Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

Question	Answer	Additional guidance	Mark
(i)	from 20 s to 45 s		1 AO1.1

Question	Answer	Additional guidance	Mark
(ii)	use of area from graph (1) process (1) EITHER calculation of area of trapezium OR calculation of area triangle and rectangle and triangle e.g. area = $\frac{[25 + 70]}{2} \times 15$ OR e.g. area triangle = $\frac{15 \times 20}{2}$ = 150 (m) area rectangle = 15 x 25 = 375 (m) area triangle = $\frac{15 \times 25}{2}$ = 187.5 (m) evaluation (1) 712.5 (m)	allow evidence of counting squares and area of one square accept 712 (m) or 713 (m) do not accept 710 (m) award full marks for the correct answer without	3 AO2.1

		working	

Question	Answer	Additional guidance	Mark
(iii)	substitution and evaluation (1) (average speed =) $\frac{712.5}{70} = 10(.2)$ (m/s)	allow $\frac{710}{70} = 10(.1)$ (m/s) allow ecf from their 7(a)(ii) award full marks for the correct answer without working	**1 AO2.1**

Q2.

Question Number	Answer	Additional guidance	Mark
	□ B centripetal force **The only correct answer is B (correct term for circular motion)** **A** is not correct – incorrect term **C** is not correct – incorrect term **D** is not correct – incorrect term		**(1)**

Q3.

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. AO1 isolated statements • weights on hanger • weights added to trolley • light gate(s) / ticker(tape) timer / ultrasonic transducer • datalogger • (interrupter) card on trolley • sloping runway • weigh trolley • use newtonmeter • use a = (v-u)/t • measure distance and time • use stopclock and ruler • use (average) speed = distance / time • use a = $(v^2-u^2)/2s$ • plot graph of F against a	**(6)** **AO1**

	detail of procedure • suspend weights from weight hanger to produce force • changing weights on hanger • keeping mass constant by moving weights between hanger and trolley • light gates/ticker(tape) timer/ultrasonic transducer used to measure acceleration/velocity/time • runway on slope so no (effect of) friction /so trolley rolls at constant speed (with no weights/force) • increase angle of slope to increase force • interrupter card for time through gate • final speed = 2 x average speed	

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 isolated facts mention at least 2 isolated statements evidence may be seen in the diagram	Possible candidate responses add weights and use light gates
Level 2	3–4	Additional guidance limited procedure 1 detail of procedure **and** mention 1 other isolated statement evidence may be seen in the diagram	Possible candidate responses use light gates to measure acceleration/velocity/time and add weights
Level 3	5–6	Additional guidance detailed procedure 2 details of procedure **and** mention 1 other isolated statement evidence may be seen in the diagram	Possible candidate responses use light gates to measure acceleration/velocity/time and suspend weights from weight hanger to produce force and sloping runway

Q4.

	Answer	Additional guidance	Mark
(i)	a description using any **four** of the following points in a logical order: measure the mass / weight of the trolley(s) / weigh the trolley(s) (1) determine the speed of trolley A (1) put one light gate (connected to data logger) further down the runway than trolley A and another beyond trolley B (1) trollies A and B stick together (1) measure combined velocity / speed of A and B (1) calculate momentum of trolley A before collision **and** A and B after collision (1) check for equality / velocity after collision is half that before collision (1) repeat **and** take mean / average (1)	 allow determine / find / calculate use (average) speed = distance / time to calculate speed of trolley A may be shown on diagram measure distance and time in appropriate places calculate (total) momentum before and after collision (total) momentum before equals (total) momentum after	**(4)** **AO1**

	Answer	Additional guidance	Mark
(ii)	{compensating for / reducing **effect** of / overcoming / balancing / cancelling **effect** of} friction OR so that trolley A travels at a constant speed / doesn't slow down	do not accept reducing / cancelling friction do not accept so trolley accelerates down slope	**(1)** **AO3**