Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2011

Physics

Assessment Unit AS 1

assessing

Module 1: Forces, Energy and Electricity

[AY111]

TUESDAY 21 JUNE, MORNING

MARK SCHEME

AVAILABLE MARKS

1 (a)

Base Quantities	S.I. Unit
mass	kg
length	m

Derived Quantities	S.I. Unit
volume	m^3
density	$kg\ m^{-3}$

Don't accept a solidus (here | or elsewhere)

[$\frac{1}{2}$] each quantity in correct place,
[$\frac{1}{2}$] each unit with quantity, round down
Allow ecf for SI unit from named quantity [4]

(b) Uses appropriate equation and converts to base units [1]
$kg\,m^2\,s^{-2}$ [1] [2] 6

2 Largest error in timing (with stopclock) – reaction time [1]
Use electronic timing system instead of stopclock or equivalent [1]
Repeat times (at each height) [1]
Use a range of heights [1]

Calculate g for each height or plot graph of s against t^2
(or any suitable alternative) [1]
Average values of g (if from calculation) or states how g is found from gradient of their graph. [1] [6]

Quality of written communication

2 marks
The candidate expresses ideas clearly and fluently, through well-linked sentences and paragraphs. Arguments are generally relevant and well structured. There are few errors of grammar, punctuation and spelling.

1 mark
The candidate expresses ideas clearly, if not always fluently. Arguments may sometimes stray from the point. There are some errors in grammar, punctuation and spelling, but not such as to suggest a weakness in these areas.

0 marks
The candidate expresses ideas satisfactorily, but without precision. Arguments may be of doubtful relevance or obscurely presented. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the passage. [2] 8

						AVAILABLE MARKS
3	**(a)**	Parabolic path, starting at 1.0 m		[1]		
		ending at height of 0.40 m		[1]	[2]	
	(b)	**(i)**	$\underline{6.6}$ m s^{-1}		[1]	
		(ii)	Uses $v^2 = u^2 + 2as$	[1]		
			Subs into equation (ignore negative signs)	[1]		
			Calculation leading to 7.417 (> 2 sig fig)	[1]	[3]	
			↳ for v or v^2			
		(iii)	Subs correct signs into suitable equation of motion			
			$v = u + at$	[1]		
			Calculation to 1.4 s	[1]	[2]	8
4	**(a)**	**(i)**	Anticlockwise		[1]	
		(ii)	Continues line of action of F and shows perpendicular distance, 90° by eye		[1]	
	(b)	**(i)**	Correct relative positions of branch and monkey	[1]		
			Forces correct, 1766 N, 235 N (allow 180 kg and 24 kg)	[1]	[2]	
		(ii)	Calculates any moment correctly ecf **(i)**	[1]		
			Subs: 1766(1.3) + 235(3.5) + X(284) = 4020	[1]		
			X = 3.2 m	[1]	[3]	
		(iii)	Perpendicular distance reduced when branch bends		[1]	8
5	**(a)**	**(i)**	Shows efficiency = p.e. at end/p.e. at start	[1]		
			Cancels m and g	[1]	[2]	
		(ii)	Uses rebound height of 1160 mm	[1]		
			Efficiency = $\frac{1160}{1800}$ = 0.64	[1]	[2]	
	(b)	Equates: mgh = $\frac{1}{2}mv^2$ or $v^2 = u^2 + 2as$		[1]		
		$v = 4.3$ (m s^{-1})		[1]	[2]	6
6	**(a)**	Extension is proportional to applied force		[1]		
		Provided the proportional limit is not exceeded		[1]	[2]	
	(b)	**(i)**	Graph starts at (5,0)	[1]		
			Straight line up to (8 N)	[1]		
			Correct curve after 8 N	[1]	[3]	
			Forfeit 1st mark for extension graph			
		(ii)	Uses $F = kx$ or calculates gradient of straight line graph	[1]		
			$k = 0.67$ or 67	[1]		
			N cm^{-1} or N m^{-1} (must be consistent with their answer)	[1]	[3]	8

						AVAILABLE MARKS
7	**(a)**	One similarity, e.g. both measured in volts		[1]		
		One difference, e.g. potential difference is energy lost, electromotive force is energy gained (by charge)		[1]	[2]	
	(b)	**(i)**	$Q = It$	[1]		
			1.4×3600	[1]	[2]	
		(ii)	$V = E/Q$	[1]		
			2.9 V	[1]	[2]	6
8	**(a)**	**(i)**	Potential difference across conductor is proportional to current through it	[1]		
			Provided T remains constant	[1]	[2]	
		(ii)	C		[1]	
	(b)	**(i)**	Before graphs cross, resistance of B is greater than C	[1]		
			When graphs cross, resistances are equal	[1]		
			After crossing, resistance of B is less than C	[1]	[3]	
		(ii)	Thermistor (ntc)	[1]		
			R decreases as T increases	[1]	[2]	8
9	**(a)**	$R = \rho l/A$		[1]		
		$A = \pi (0.2 \times 10^{-3})^2$		[1]	[2]	
	(b)	**(i)**	R values 1.5, 2.3, 3.1, 3.8, 4.5		[1]	
		(ii)	Scale so that points cover $> \frac{1}{2}$ ecf **(i)**	[1]		
			4 points correct	[1]		
			Best fit line	[1]	[3]	
		(iii)	Gradient approx 3.8 } candidate's values	[1]		
			$\rho = 4.82 \times 10^{-7}$ } candidate's values	[1]		
			Ω m	[1]	[3]	9
10	**(a)**	$\frac{1}{R_T} = \frac{1}{R} + \frac{1}{R}$		[1]		
		Rearranges to $R_T = R/2$		[1]	[2]	
	(b)	**(i)**	10 + 14 = 24	[1]		
			24 and 12 in parallel = 8	[1]		
			R = 8	[1]	[3]	
		(ii)	I through 24 kΩ = 0.06 mA	[1]		
			Total I = 0.18 mA	[1]		
			V = 3.96 (V)	[1]	[3]	8
					Total	**75**