Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

Question number	Indicative content	Mark
*	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. 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. **measurement of distance using a rule or similar to find** • height of the ramp • travelled length of ramp / distance x to Y • width of card (if used) • distance between light gates (if used) • distance between dots on tape (if used) **measurement of time such as** • use of ticker-tape • use of a single light gate connected to electronic timer with a card fixed to the trolley • use of two light gates connected to electronic timer with a means of interrupting the light beams • use of (manually operated) stop clock /watch / timer	**6** **AO1.2**

	determination of speed • detail about which distance and time measurements are being used • repeat and average • repeat using different heights of the ramp	

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1) • Presents a description which is not logically ordered and with significant gaps. (AO1)
Level 2	3-4	• 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) • Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1) • Presents a description that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels 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.
	0	No rewardable material.	
Level 1	1–2	Additional guidance Limited description of measurement of distance and time	Possible candidate responses Measure the distance down the ramp. determine the time it took.
Level 2	3–4	Additional guidance Partial description including **two** from measurement of a relevant distance measurement of relevant time calculation of speed	Possible candidate responses Use the light gates to measure the time it took to go down. Measure the distance down the ramp with a ruler.
Level 3	5–6	Additional guidance Detailed description of measurements of relevant distances and associated times to find speed	Possible candidate responses Use light gates to measure the time to go from X to Y Use a ruler to measure the distance between the light gates. Divide distance between the light gates by the time taken to travel from X to Y.

Q2.

Question number	Answer	Additional guidance	Marks
(i)	An answer that combines points of interpretation/evaluation to provide a logical description: • braking distance increases as speed increases (1) • but increases at an increasing rate (1)	 accept takes 'longer' to brake accept positive correlation allow any clear correct idea of non-linearity / **use** of data from the graph indicating this trend	**(2)**

Question number	Answer	Additional guidance	Marks
(ii)	• correctly shaped curve (from the origin) with an increasing gradient (1) • above / between existing curve and y-axis (1)	reject if the line wavers significantly (up to 10 m/s) independent mark ignore tramlining ignore anything after speed = 10 m/s	**(2)**

Question number	Answer	Additional guidance	Marks
(iii)	an answer that combines 3 of the following points to provide a logical description of **the method**:	**must** be in the context of investigating **ignore repetition of stem of question**	**(3)**
	• add / change masses (or weights) to the bike (1)	bikes of different masses	
	• **measure** the braking distance (1)	however 'measure' is expressed	
	• use the same (initial) speed (1) • use same braking force/cyclist (1)	ignore 'repeating the experiment', without changing masses / weights	

Q3.

Question number	Answer	Additional guidance	Mark
	A description to include: measurement of (relevant) distance (1) measurement of (relevant) time (1) use of speed = $\frac{\text{distance}}{\text{time}}$ (1) detail (1)	 one of distance down slope or distance along bench or length of toy car/card 'record the distance the car travels and time it' scores 2 marks for example: speed down slope × 2 mark distance along bench use a light gate speed gun at the bottom of the slope repeating AND averaging	**(4)**

Q4.

Question number	Indicative content	Mark
*	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. 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. **AO3** • graph starts at zero • graph increases to a maximum at 2 s • graph stays constant for 2.6 s • graph decreases to zero at 6 s • graph stays at zero after 6 s • graph decreases steeply until 5 s • graph decreases less steeply until 6 s • graph at zero between 6 and 7s **AO2** • velocity is zero at time zero • velocity increases/train accelerates until 2 s • velocity is constant for 2.6 s • velocity decreases/train decelerates until 6 s • deceleration changes at 5 s • acceleration is gradient of graph • velocity zero between 6 and 7 s	**(6)** **AO2** **AO3**

Level	Mark	Descriptor
	0	• No awardable content
Level 1	1–2	• Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) • The description attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) • The description is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3)
		• The description is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

Level	**Mark**	**Additional Guidance**	**General additional guidance – the decision within levels** 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.
	0	No rewardable material.	
Level 1	1–2	Additional guidance isolated facts about the movement of the train or the shape of the graph	Possible candidate responses the train speeds up and slows down
Level 2	3–4	Additional guidance Description of motion in at least 2 parts of the graph. At least one of those parts linked to data from the graph.	Possible candidate responses the train speeds up for the first 2 seconds then stays at a constant speed
Level 3	5–6	Additional guidance Description of motion in at least 3 parts of the graph. At least two of those parts linked to data from the graph.	Possible candidate responses the train speeds up for the first 2 seconds then stays at a constant speed for 2.6 seconds then slows down