New Specification

Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Physics

Assessment Unit AS 3B

assessing

Practical Techniques and Data Analysis

[SPH32]

THURSDAY 15 JUNE, MORNING

MARK SCHEME

					AVAILABLE MARKS
1	Regular x-scale (major division 0.1)		[1]		
	Regular y-scale (major division 400 or 500)		[1]		
	Axes labelled with quantity		[1]		
	Axes units included with solidus and consistent with scale and values		[1]		
	Plotting points		[3]		
	[–1] each mistake to [0]				
	Trend line		[1]		
	[Penalty –1 if axes are reversed]				8
2	**(a)** Gradient = (y2 – y1)/(x2 – x1) – correct points	subs	[1]		
	Gradient calculated from their values		[1]		
	Gradient = 49 (48–50 quality)		[1]		
	Unit = Pa $°C^{-1}$ (or correct alternative)		[1]	[4]	
	[Penalty –1 if $\triangle x < 10\,°C$]				
	(b) **(i)** EFL drawn			[1]	
	(ii) Gradient difference		[1]		
	divided by BFL gradient		[1]		
	%U consistent with gradients		[1]	[3]	8
3	**(a)** a = 12		[1]		
	$-a^{0.5}b = c$ [1]				
	b = 4 (must follow from correct physics. Not from a = 3.46) (ecf from a)		[1]	[3]	
	(b) Unit of a = eV		[1]		
	Unit of b = none		[1]	[2]	5
4	**(a)** **(i)** Period = 1.21 (s)		[2]		
	(1.2, 1.206, 1.2061		[1])	[2]	
	(ii) Mean = 29.55		[2]		
	(28.58)		[1]	[2]	
	[Penalty –1 sig fig]				
	(iii) 95.0		[1]		
	Rule accurate to 1 mm (other values)		[1]	[2]	
	(b) **(i)** Increase time duration measured				
	1 period too short		[1]		
	Reduces percentage uncertainty		[1]	[2]	
	(ii) Repeatability implies reliability/notice anomalies		[1]		
	Averaging (improves accuracy)		[1]	[2]	10

							AVAILABLE MARKS
5	**(a)**	**(i)**	$\%U = \frac{0.1}{14.5} \times 100$ subs	[1]			
			$\%U = 0.7\ \%$	[1]	[2]		
		(ii)	$U_{(470)} = 47\ \Omega$ or $U_{(320)} = 16\ \Omega$	[1]			
			$U_{(790)} = 63\ \Omega$ (ecf from $U_{(470)} + U_{(320)}$)	[1]			
			$\%U = 8\%$	[1]	[3]		
			[15% – 0/3]				
	(b)		$\%U(V^2) = 2(0.7) = 1.4\%$	[1]			
			$\%UP = 1.4\%$ (ecf*) + 8% (ecf*) = 9.4%	[1]			
			P = 0.266 (W)	[1]			
			UP = 0.025 (W) ecf P	[1]	[4]		9
			ecf (from 15% in **(a)(ii)** leads to 0.044W) gets 4/4				
			max/min method				
			Max: Correct calculation of V^2 max = 213.2 [1]				
			Correct calculation of R min = 727 [1]				
			Pmax = 0.293 (ecf their V^2 and R)				
			P = 0.266 [1]				
			$\triangle P$ = 0.027 (ecf their Pmax – P) [1]				
			Min: V^2 min = 207.4 [1]				
			Rmax = 853 [1]				
			Pmin = 0.243				
			P = 0.266 [1]				
			$\triangle P$ = 0.023 [1]				
6	**(a)**		Length of interrupt card		[1]		
	(b)		Air track reduces friction	[1]			
			Pulley (reduces friction)	[1]			
			$\therefore$ Resultant force = weight (mg), m = suspended mass	[1]	[3]		
	(c)		Problem: accelerated mass increases/mass of system is not constant	[1]			
			(Stick) slotted masses to trolley	[1]			
			Transfer slotted masses to suspended mass	[1]	[3]		
	(d)		Light gates separation <0.76 m	[1]			
			Trolley passes through gates before masses hit the ground	[1]			
			Mass on ground means zero resultant force/force not constant for duration of one run	[1]	[3]		10
					Total		**50**