Chapter 16

Measurement units and conversions

Learn the ideas below, follow each worked example, then attempt the practice before checking the answers.

16.1 Choosing units and measuring

A measurement combines a number with a unit. Choose a unit appropriate to the size and quantity. Length, mass, capacity, area and volume measure different attributes. Read a scale by finding the value between labelled marks, counting intervals rather than tick marks, and viewing straight on.

Worked example A ruler interval from 2 cm to 3 cm split into ten equal intervals has 1 mm per interval. An object ending at the sixth small mark after 2 cm measures 2.6 cm or 26 mm if it starts at zero.

16.2 Length and mass conversions

For metric length, 10 mm = 1 cm, 100 cm = 1 m and 1,000 m = 1 km. For mass, 1,000 mg = 1 g, 1,000 g = 1 kg and 1,000 kg = 1 tonne. Multiply to express a measurement in smaller units and divide to use larger units.

Worked example 3.75 km = 3,750 m. Also, 4,250 g = 4.25 kg. A combined mass of 2 kg 350 g and 850 g is 2,350 g + 850 g = 3,200 g = 3.2 kg.

16.3 Capacity and volume conversions

Capacity describes how much a container can hold. Volume describes the space occupied. One litre equals 1,000 millilitres, and 1 mL equals 1 cm^3. One litre also equals 1,000 cm^3. Keep the quantity type clear when choosing units.

Worked example 2.4 L = 2,400 mL = 2,400 cm^3. A bottle containing 750 mL has 0.75 L. Three such bottles hold 2.25 L.

16.4 Area and cubic unit conversions

Square the length conversion factor for area and cube it for volume. A square metre contains 100 × 100 square centimetres. A cubic metre contains 100 × 100 × 100 cubic centimetres. One hectare is 10,000 m².

Worked example 1 m² = 10,000 cm², so 2.3 m² = 23,000 cm². Also, 1 m³ = 1,000,000 cm³ = 1,000 L. Therefore, 0.04 m³ = 40 L.

16.5 Combining measurements and accuracy

Convert measurements to compatible units before adding or comparing. State the final unit and sensible accuracy. Measuring instruments have limited resolution, so avoid giving more precision than the data supports. Distinguish an exact unit conversion from an approximate measured value.

Worked example A ribbon is 1.8 m long and another is 65 cm. Convert 1.8 m to 180 cm, then add: 180 + 65 = 245 cm = 2.45 m. The conversion is exact.

Chapter 16 practice

Work in your notebook. Show your method and include units where needed.

1. Convert 6.08 m to centimetres.
2. Convert 3,450 mg to grams.
3. Convert 1.25 L to millilitres.
4. Convert 72,000 cm² to m².
5. Find 2 m 35 cm − 87 cm.

Answers with methods

1. 6.08 × 100 = 608 cm.

2. 3,450 ÷ 1,000 = 3.45 g.

3. 1.25 × 1,000 = 1,250 mL.

4. 72,000 ÷ 10,000 = 7.2 m².

5. 235 − 87 = 148 cm = 1 m 48 cm.

Common mistake to avoid

Converting m² to cm² requires multiplying by 10,000, not 100. The exponent on a unit changes the conversion factor.