



**ADVANCED SUBSIDIARY (AS)**  
**General Certificate of Education**  
**2018**

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**Physics**  
**Assessment Unit AS 3B**  
**(Theory)**  
*assessing*

**Practical Techniques**  
**and Data Analysis**

**[SPH32]**  
**THURSDAY 14 JUNE, MORNING**

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**MARK  
SCHEME**

				AVAILABLE MARKS
1	Regular Y axis scale, $>\frac{1}{2}$	[1]		
	Regular X axis scale, $>\frac{1}{2}$	[1]		
	Axes labelled with quantity	[1]		
	Axes units included with solidus and consistent with values	[1]		
	Plotting points	[3]		
	Trend line	[1]		
	Reverse axes –1	[8]		8
2	(a) 6.6 cm	[1]		
	(b) (i) extreme fit accurate	[1]		
	(ii) new intercept difference to 1 d.p. (ecf intercept)	[1] [1]	[2]	4
3	(a) (i) negative answer	[1]		
	consistent value from their large triangle	[1]		
	magnitude 4.9–5.1	[1]		
	Unit A V <sup>-1</sup> or Ω <sup>-1</sup>	[1]	[4]	
	(ii) $I_r = E - V$	[1]		
	$y = mx + c$	[1]		
	$I = -(1/r)(V) + E/r$	[1]	[3]	
	(iii) gradient = $(-1/r)$	[1]		
	$r = 0.2$	[1]	[2]	
	ecf from (a)(i)			
	(iv) (1) when $I = 0$ , $V/r = E/r$	[1]		
	So the x-axis intercept = E	[1]	[2]	
	(2) $E = 1.80 V - 1.81 V$	[1]		
	(b) current low/less	[1]		
	high current would damage cell/component/drain the cell	[1]	[2]	14
4	(a) the device measures to cm or 0.01 m	[1]		
	Even for values $> 1$ m, still quoting to 1 cm.	[1]	[2]	
	(b) 3.30 s (3.25–3.34)	[1]		
	All to one hundredth of a second/0.01 s	[1]	[2]	
	(c) speed = distance/time	[1]		
	$5.00/3.73 = 1.34$	[1]		
	To 3 sig figs	[1]	[3]	
	(d) $ms^{-1}$ and m	[1]		
	square v unit correctly $m^2s^{-2}$	[1]		
	$ms^{-2}$	[1]	[3]	10

				AVAILABLE MARKS
5	(a) $s = ut + \frac{1}{2} at^2$ $u = 0$ or $s = \frac{1}{2} at^2$ $g = 2s/t^2$ or plot $s$ against $t^2$ , gradient = $\frac{g}{2}$	[1] [1] [1]	[3]	
(b) (i) $(0.01/1.95) 100$ or $\frac{0.02}{1.95}$ Value 0.5 % 1%	[1] [1]	[2]		
(ii) $g = 2s/t^2$ $g = 8.953 \dots \dots$ To 2 sig figs 9.0 $2 \times 8 = 16$ doubling $16 + 0.5 = 16.5\%$ adding $16.5\% \text{ of } 9.0 = 1.5$ to 1 d.p., max. 2 s.f. Min/max method $g$ value, max $s$ , min $t$ , subtract. [4] equivalent	[1] [1] [1] [1] [1]	[4]		
(c) (i) $0.86 \text{ ms}^{-2}$ (Diff in their $g$ value and 9.81) $8.7\% \left( \frac{\text{Diff}}{9.81} \times 100\% \right)$	[1] [1]	[2]		
(ii) • use automated timing .... light gates, etc. • repeat timings, evaluate average time at a distance • graphical procedure from a range of distances, or calculate 'a' values from range of distances and average	[1] [1] [1]	[3]	14	
		Total	50	