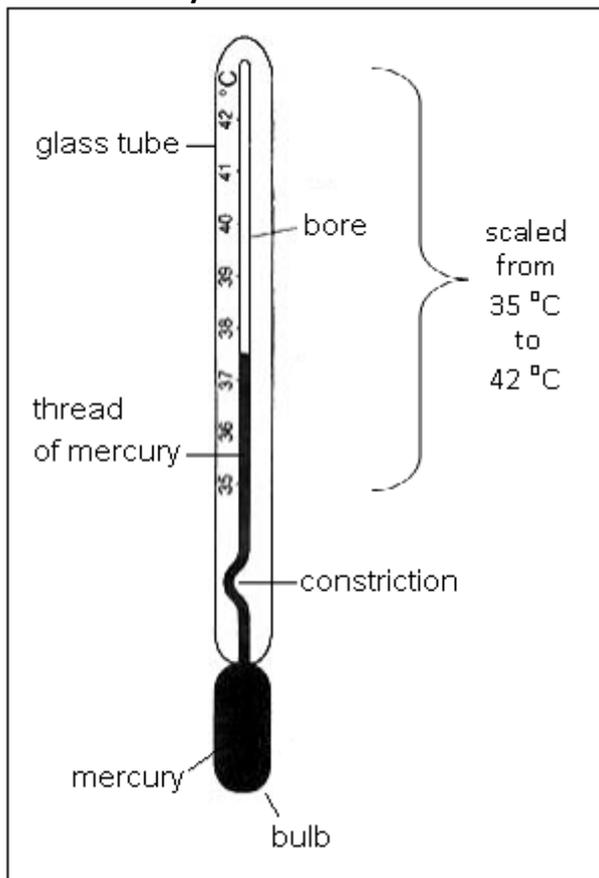
- ♥ It is not flexible but can see through, waterproof and able to withstand heat.
- ♥ Metric unit for temperature is degrees Celsius ( $^{\circ}\text{C}$ ).

## Clinical Thermometer

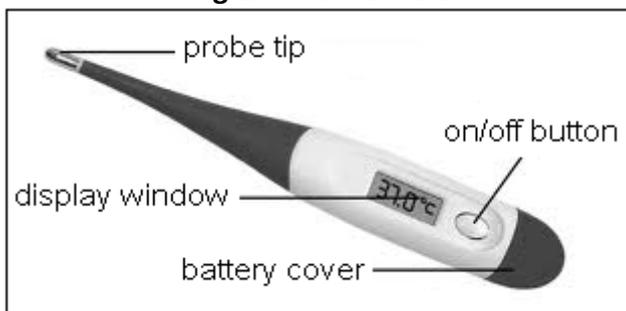
*(used to measure the temperature of human body)*

- ♥ There is a kink (constriction) near the bulb to prevent mercury level from falling on its own after thermometer is taken out of the mouth for reading.
- ♥ Healthy person show a temperature reading of  $37^{\circ}\text{C}$  while a person having a fever, the temperature will be higher than  $37^{\circ}\text{C}$ .

### Mercury-in-Glass Thermometer



### Digital Thermometer

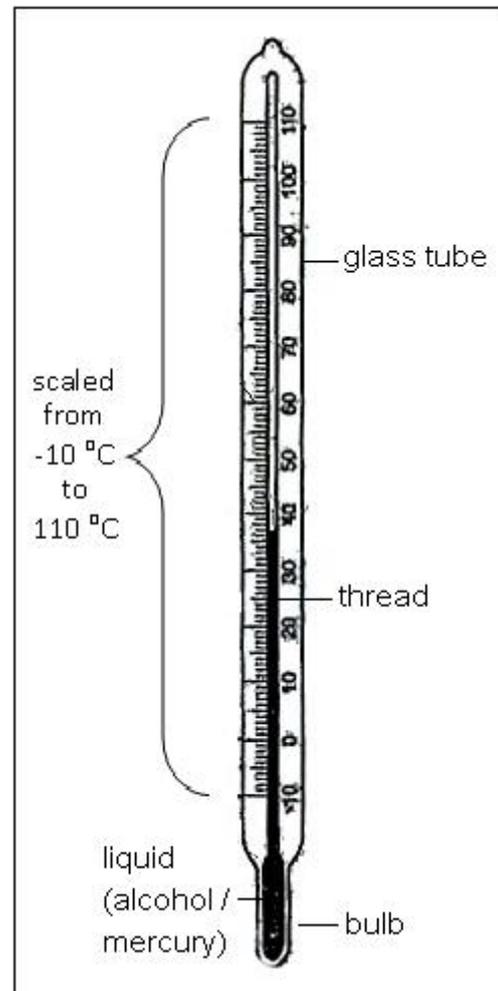


- ♥ reading of temperature is displayed digitally as in digital watches
- ♥ this is safer because no mercury is used in this and it is important to note that mercury is a highly toxic substance

## Laboratory Thermometer

*(used to measure the temperature in laboratory)*

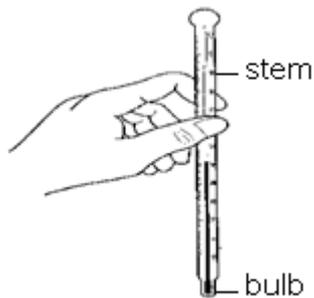
- ♥ Mercury level falls on its own as no kink (constriction) is present.
- ♥ Temperature is read while keeping the thermometer in the source, such as liquid.



## The Way of Measuring and Reading of Laboratory Thermometer

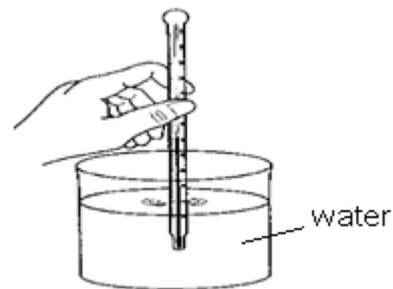
### Step 1

Hold the thermometer upright at the upper stem not at the bulb.



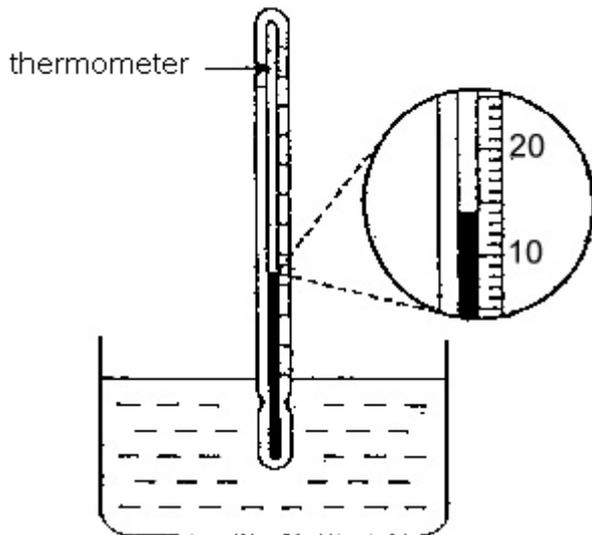
### Step 2

Immerse the bulb in the water, without touching the beaker.



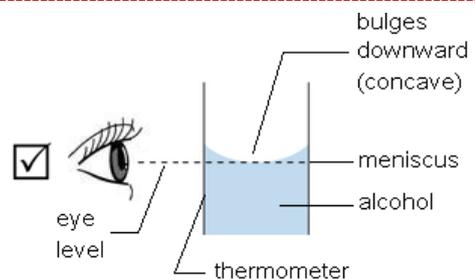
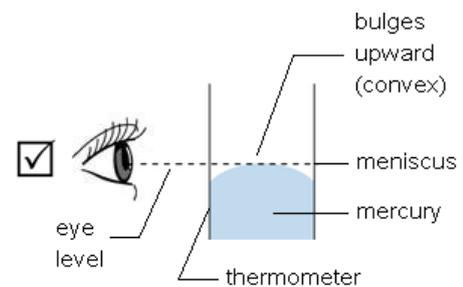
### Step 3

Take the reading of the temperature when the liquid level stops rising or falling.



### Step 4

Place your eyes at the same level as the liquid inside the thermometer. Read the marking on the thermometer at the meniscus of the liquid.



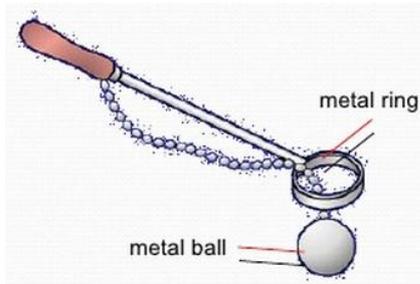
## Effects of Heat on Matter

*Expand when they gain heat & Contract when they lose heat.*

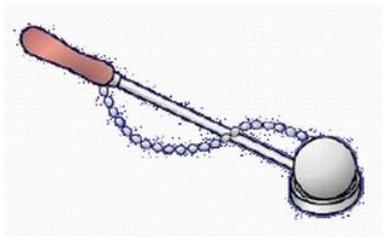
### Solid

*The following apparatus can be used to observe the expansion and contraction of solids.*

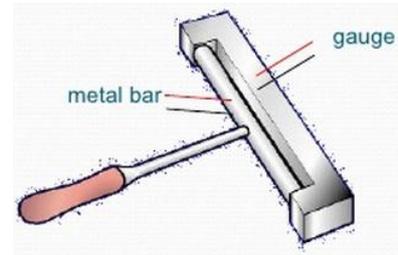
1. At room temperature, the metal ball is able to pass through the ring.



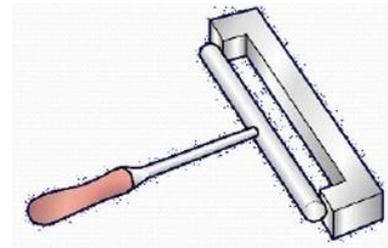
2. When the ball is heated, it cannot pass through due to expansion; when cooled, it reverts to its normal size.



1. At room temperature, the metal bar is able to fit into the gauge.

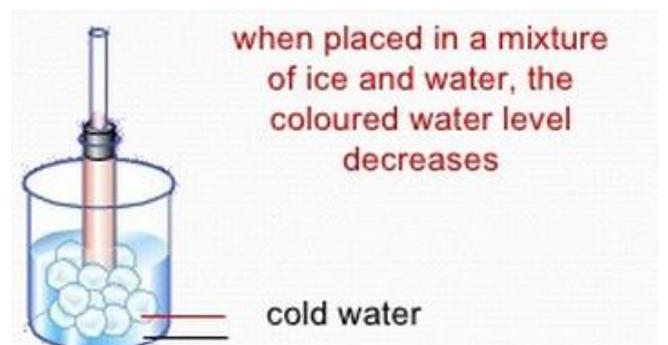
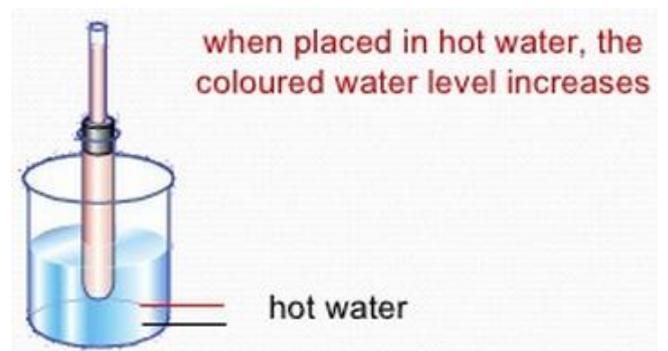
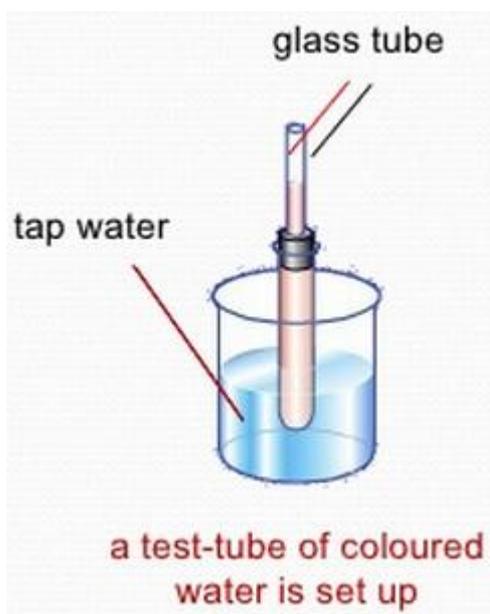


2. When the bar is heated, it cannot fit due to expansion; when cooled, it reverts to its normal size.



### Liquid

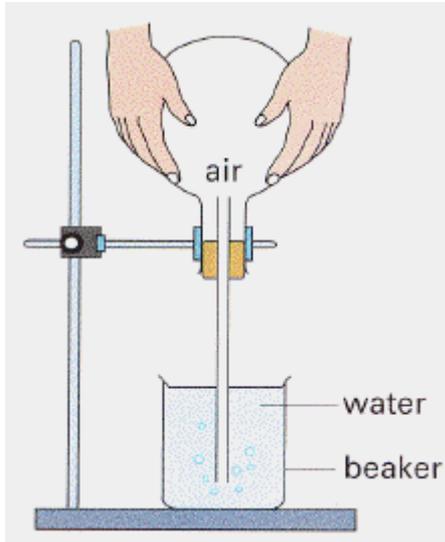
*The following apparatus can be used to observe the expansion and contraction of liquids.*



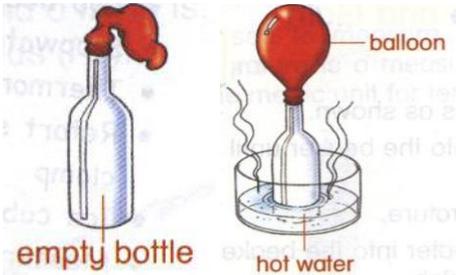
## Gases

*The following apparatus can be used to observe the expansion and contraction of gases.*

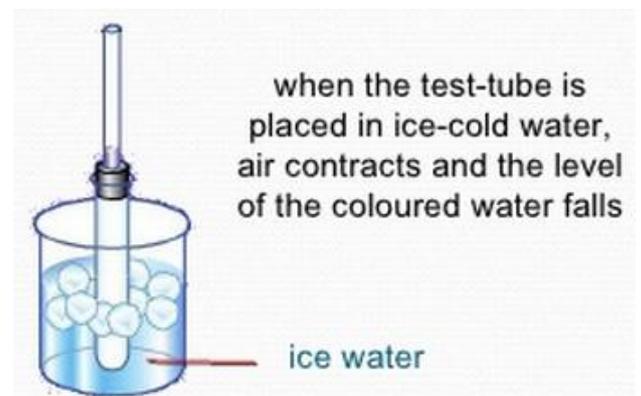
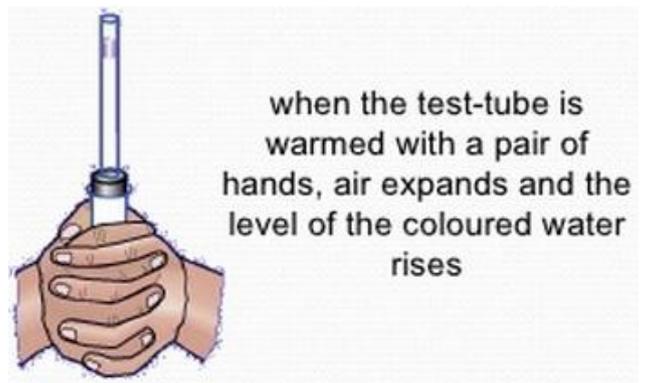
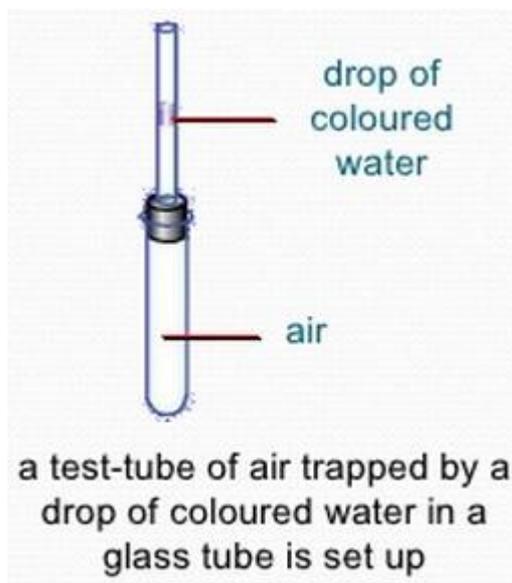
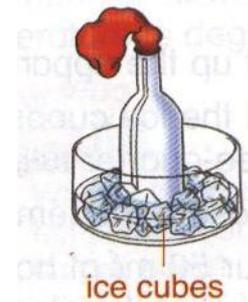
When the air in the inverted flask is warmed with your hands, it expands and escapes in the form of bubbles through the glass tube.



1. When the bottle is immersed in hot water, the air in the bottle gains heat and expands. This makes the balloon inflate.

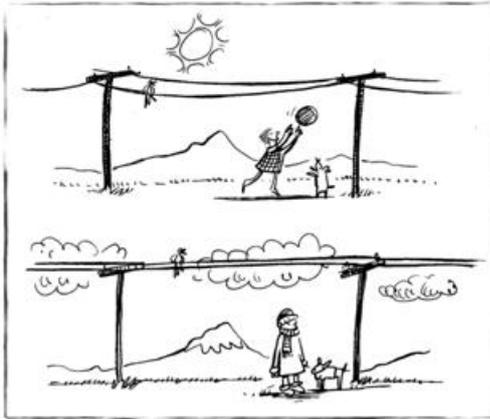


2. When the bottle with inflated balloon is placed in cold water, the air in the bottle loses heat and contracts. This makes the balloon deflate.

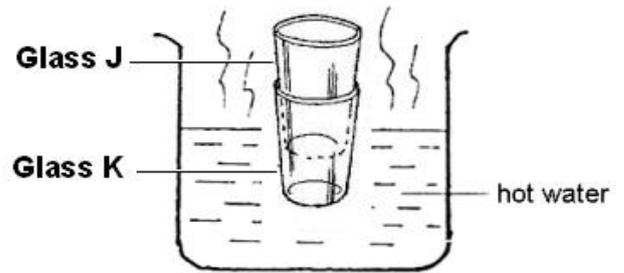


The 3 experiments above show that gases expand when heated and contract when cooled.

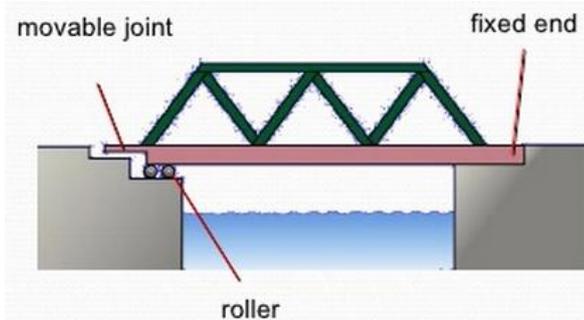
## Application of the Principal of Expansion and Contraction



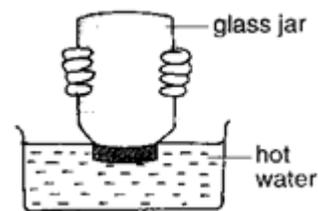
An electric cable is installed loosely to prevent it from snapping when it contracts in cold weather.



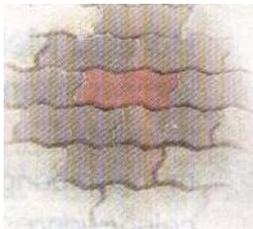
Two glasses that are stuck together can be separated easily by placing them in hot water (Glass K expands and can be separated easily).



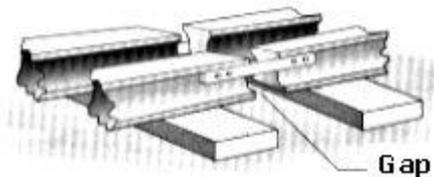
Rollers allow for the expansion and contraction of a bridge.



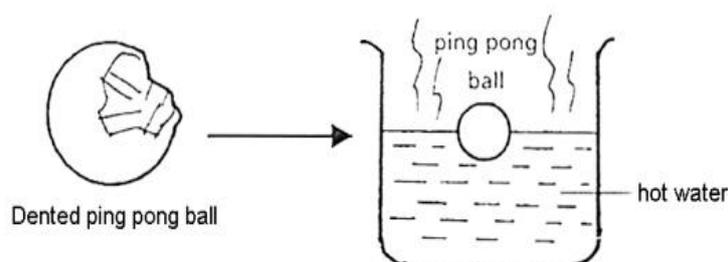
The heat from the water allows the metal lid of the bottle to expand. This makes it easier to open the bottle.



Concrete slabs on pavement have gaps to allow for expansion on hot days.



There are gaps at railway tracks to allow for expansion in hot weather. Without the gaps, the tracks buckle and this affects the safety of the trains.



When a dented ping-pong ball is placed in a bowl of hot water, the air in the ping-pong ball will absorb heat and expand (air in the ball increases in volume).

As the air expand, it will push the dent outward making the ball return to its original shape.