Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Physics

Assessment Unit AS 3B (Theory)

assessing

Practical Techniques and Data Analysis

[SPH32]

TUESDAY 7 MAY, AFTERNOON

MARK SCHEME

					AVAILABLE MARKS
1	Regular x-scale			[1]	
	Regular y-scale			[1]	
	Axes labelled with quantity			[1]	
	Axes units correct with solidus			[1]	
	Points correct ([–1] each mistake to [0])			[3]	
	Best fit line Penalty [–1] if axes reversed			[1]	8
2	**(a)** Hz^{-1} or s			[1]	
	(b) **(i)** Gradient = 2L/v		[1]		
	$v = 2L/\text{gradient}$ or $v = \frac{2L}{2.9}$ (2nd line gets [2])		[1]	[2]	
	(ii) 1.2 ms^{-1}			[1]	4
3	**(a)** Completes best fit line accurately to intercept 2.4 ($\pm\frac{1}{2}$ square)		[1]		
	Reads their intercept correctly		[1]		
	Takes square root of their intercept (1.55 guide)		[1]	[3]	
	(b) **(i)** $v^2 = u^2 + 2as$		[1]		
	Correct mapping to y = mx + c		[1]	[2]	
	(ii) Correct points from large triangle		[1]		
	Gradient calculated correctly from their points		[1]		
	Value 0.77 quality ($\pm$ 0.02)		[1]	[3]	
	(iii) 0.5 × their gradient			[1]	
	(iv) Draw extreme **fit** line		[1]		
	Measure gradient and calculate new acceleration		[1]		
	Subtract acceleration values		[1]	[3]	12
	Alternative 2nd + 3rd marks: Measure gradient and subtract gradient values 0.5 × uncertainty in gradient				

						AVAILABLE MARKS
4	(a)	(i)	0.01 mm		[1]	
		(ii)	1. Wire may not be constant diameter	[1]		
			2. Anomalous results discarded	[1]		
			Averaging	[1]	[3]	
	(b)		Vernier calliper		[1]	
	(c)		volume = 0.592 cm^3	[1]		
			frac unc in l = 0.18%(0.0018)	[1]		
			% or fractional unc in d = 0.27% and doubles % unc in d (ecf **(i)**)	[1]		
			Adds % unc (0.72%)	[1]		
			Calculates unc in V (0.004) ecf their percentage unc	[1]		
			Quoted to correct significance (single digit) (max/min method acceptable)	[1]	[6]	11
5	(a)		Convex/converging		[1]	
	(b)		Mean = 28.9 (accept 28.7)	[1]		
			Headings with correct unit in table	[1]		
			1/u = 0.020	[1]		
			1/v = 0.047	[1]	[4]	
	(c)		Uncertainty in image position is greater than object position	[1]		
			Object position – unc in metre ruler	[1]		
			Image position – additional judgement of when the image is focused	[1]	[3]	8

					AVAILABLE MARKS
6	**(a)**	Any method, e.g. Velcro, blue tack, pin & cork		[1]	
	(b)	**(i)** 1 between the gliders and before collision	[1]		
		2 after collision	[1]	[2]	
		(ii) length of the card		[1]	
	(c)	momentum before = momentum after or $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$	[1]		
		$m_1u_1 + 0 = (m_1 + m_2)v$ or $m\ u = 2mv$	[1]		
		$u = 2v$ (or speed halves)	[1]	[3]	7
				Total	**50**