

Multiple Choice Answers

Q2: D

Multiple Choice Answers

Q2: D

Q4: C

Multiple Choice Answers

Q2: B

Q3: B

2(a)(i)	Final value of d in the range 4.0 cm to 8.0 cm with unit.
2(a)(ii)	Absolute uncertainty in d in range 0.2 cm to 0.6 cm Correct method of calculation to find percentage uncertainty e.g. absolute uncertainty / value from 2(a)(i) $\times 100$. If repeated readings have been taken, then the uncertainty can be half the range if the working is clearly shown, but NOT zero if values are equal.
2(b)	Value of L in the range 85.0 cm to 100.0 cm with unit (somewhere)
2(c)(i)	Raw values of h to the nearest millimetre with unit (seen somewhere)
	Value of final t in the range 1.0 s to 5.0 s with unit
	Evidence of repeated measurements of t
2(c)(ii)	Value of a calculated correctly
2(c)(iii)	Justification for significant figures in a linked to significant figures in L and t .
2(d)	Second values of h and t .
	Second value of t greater than first value of t
2(e)	Two values of k calculated correctly.
	The final k values must not be written as fractions or given to only one significant figure.
2(f)	Calculation of percentage difference between candidate's two k values and comparison of percentage difference with 15%, leading to a consistent conclusion.

2(g)(i)	1 mark for each point up to a maximum of 4. A Two readings are <u>not enough to draw a conclusion</u> or not enough k values to draw a conclusion B Difficulty with measuring <u>d or diameter</u> with reason e.g. parallax / <u>base</u> / <u>bottom</u> of the bottle is not uniform / edges of the <u>base</u> / <u>bottom</u> of the bottle is curved C Difficult to set / measure the value of <u>L / length</u> with a reason e.g. difficult to place the bottle in the exact same place each time / cannot judge the centre line of the bottle / parallax error D Difficult to measure <u>h or height</u> with a reason e.g. bottle distorts view of water / refraction effects / parallax error / non-uniform shape (of bottle) E Difficulty with the bottle rolling / moving down the rulers (in a straight line) with a reason e.g. rulers bend / ruler(s) move (when bottle is rolling) / rulers are not parallel / bottle is not uniform (shape) / wooden strip is not parallel to the bench / rulers are not at the same height F Difficult to measure <u>t / time</u> with a reason e.g. knowing or judging when bottle reaches the end of rulers
2(g)(ii)	1 mark for each point up to a maximum of 4. A Take more readings (for different values of h) <u>and</u> plot a graph or take more readings <u>and</u> compare k values B Use caliper C Method to hold the bottle at the start / top of rulers e.g. (card) stop D Use a straight-sided / uniform (diameter) bottle E Use a (single) plank / ramp or method of fixing rulers (to wooden strip or bench) e.g. adhesive putty, tape G Improved timing method e.g. video (record / film) <u>and</u> with a timer in view / use frame-by-frame

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Q2: D

Q3: B

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Q3: B

Multiple Choice Answers

Q12: D

1(a)	how close the (measured) value is to the true value (of the quantity)
1(b)(i)	$(\rho =) m / V$ $= 31.3 \times 10^{-3} / (1.53 \times 10^{-2})^3 = 8.7 \times 10^3 \text{ (kg m}^{-3}\text{)}$
1(b)(ii)	$(0.5 / 31.3)$ or $(0.01 / 1.53)$ $\% \text{ uncertainty} = (0.016 \times 100) + 3 \times (0.0065 \times 100)$ $= 4\%$
1(b)(iii)	The ranges (of the densities of A and B) overlap or the (calculated) density of A is within the range of the density of B or the difference in densities is within the uncertainty (of B) (so) they could be the same