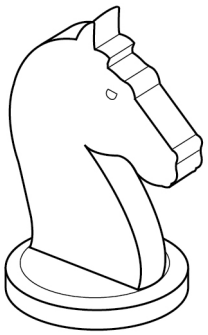
Do not write outside the box

0 2 A student wanted to determine the density of the irregular shaped object shown in **Figure 3**

Figure 3



0 2 . 1 Plan an experiment that would allow the student to determine the density of the object.

[6 marks]

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0 2 . 2 Another student did a similar experiment.

He determined the density of five common plastic materials.

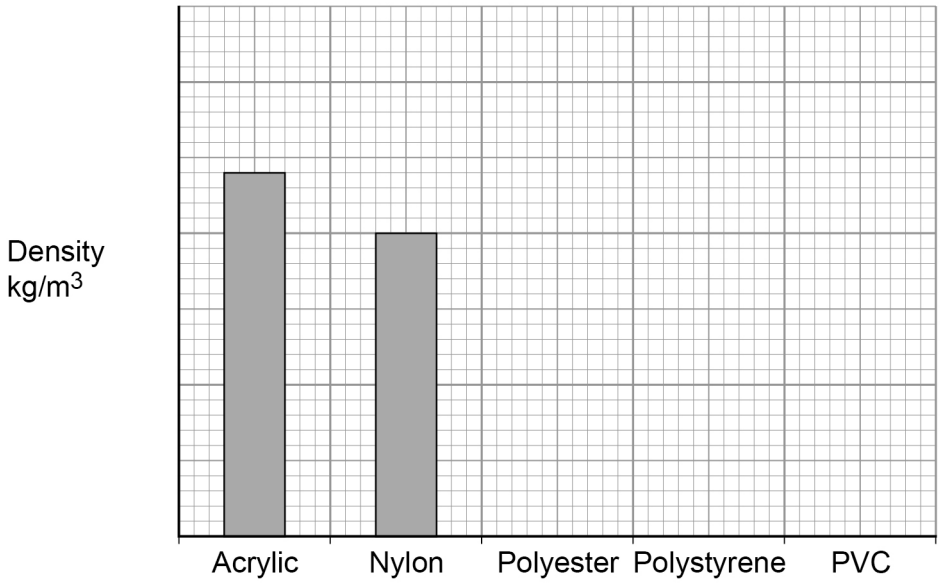
Table 1 shows the results.

Table 1

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

Figure 4 shows the results plotted in a bar chart.

Figure 4



Complete **Figure 4**

You should:

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

[4 marks]

Turn over ►

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0 2 . 3 The student is given a piece of a different plastic material.

The student determined the density of the material three times.

Table 2 shows the results.

Table 2

	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

12

Question	Answers	Mark	AO / Spec. Ref.
02.1	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 6.3.1.1
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • measure mass • use a top pan balance or scales • part fill a measuring cylinder with water • measure initial volume • place object in water • measure final volume • volume of object = final volume − initial volume • fill a displacement / eureka can with water • water level with spout • place object in water • collect displaced water • measuring cylinder used to determine volume of displaced water • use of: $\text{density} = \frac{\text{mass}}{\text{volume}}$		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	all *y*-axis values correct (minimum of 3)	allow **1** mark for two correct values	2	AO2 6.3.1.1
	all bars drawn to the correct height	allow **1** mark for two correct bars allow ± ½ small square	2	
02.3		an answer of 80 scores **2** marks		AO3 6.3.1.1
	$\frac{(1120 - 960)}{2}$	ignore + and / or − signs	1	
	= 80 (kg/m^3)	an answer of 160 scores **1** mark	1	
Total			**12**	