

Q1.

Question number	Answer	Additional guidance	Mark
	estimation (1)  reading off scale either 1750 or 1350 seen  evaluation (1)  400 (cm <sup>3</sup> )	allow estimate in range 1300-1400 or 1700-1800 for 1 mark  accept any answer between 350 and 450 (cm <sup>3</sup> )  award full marks for the correct answer without working  if no other marks scored accept an answer between 350 and 450 to any other power of 10 for one mark	(2) AO2.2

Q2.

Question Number	Answer	Additional guidance	Mark
(i)	29(g)		(1)

Question Number	Answer	Additional guidance	Mark
(ii)	25(cm <sup>3</sup> )		(1)

Question Number	Answer	Mark
(iii)	<p><b>D</b> density = <math>\frac{\text{mass}}{\text{volume}}</math></p> <p><b>D</b> is the only correct answer</p> <p><b>A</b> is incorrect because the equation density = mass + volume is incorrect</p> <p><b>B</b> is incorrect because the equation density = mass – volume is incorrect</p> <p><b>C</b> is incorrect because the equation density = mass x volume is incorrect</p>	(1)

Question Number	Answer	Additional guidance	Mark
<b>(iv)</b>	<p>Any two improvements from:</p> <p>use balance that reads to one or more decimal places/more decimal places (1)</p> <p>use tare/zero balance for first measurement (1)</p> <p>use measuring cylinder with smaller divisions (1)</p> <p>use larger volume of liquid (1)</p> <p>repeat <u>and</u> average (1)</p> <p>read measuring cylinder at eye level (1)</p>	<p>Accept use more accurate/precise balance in this context</p> <p>Allow reset for tare</p> <p>Allow more accurate/ different scale / different divisions / thinner measuring cylinder</p> <p>Allow use more liquid / larger mass of liquid</p> <p>Allow avoid parallax error / read from bottom of meniscus</p>	<b>(2)</b>

Q3.

Question number	Answer	Additional guidance	Mark
	<p>an explanation linking</p> <p>density of wood less (than that of water) (1)</p> <p>less (volume of) water displaced (than volume of wood) (1)</p>	<p>allow wood floats / should be submerged</p> <p>allow wood absorbing water</p> <p>allow (idea of) incorrect volume reading</p> <p>allow (idea that) the volume cannot be measured this way</p>	<p><b>(2)</b></p> <p><b>AO2</b></p>

## Q4.

Question number	Answer	Additional guidance	Mark
	<p>Any <b>two</b> from the following in any order</p> <p>(I took a) reading of the water level in the measuring cylinder without the metal. (1)</p> <p>(I made sure that) the metal was fully immersed / submerged (1)</p>	<p>Answers need not be exactly the same as those given here provided that the meaning is clear.</p> <p>accept measured / read for take a reading</p> <p>accept reading of original level / volume</p> <p>accept starting with a specified amount e.g. 50ml</p> <p>all the metal was under water</p>	<p><b>(2)</b> <b>AO1</b></p>
	<p>(I) subtracted the two readings / volumes (1)</p>	<p>took one from the other / found the difference</p> <p>ignore:</p> <ul style="list-style-type: none"> <li>repeat and/or average</li> <li>other measurements such as mass</li> <li>other methods such as Eureka can</li> <li>ideas of spillage</li> <li>reading from bottom of meniscus</li> </ul>	

Q5.

Question number	Answer	Additional guidance	Mark
	<p>An answer that provides a description by making reference to:</p> <ul style="list-style-type: none"><li>part fill a measuring cylinder with water and record the starting volume (1)</li><li>completely immerse the stone in the water and record the final volume of water and stone (1)</li><li>volume of stone = final volume - initial volume (1)</li></ul>	<p>accept valid alternative methods, e.g.</p> <p>fill a displacement can until some water overflows/flows out of spout</p> <p>completely immerse the stone in the displacement can and collect the displaced water in a measuring cylinder</p> <p>volume of water displaced = volume of stone</p>	<p>(3)</p>

Q6.

Question number	Answer	Additional guidance	Mark
<b>(i)</b>	<p>an explanation linking any three of the following :</p> <p>use a measuring cylinder /beaker or use a eureka can /displacement can/container with spout (1)</p> <p>(partly) fill measuring cylinder /beaker (with water) note the reading or fill (eureka) can to spout (1)</p> <p>immerse piece of copper (in water) (1)</p> <p>note difference in readings of water level (in measuring cylinder /beaker) or collect water from spout in a measuring cylinder /beaker (1)</p>	<p>give credit for other acceptable methods</p> <p>If no other marks scored then allow 1 mark for attempt to measure volume directly: e.g. fill copper tube with water, tip out and measure volume or measure dimension(s) of copper tube</p>	<b>(3)</b>

Q7.

Question Number	Answer	Additional guidance	Mark
	<p>A description including:</p> <p>find mass of marble(s) (1)</p> <p>put marble(s) into water (in cylinder) and measure <b>change</b> in water level (1)</p> <p>divide mass by volume (1)</p> <p>suitable idea to improve accuracy such as use several marbles (1)</p>	<p>weigh marble(s)</p> <p>accept volume for water level</p> <p>note level before and after marble(s) added</p> <p>find <b>volume</b> of water displaced</p> <p>density = mass/volume in words or symbols</p> <p>subtract mass of bag from total mass of marbles and bag</p> <p>ensure water measured at eye level</p> <p>use appropriately sized measuring cylinder</p> <p>ignore reference to repeating and taking average</p>	<p><b>(4)</b></p>

Q8.

Question number	Indicative content	Mark
*	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p style="text-align: center;"><b>AO1 (strand 2) (6 marks)</b></p> <p>Indicative content</p> <ul style="list-style-type: none"><li>• measure the length and width of a strip with the ruler / a metre rule</li><li>• measure the thickness of the strip with a more accurate device e.g. digital callipers OR place 5 (say) of the same strip on top of each other and measure their thickness with the ruler then <math>\div 5</math> to calculate a single thickness [plus air gap]</li><li>• measure the mass of a strip with an electronic balance</li><li>• measure the mass of (say) 5 strips then <math>\div 5</math> to calculate the mass of one of them</li><li>• calculate the volume (<math>= l \times w \times t</math>) in <math>m^3</math> and the mass in kg</li><li>• use displacement can/measuring cylinder to find the volume</li><li>• mass / volume to get density</li><li>• check if it's near one of the teacher's two values of density given</li><li>• if it's close / not so far off it's safe to assume that strip is of the identified material</li><li>• repeat for the other strip</li><li>• other repeat measurements</li></ul>	<p><b>(6)</b> <b>AO1</b></p>

AO targeting: AO1.2		
Level	Mark	Descriptor
	0	<ul style="list-style-type: none"> <li>No rewardable material.</li> </ul>
Level 1	1-2	<ul style="list-style-type: none"> <li>Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1)</li> <li>Presents a description which is not logically ordered and with significant gaps. (AO1)</li> </ul>
Level 2	3-4	<ul style="list-style-type: none"> <li>Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1)</li> <li>Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing. (AO1)</li> </ul>
Level 3	5-6	<ul style="list-style-type: none"> <li>Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1)</li> <li>Presents a description that has a well-developed structure which is clear, coherent and logical. (AO1)</li> </ul>

Summary for guidance			
Level	Mark	Additional Guidance	General additional guidance – the decision within levels
	0	No rewardable material.	e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
Level 1	1-2	<u>Additional guidance</u> Partially complete description of a suitable procedure with at least two measurements  OR one measurement and another procedural point	<u>Possible candidate responses</u> measure the length measure the width of a strip measure the mass/weight of a strip  e.g. repeat measurements
Level 2	3-4	<u>Additional guidance</u> Mostly complete description of a suitable procedure with at least three measurements and some description of processing the results.	<u>Possible candidate responses</u> As above with measure the thickness of the strip  calculate the volume (= l x w x t) OR immerse in liquid to get volume
Level 3	5-6	<u>Additional guidance</u> Detailed description of a suitable procedure with all necessary measurements and a clear description of processing the results.	<u>Possible candidate responses</u> As above with extra detail e.g. measure the mass of (say) 5 strips then ÷5 to calculate the mass of one of them detail of obtaining volume by immersion use density =mass /volume  check if density value obtained is near one of the teacher's two values