New Specification

cea

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)   [1]   [3]

(ecf from a)

(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]

<u>Rule</u> accurate to <u>1 mm</u> (other values)   [1]   [2]

(b)   **(i)**   Increase time duration measured

1 period too short   [1]

Reduces <u>percentage</u> uncertainty   [1]   [2]

(ii)   Repeatability implies reliability/notice anomalies   [1]

Averaging (improves accuracy)   [1]   [2]   **10**

							AVAILABLE MARKS

5 **(a)** **(i)** $\%U = \dfrac{0.1}{14.5} \times 100$ 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**