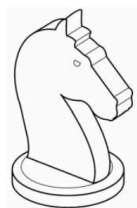


Q1. (2018)

07

A student wanted to determine the density of the irregular shaped object shown in **Figure 11**

Figure 11

a)

07.1

Plan an experiment that would allow the student to determine the density of the object.

[6 marks]

b)

07.2

Another student did a similar experiment.

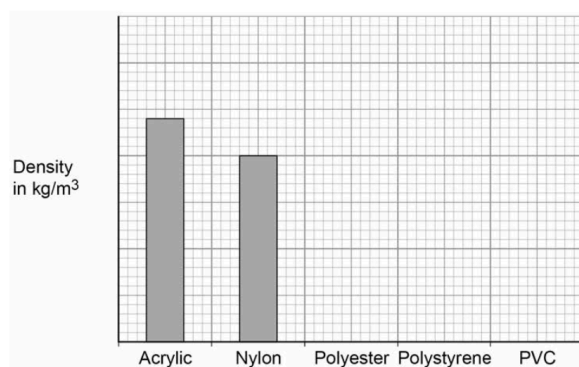
He determined the density of five common plastic materials.

Table 3 shows the results.

Table 3

Plastic material	Density in kg/m^3
Acrylic	1200
Nylon	1000
Polyester	1380
Polystyrene	1040
PVC	1100

Figure 12 shows the results plotted in a bar chart.

Figure 12

Complete **Figure 12**

You should:

- Write the correct scale on the y-axis.
- Draw the bars for polyester, polystyrene and PVC.

[4 marks]

c)

0 7 . 3 The student is given a piece of a different plastic material.

The student determined the density of the material three times.

Table 4 shows the results.

Table 4	
	Density in kg/m^3
1	960
2	1120
3	1040

Determine the uncertainty in the student's results.

[2 marks]

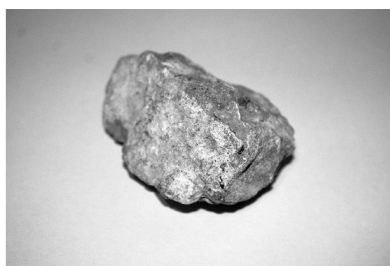
Uncertainty = _____ kg/m^3

Q2. (2021)

0 1 A student investigated the density of different types of rock.

Figure 1 shows a piece of limestone.

Figure 1



a)

0 1 . 1 The student was **not** able to calculate the volume of the piece of limestone using measurements taken with a ruler.

What is the reason?

[1 mark]

Tick (✓) **one** box.

A ruler is not very accurate.

☐

The piece of limestone has an irregular shape.

☐

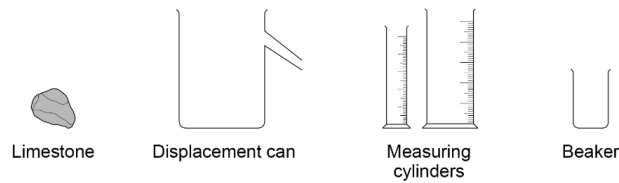
There is a large uncertainty when using a ruler.

☐

b)

0 1 . 2 Figure 2 shows some of the equipment given to the student.

Figure 2



Describe a method the student could use to determine the volume of the piece of limestone.

[4 marks]

c)

0 1 . 3 The mass of the piece of limestone was 155 g.

The volume of the piece of limestone was 62 cm³.

Calculate the density of the piece of limestone.

Use the equation:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

[2 marks]

d)

0 1 . 4 Density can be measured in g/cm³.

What is another unit for density?

[1 mark]

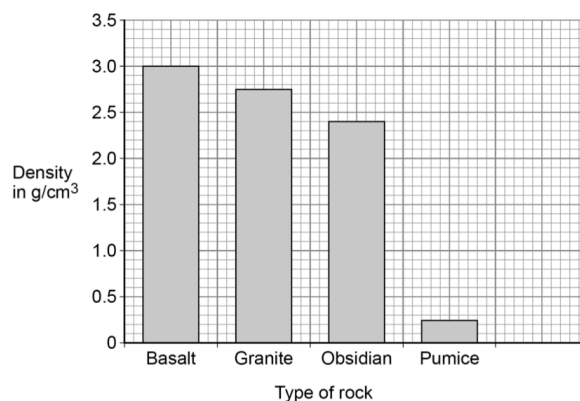
Tick (✓) **one** box.

- | | |
|---------------------|--------------------------|
| cm/g ³ | ☐ |
| kg/m ³ | ☐ |
| kg ³ /m | ☐ |
| kg ³ /cm | ☐ |

e)

Figure 3 gives the density of some other types of rock.

Figure 3



The student has a sample of an unknown type of rock.

The density of this rock is 2.4 g/cm³.

0 1 . 5 Draw a bar on **Figure 3** to show the density of the unknown type of rock.

[1 mark]

f)

0 1 . 6 Complete the sentence.

Choose the answer from the box.

[1 mark]

basalt	granite	obsidian	pumice
--------	---------	----------	--------

The data in **Figure 3** suggests that the unknown type of rock is _____.

g)

0 1 . 7 The student **cannot** be certain that the unknown type of rock is one of the types of rock in **Figure 3**.

Give a reason why.

[1 mark]

Q3. (2021)

0 1 . 9 Complete the sentence.

Choose the answer from the box.

[1 mark]

less than	the same as	more than
-----------	-------------	-----------

The holes containing air cause the density of pumice to be _____ the density of other types of rock.

Q4. (2022)

0 4 **Figure 6** shows a swimmer wearing a wetsuit.

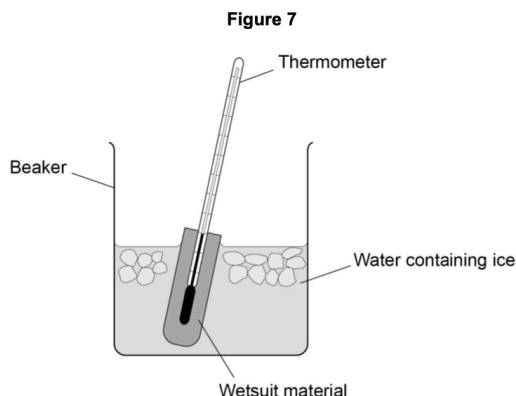
The wetsuit helps to keep the swimmer warm.

Figure 6



A student wrapped a thermometer in a piece of wetsuit material and placed the thermometer in water containing ice.

Figure 7 shows the apparatus.



The student recorded the temperature of the thermometer after 30 seconds for four materials. Each piece of material was the same size and thickness.

In each test the starting temperature of the thermometer was 21.0 °C

Table 2 shows the results.

Table 2

Material	W	X	Y	Z
Temperature in °C	13.5	8.0	16.0	12.0

The student wanted to determine the density of a wetsuit material.

The student measured the length of one side of a cube of wetsuit material with:

- a micrometer
- a ruler.

Table 3 shows the results.

Table 3

Equipment	Length in cm		
	Measurement 1	Measurement 2	Measurement 3
Micrometer	0.581	0.557	0.576
Ruler	0.6	0.6	0.6

a)

0 4 6 Complete the sentence.

Choose the answer from the box.

[1 mark]

calibration	precision	reproducibility	resolution
-------------	-----------	-----------------	------------

The results show that compared to the ruler the micrometer has a higher

_____.

b)

Use the Physics Equations Sheet to answer questions 04.7 and 04.8.

0 4 7 Write down the equation that links density (ρ), mass (m) and volume (V).

[1 mark]

c)

0 4 . 8

The student calculated the volume of the cube of wetsuit material to be 0.186 cm^3 The density of the cube was 0.300 g/cm^3

Calculate the mass of the cube.

Give your answer in grams.

[3 marks]

Q5. (2023)

0 3 . 6

The density of steel decreases as it melts.

How does the spacing of the particles change as the steel melts?

[1 mark]

Q6. (2024)

0 5

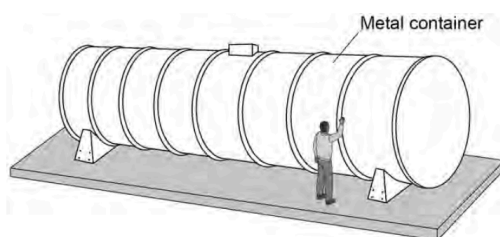
Data-storage computers get very hot.

Scientists investigated using the sea to cool data-storage computers.

The computers were set up inside a large metal container.

Figure 8 shows the metal container before it was lowered into the sea.

Figure 8



a)

0 5 . 6

The container has a length of 12 m.

The container has a cross-sectional area of 7.5 m^2 .

Calculate the volume of the container.

Use the equation:

$$\text{volume} = \text{length} \times \text{cross-sectional area}$$

[1 mark]

b)

Use the Physics Equations Sheet to answer questions 05.7 and 05.8.

0 5 . 7

Write down the equation that links density (ρ), mass (m) and volume (V).

[1 mark]

c)

0 5 . 8

The average density of the container and its contents is 1100 kg/m^3 .

Calculate the mass of the container and its contents.

Use your answer to Question 05.6

[3 marks]