



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]	8
	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	[1]	
	Penalty [−1] if axes reversed		
2	(a) Hz ^{−1} or s	[1]	4
	(b) (i) Gradient = 2L/v	[1]	
	v = 2L/gradient or v = $\frac{2L}{2.9}$ (2nd line gets [2])	[1] [2]	
	(ii) 1.2 ms ^{−1}	[1]	
3	(a) Completes best fit line accurately to intercept 2.4 ($\pm \frac{1}{2}$ square)	[1]	12
	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 (± 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]	
	Alternative 2nd + 3rd marks: Measure gradient and subtract gradient values 0.5 × uncertainty in gradient		

			AVAILABLE MARKS		
4	(a) (i)	0.01 mm	[1]	11	
	(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]		
5	(a)	Convex/converging	[1]	8	
	(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]		

6 (a) Any method, e.g. Velcro, blue tack, pin & cork	[1]	AVAILABLE MARKS
(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]
Total		7
		50