

**Question 1** (Answer: **D**)

- A ball's widest point cannot be lined up against a ruler directly.
- Place two flat blocks or set squares either side of the ball, just touching it.
- The distance between them, read off the ruler, is the diameter.

**Question 3** (Answer: **B**)

- A region in which a mass experiences a force is a \*field\*.
- For gravity that is the gravitational field.
- Charge belongs to electric fields, and gravitational potential energy is a quantity, not a region.

**Question 1** (Answer: **A**)

- A vector has direction as well as size.
- Acceleration is a rate of change of velocity and force acts in a direction, so both are vectors.
- Density and pressure have no direction, so they are scalars.

**Question 1** (Answer: **A**)

- Passing the marker \*from the same direction\* happens once per complete swing, so each pass is one period.
- 12 periods take  $138 - 90 = 48$  s.
- $T = 48/12 = 4.0$  s.

|          |                                                                                                                                   |
|----------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1(a)(i)  | scalar has magnitude (size) <u>only</u> <b>OR</b> vector has (magnitude and) direction                                            |
| 1(a)(ii) | mass, energy and temperature<br>all correct and no additional quantities 2 marks<br>2 correct and no additional quantities 1 mark |
| 1(b)(i)  | decrease in kinetic energy = increase in gravitational (potential) energy <b>OR</b><br>$\frac{1}{2}mv^2 = mg(\Delta)h$            |
|          | $v^2 = 2gh$ <b>OR</b> $v^2 = 2 \times 9.8 \times 5.0$ <b>OR</b> $v^2 = 98$                                                        |
|          | $v = \sqrt{98}$ <b>OR</b> 9.899                                                                                                   |
| 1(b)(ii) | 0.57 kg m / s (upwards) <b>OR</b> 0.57 Ns (upwards)                                                                               |
|          | (momentum = ) $mv$ <b>OR</b> $5.8 \times 10^{-2} \times 9.9$                                                                      |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1(a)      | (only) acceleration <b>AND</b> velocity circled                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1(b)(i)   | 56 m / s<br>braille: 55 m / s                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1(b)(ii)  | accelerates <b>OR</b> speed increases<br><b>AND</b><br>(then) constant speed<br><b>AND</b><br>(then) decelerates <b>OR</b> speed decreases<br><br><u>constant</u> acceleration <b>OR</b> <u>constant</u> deceleration                                                                                                                                                                                                                                                                           |
| 1(b)(iii) | 26 000 m <b>OR</b> 26 km<br>braille: 26 125 m<br><br>(distance =) area under the speed–time graph <b>OR</b><br>(distance =) <u>average speed</u> × time taken<br><br>$0.5 \times 80 \times 56$ <b>AND</b> $56 \times 400$ <b>AND</b> $0.5 \times 50 \times 56$<br><b>OR</b><br>$\frac{1}{2} \times \{400 + 530\} \times 56$<br>braille: $0.5 \times 100 \times 55$ <b>AND</b> $55 \times 400$ <b>AND</b> $0.5 \times 50 \times 55$<br><b>OR</b><br>$\frac{1}{2} \times \{400 + 550\} \times 55$ |
| 1(b)(iv)  | any <b>one</b> from:<br><ul style="list-style-type: none"> <li>lower acceleration <b>OR</b> less acceleration</li> <li>lower deceleration <b>OR</b> less deceleration</li> <li>lower maximum speed <b>OR</b> lower average speed <b>OR</b> lower constant speed</li> </ul>                                                                                                                                                                                                                      |

**Question 1** (Answer: A)

- A vector has both size and direction; a scalar has size only.
- Mass and energy have no direction, so they are scalars.
- Weight is a force and acceleration is a rate of change of velocity, so both are vectors.

**Question 1** (Answer: D)

- A vector has direction as well as size.
- Weight is a force, and forces always act in a particular direction.
- Density, mass and pressure are all scalars – they have size only.