

## Mark schemes

|           |   |            |
|-----------|---|------------|
| <b>1.</b> | (a) <b>Level 2:</b> The method would lead to the production of a valid outcome. Key steps are identified and logically sequenced.   | 3–4        |
|           | <b>Level 1:</b> The method would not necessarily lead to a valid outcome. Some relevant steps are identified, but links are not made clear.   | 1–2        |
|           | <b>No relevant content</b>  | 0          |
|           | <b>Indicative content</b>   |            |
|           | <ul style="list-style-type: none"><li>part fill a measuring cylinder with water</li><li>measure initial volume</li><li>place object in water</li><li>measure final volume</li><li>volume of object = final volume – initial volume</li></ul>                    |            |
|           | <ul style="list-style-type: none"><li>fill a displacement / eureka can with water</li><li>water level with spout</li><li>place object in water</li><li>collect displaced water</li><li>measuring cylinder used to determine volume of displaced water</li></ul> |            |
| (b)       | density = $\frac{48.6}{18.0}$   | 1          |
|           | density = 2.70 (g/cm <sup>3</sup> )   | 1          |
|           | <i>an answer of 2.70 (g/cm<sup>3</sup>) scores 2 marks</i>  |            |
| (c)       | limestone   | 1          |
| (d)       | eye position when using measuring cylinder<br><b>or</b><br>water level in can (at start) not at level of spout<br><b>or</b><br>not all water displaced by stone is collected in container   | 1          |
| (e)       | volume would be lower / higher  | 1          |
|           |   | <b>[9]</b> |

2.

**Level 3 (5–6 marks):**

Clear and coherent description of both methods including equation needed to calculate density. Steps are logically ordered and could be followed by someone else to obtain valid results.

**Level 2 (3–4 marks):**

Clear description of one method to measure density **or** partial description of both methods. Steps may not be logically ordered.

**Level 1 (1–2 marks):**

Basic description of measurements needed with no indication of how to use them.

**0 marks:**

No relevant content.

**Indicative content**

**For both:**

- measure mass using a balance
- calculate density using  $\rho = m / V$

**Metal cube:**

- measure length of cube's sides using a ruler
- calculate volume

**Small statue:**

- immerse in water
- measure volume / mass of water displaced
- volume of water displaced = volume of small statue

[6]

3.

(a) range of speeds

1

moving in different directions

*accept random motion*

1

(b) internal energy

1

(c) density = mass / volume

1

(d) 0.00254 / 0.0141

1

0.18

1

*accept 0.18 with no working shown for the 2 calculation marks*

kg / m<sup>3</sup>

1

[7]