F6 Recording data and uncertainty

Revision: volumes

The standard unit for volume is the metre cubed, m^3. However, the volumes of solutions used in chemistry labs are usually much less than 1 m^3. Instead, cm^3 or dm^3 (decimetre cubed) are used.

1 m^3 = 1,000,000 cm^3 = 1000 dm^3

1 dm^3 = 1000 cm^3 = 1 litre

Nowadays, litres and millilitres are rarely used in written chemistry, but 1 ml = 1 cm^3 and many pieces of glassware still show ml.

1. Complete the table by choosing the approximate volume units from the options in bold and estimating the volume for each of the everyday items (images not to scale).

cm^3 dm^3 m^3

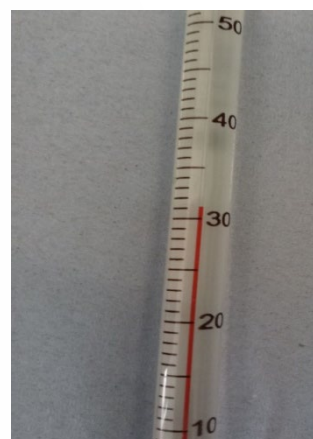|	Drinks bottle	Sugar cube	Washing machine
Approximate volume			

Images © Shutterstock

2. Give the calculation to convert a volume in cm^3 to m^3.

3. Give the calculation to convert a volume in dm^3 to cm^3.

4. For each example below, convert the volume units.
   (a) A helium balloon has a volume of 1600 cm^3. Convert this volume into dm^3.

   (b) An experiment requires 1.35 dm^3 of hydrochloric acid solution. What volume is this in cm^3?

   (c) A swimming pool contains 375 m^3 of water. What is the volume in cm^3?

   (d) A carbon dioxide cylinder has a volume of 6.54 dm^3. What is the volume in m^3?

New content: making measurements

The value recorded for a measurement must be related to the scale used.

Usually, for graduated scales (made from lots of lines) we work out the value on the scale of half the smallest division. On the thermometer shown here, the smallest division between lines is 1°C, so half the smallest division is 0.5°C.

This means that we must record measurements on this thermometer to the nearest 0.5°C and therefore give one decimal place.
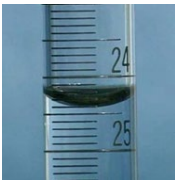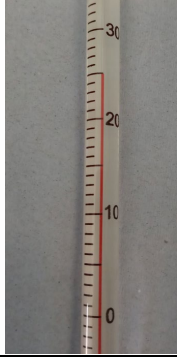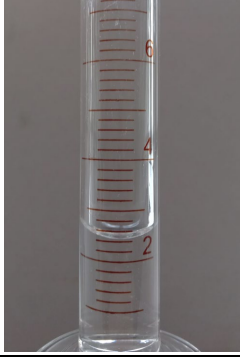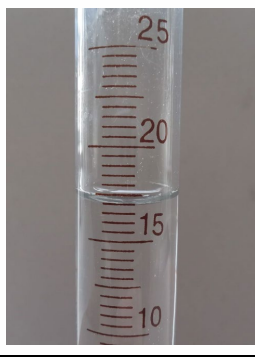
Every reading should be to one decimal place, with the number after the decimal being either '0' (on the line) or '5' (between lines). We cannot give a measurement more precisely than the nearest 0.5°C on this scale, so the number after the decimal cannot be 6 or 2 or 3 etc., as that would be more precise than the nearest 0.5°C.

So, the measurement in the image is 31.0°C.

If a different scale is used, the decision about the number of decimal places must be made again, but the principle of using half the smallest division is the same.

1. Now, read each of these instruments giving the answer with the appropriate precision.

Equipment	Burette	Thermometer	Measuring cylinder (cm³)	Measuring cylinder (cm³)
Picture of scale				
Smallest division				
Half of the smallest division				
Reading shown in image				