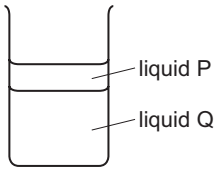
4 The diagram shows one liquid floating on top of another liquid.



Which statement explains why liquid P floats on top of liquid Q?

A The mass of liquid Q is greater than the mass of liquid P.

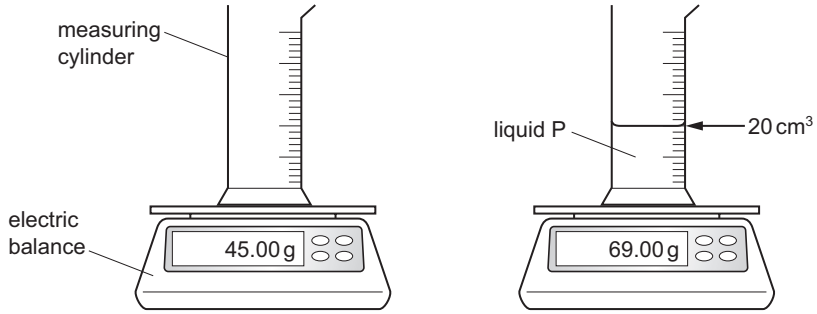
B The mass of 1 cm^3 of liquid Q is greater than the mass of 1 cm^3 of liquid P.

C The volume of liquid Q is greater than the volume of liquid P.

D The volume of 1 g of liquid Q is greater than the volume of 1 g of liquid P.

4 Students are asked to predict the order in which three liquids, P, Q and R, will float on each other. They are told that the liquids will **not** mix.

The diagrams show how the density of liquid P is determined.



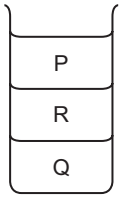
The table shows the densities of Q and R.

liquid	density / g/cm^3
Q	0.75
R	1.1

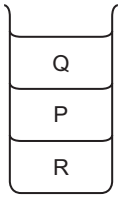
The liquids are poured gently into a tall beaker and allowed to settle.

Which diagram shows the liquids settled in the correct order?

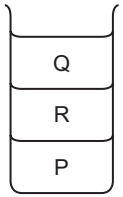
A



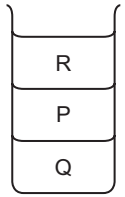
B



C



D



5 Three different liquids are poured into a tall beaker. The liquids do **not** mix.

The liquid densities are shown in the table.

liquid	density / g/cm^3
P	1.8
Q	2.4
R	1.2

What is the correct order of the liquids from the top of the beaker to the bottom?

A P → Q → R **B** Q → P → R **C** Q → R → P **D** R → P → Q

4 **(a)** **(i)** A rectangular glass tank contains 3.0 m^3 of liquid. The mass of the liquid is 2800 kg. Calculate the density of the liquid.

density = ... [1]

(ii) A metal block is placed in the tank and it sinks to the bottom. The top surface of the block is 1.1 m below the surface of the liquid.

Fig. 4.1 shows the block on the bottom of the tank.

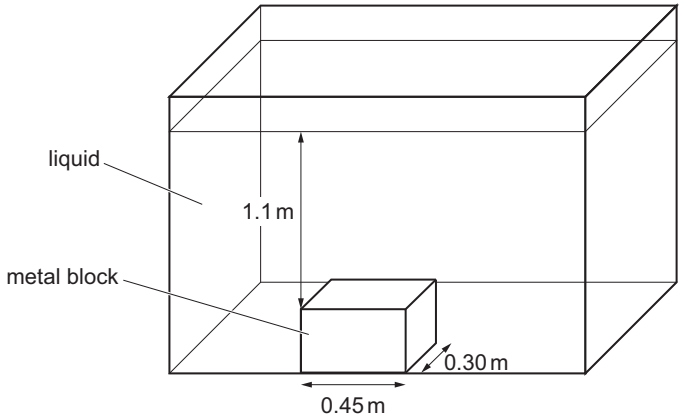


Fig. 4.1

Calculate the force exerted by the liquid on the top of the block.

force on top of the block = ... [4]

(b) Fig. 4.2 shows part of a steel railway track. There are small gaps between sections of the rail.

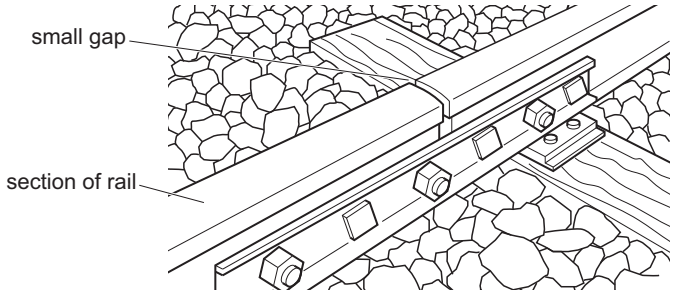


Fig. 4.2

State why gaps are needed between the sections of rail. Explain your answer in terms of particles.

statement .....

explanation .....

.....

[2]

(c) Fig. 4.3 shows a saucepan of boiling water on the heating ring of an electric cooker.

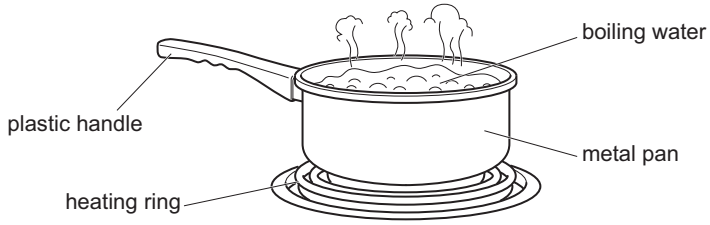


Fig. 4.3

The handle is made from plastic.
Explain why this material is suitable.

.....

.....

..... [2]

[Total: 9]

1 A student determines the volume of a block of modelling clay by two methods.

Method 1

He measures the block of modelling clay shown full size in Fig. 1.1.

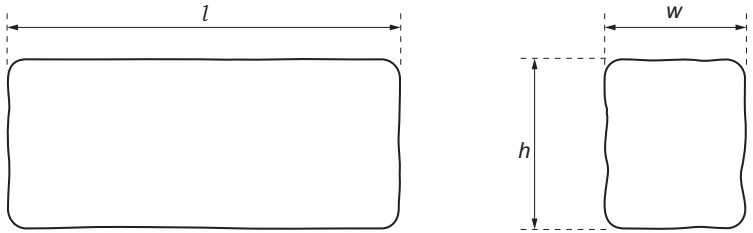


Fig. 1.1

(a) **(i)** Measure the length l, width w and height h of the block of modelling clay on Fig. 1.1. Record your values in centimetres to the nearest millimetre.

length l = ... cm

width w = ... cm

height h = ... cm

[2]

(ii) Calculate a value V_A for the volume of the block. Use your measurements from **(a)(i)** and the equation:

$$V_A = l \times w \times h.$$

V_A = ... cm^3 [1]

(b) Suggest why V_A is only an approximate value for the volume of the block.

Describe how the accuracy of V_A can be improved.

suggestion .....

.....

improvement .....

.....

[2]

(c) Another student measures the dimensions of a block of clay which is much smaller than the block in **(a)**. Suggest why these measurements may not be as accurate as yours, even if they are done carefully.

.....

.....

..... [1]

Method 2

(d) **(i)** The student pours water into a measuring cylinder.

Record the volume V_1 of the water in the measuring cylinder shown in Fig. 1.2.

V_1 = ... cm^3 [1]

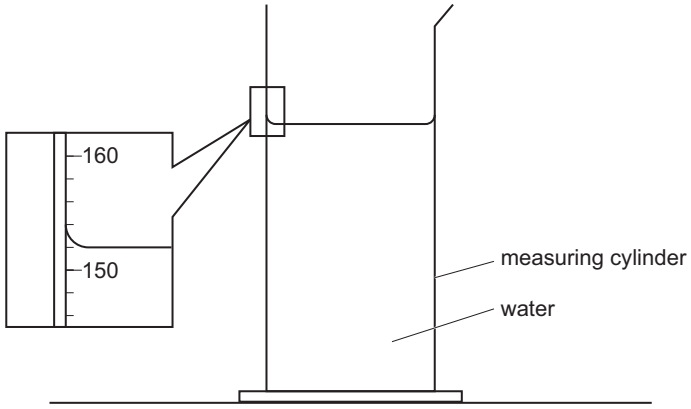


Fig. 1.2

(ii) Describe briefly how a measuring cylinder is read to obtain an accurate value for the volume of water.

.....

..... [1]

(e) The student lowers the modelling clay into the water using a loop of thread, as shown in Fig. 1.3.

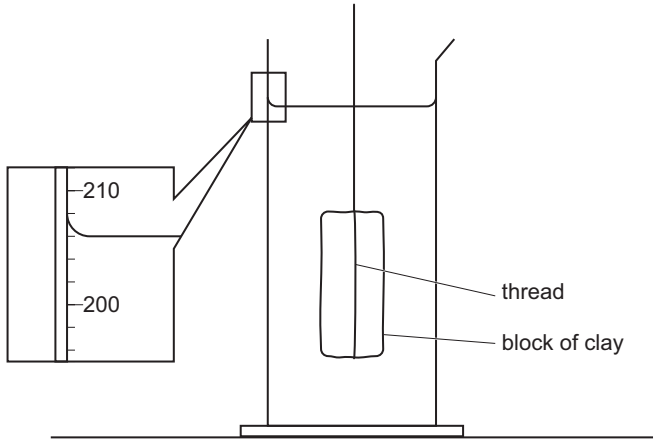


Fig. 1.3

Record the new reading V_2 shown on the measuring cylinder scale in Fig.1.3.

V_2 = ... cm^3

Calculate another value V_B for the volume of the block.

Use your measurements from **(d)(i)** and **(e)** and the equation: $V_B = (V_2 - V_1)$.

V_B = ... cm^3
[1]

(f) Suggest **one** possible source of inaccuracy in Method 2 and suggest **one** improvement to reduce its effect.

source of inaccuracy .....

.....

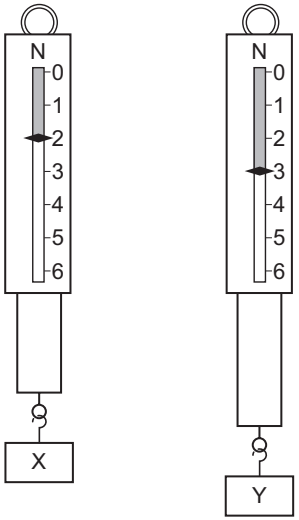
improvement .....

.....

[2]

[Total: 11]

3 The diagrams show two metal blocks, X and Y, suspended from identical force meters. X and Y have identical dimensions.



Which statement about X and Y is correct?

A They have different volumes and different weights.

B They have different volumes and equal weights.

C They have equal volumes and equal weights.

D They have equal volumes and different weights.

1 A student determines the density of a ball.

(a) He places the ball between two wooden blocks, as seen from above in Fig. 1.1.

He takes two measurements, d_1 and d_2.

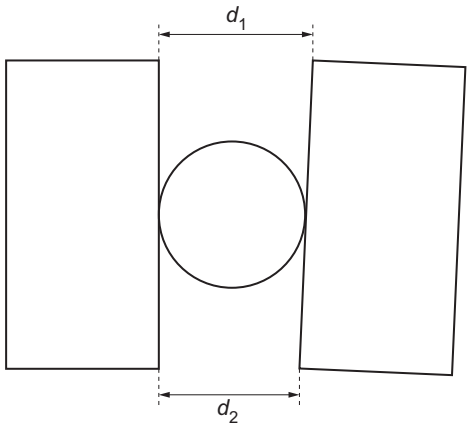


Fig. 1.1

(i) On Fig. 1.1, measure the lengths d_1 and d_2.

d_1 = ... cm

d_2 = ... cm
[1]

(ii) Using your measurements, calculate the diameter d of the ball. Show your working.

d = ... cm [1]

(iii) Explain why this method is used to measure the diameter of the ball.

.....

..... [2]

(b) Calculate the volume V of the ball using the equation $V = 0.52d^3$.

Include the unit.

V = ... [2]

(c) The student measures the mass m_D of a dish.

m_D = 102.5 g

He places the ball in the dish and measures the combined mass m_C of the dish and the ball.

Fig. 1.2 shows the dish and the ball on a balance.

Record the reading shown on the balance.

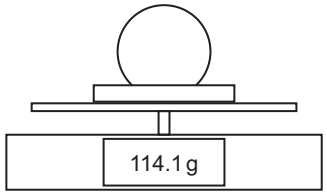


Fig. 1.2

m_C = ... g

Calculate the mass m_B of the ball. Show your working.

m_B = ... g
[2]

(d) Calculate the density ρ of the ball using the equation:

$$\rho = \frac{m_B}{V}.$$

Give your answer to a suitable number of significant figures for this experiment. Include the unit.

ρ = ... [3]

[Total: 11]

4 The mass of an object is 2.5 kg. The volume of the object is 480 cm^3.

What is the density of the object?

A 5.2×10^{-3} g / cm^3

B 5.2 g / cm^3

C 190 g / cm^3

D 1.2×10^3 g / cm^3

4 The table shows the mass and volume of three different liquids, X, Y and Z.

liquid	mass / g	volume / cm^3
X	120	200
Y	80	67
Z	100	120

The liquids are placed in the same container. The liquids do not mix.

Which liquid is at the top of the container and which liquid is at the bottom?

	liquid at top	liquid at bottom
A	X	Y
B	X	Z
C	Y	X
D	Y	Z