

**Summary**

The temperature of an object depends upon how much its particles are vibrating.

Internal energy (thermal energy) is the total amount of energy in an object.

Heat energy travels from a hot object to a cold object.

Absolute zero is the coldest possible temperature at  $-273^{\circ}\text{C}$ . Temperature in kelvin =  $^{\circ}\text{C} + 273$ .

**Questions**

- Copy out and fill in the missing words:
  - Thermometers are used to measure . . . . which depends on how much the . . . . are vibrating. Internal energy is the amount of . . . . in an object.
  - The coldest possible temperature is . . .  $^{\circ}\text{C}$ , called . . . . .

- Copy out and complete the rhyme:
 

*Thermometers were often made  
With marks described as C . . . .  
But modern times have seen a fuss  
To change the name to C . . . .*

- Copy out and place ticks in the table to show which liquid is better in each case:

	Mercury	Alcohol
Expands more evenly		
Expands more		
A better conductor of heat		
Useful at higher temperatures		
Useful at lower temperatures		

- Explain the difference between heat and temperature.
- Professor Messer blows his top. Tell him why he's such a flop:

- Describe and explain the features of a thermometer which will make it
  - sensitive,
  - quick-acting.
- Convert  $10^{\circ}\text{C}$  to kelvin.
  - Convert  $300\text{ K}$  to  $^{\circ}\text{C}$ .
  - What is your body temperature in kelvin?
- Professor Messer was taken ill. The table shows how his temperature varied:

Time (hours)	0	1	2	3	4	5	6	7	8	9	10
Temperature ( $^{\circ}\text{C}$ )	37	39	40	40	40	39.5	38.3	37.7	37.3	37	37

- Plot a graph of his temperature (for the range  $36\text{--}40^{\circ}\text{C}$ ) against time (in hours).
- What was his highest temperature?
- When did this happen?
- When do you think an ice-bath was used to cool him?
- For how long was his temperature above normal?
- At what times do you think his temperature was  $38^{\circ}\text{C}$ ?
- When was he cooling fastest?



When investigating varying quantities

In the following experiment, keep the temperature constant and

**Experiment 1**  
**Keeping the temperature constant**  
Use the apparatus to investigate how the volume of gas varies with pressure applied (with constant temperature).

Use the vertical scale to measure the volume of trapped air. What is the pressure? What is the volume?

The pressure is measured with a Bourdon gauge. What is the pressure? What is the volume? Why is the pressure constant?

Now use the apparatus to investigate how the volume of gas varies with temperature (with constant pressure). Squeeze the bulb slightly warmer. What happens back to room temperature?

Now measure the volume of gas. Put your results in a table. Use the pump to vary the pressure.

Then calculate the slope of the graph of results.

This is called Boyle's Law.

**For a fixed mass of gas at constant temperature:**

Did you notice that the volume of gas increases as the pressure decreases? If  $p$  increases,  $V$  decreases.

**volume is inversely proportional to pressure.**