Question number	Answer	Mark
1(a)	Idea of a direct reading (without calculation)	**(1)**

Question number	Answer	
1(b)	If student B drops the ruler, they are not really measuring their own reaction time as they know when ruler has been dropped	**(1)**

Question number	Answer	Additional guidance	Mark
1(c)(i)	calculating the mean (1) 18.36 rounding to 2 s.f. (1) 18 (cm)	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
1(c)(ii)	Rearrangement (1) $t = \sqrt{\frac{\text{distance}}{500}}$ Substitution and answer (1) time = 0.17 (s)	award full marks for correct numerical answer without working allow answers which round to 0.17, e.g. 0.1673	**(2)**

Question number	Answer	Additional guidance	Mark
1(d)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • 25.5 is an anomalous result (1) • (because) it is much further away from the mean than the other results (1)	ignore 19	**(2)**

Question number	Answer	Mark
1(e)	• Take more readings (1) • Idea that a third student should also measure the reaction time (1)	**(2)**

Question number	Answer	Additional guidance	Mark
1(f)	An answer that combines the following points to provide a logical description of the plan/method/experiment: • using a larger group of students/large population of students (1) • and measure how their reaction time varies with age/height (1)	allow any suitable variable	**(2)**

Question number	Answer	Additional guidance	Mark
2(a)(i)	Calculating the mean (1) 18.36 Rounding to 2 s.f. (1) 18 (cm)	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Additional guidance	Mark
2(a)(ii)	Rearrangement (1) $t = \sqrt{\frac{\text{distance}}{500}}$ Substitution and answer (1) time = 0.17 (s)	award full marks for correct numerical answer without working allow answers which round to 0.17, e.g. 0.1673	**(2)**

Question number	Answer	Additional guidance	Mark
2(b)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • 25.5 is an anomalous result (1) • (because) it is much further away from the mean than the other results (1)	ignore 19	**(2)**

Question number	Answer	Mark
2(c)	• Take more readings (1) • Idea that a third student should also measure the reaction time (1)	**(2)**

Question number	Answer	Additional guidance	Mark
2(d)	An answer that combines the following points to provide a logical description of the plan/method/experiment: • using a larger group of students/large population of students (1) • and measure how their reaction time varies with age/height (1)	allow any suitable variable	**(2)**

Question number	Ans		Mark
3(a)	evidence that anomalous reading excluded (1) answer (1) average length = 20.31 (mm)	accept 101.57 (÷5) for first mark accept 20.314 (mm)	(2)

Question number	Answer	Additional guidance	Mark
3(b)(i)	• Axes with linear scales that use more than half of each edge of the grid and labelled with units from table (1) • All points correctly plotted to ± half a square (1) • Single straight line passing through all points and the origin (1)	allow 1 mark if only one plotting error and correct line drawn for points plotted	(3)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	A comment that makes reference to the following points: (using table) • idea that equal increments of force/weight/mass cause equal increments of extension (1) • correct reference to figures in the table (1) OR (using graph) • the graph line is straight (1) • the graph line passes through the origin (1) AND therefore the student's conclusion is correct (1)	last marking point can only be achieved if at least one of the other two marks is awarded	(3)

Question number	Answer	Additional guidance	Mark
3(c)	An answer that combines points of interpretation/evaluation to provide a logical description: • above 37.5 N/4 mm there are large increases of extension for small increases in load (1) • the maximum extension of the wire is about 16.5 mm before it breaks (1) • above 12 mm the wire keeps on extending when the load is reduced below 46 N (1)	accept extension is (much) greater for each 1 N increase in load above 37.5 N	**(3)**

Question number	Answer	Additional guidance	Mark
4(a)	evidence that anomalous reading excluded (1) evaluation (1) average length = 20.31 (mm)	accept 101.57 (÷5) for first mark accept 20.314 (mm)	**(2)**

Question number	Answer	Additional guidance	Mark
4(b)(i)	• Axes with linear scales that use more than half of each edge of the grid and labelled with units from table (1) • All points correctly plotted to ± half a square (1) • Single straight line passing through all points and the origin (1)	allow 1 mark if only one plotting error and correct line drawn for points plotted	**(3)**

Question number	Answer	Additional guidance	Mark
4(b)(ii)	A comment that makes reference to the following points: (using table) • idea that equal increments of force/weight/mass cause equal increments of extension (1) • correct reference to figures in the table (1) OR (using graph) • the graph line is straight (1) • the graph line passes through the origin (1) AND therefore the student's conclusion is correct (1)	last marking point can only be achieved if at least one of the other two marks is awarded	**(3)**

Question number	Answer	Additional guidance	Mark
4(c)	An answer that combines points of interpretation/evaluation to provide a logical description: • above 37.5 N/4 mm there are large increases of extension for small increases in load (1) • the maximum extension of the wire is about 16.5 mm before it breaks (1) • above 12 mm the wire keeps on extending when the load is reduced below 46 N (1)	accept extension is (much) greater for each 1 N increase in load above 37.5 N	**(3)**