Rewarding Learning

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

# Physics
## Assessment Unit AS 3B
## (Theory)

*assessing*

## Practical Techniques and Data Analysis

**[SPH32]**

**THURSDAY 14 JUNE, MORNING**

# 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 | [1] | | | |
| | difference to 1 d.p. (ecf intercept) | [1] | [2] | | 4 |
| **3** | **(a)** **(i)** negative answer | [1] | | | |
| | consistent value from their large triangle | [1] | | | |
| | magnitude 4.9–5.1 | [1] | | | |
| | Unit A $V^{-1}$ or $\Omega^{-1}$ | [1] | [4] | | |
| | **(ii)** Ir = 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)** | $s = ut + \frac{1}{2} at^2$ | [1] | | |
| | | $u = 0$ or $s = \frac{1}{2} at^2$ | [1] | | |
| | | $g = 2s/t^2$ or plot s against $t^2$, gradient = $\frac{g}{2}$ | [1] | [3] | |
| | **(b)** | **(i)** (0 .01/1.95) 100 or $\frac{0.02}{1.95}$ | [1] | | |
| | | Value 0.5 % 1% | [1] | [2] | |
| | | **(ii)** $g = 2s/t^2$ | | | |
| | | $g = 8.953$ ……. To 2 sig figs 9.0 | [1] | | |
| | | $2 \times 8 = 16$ doubling | [1] | | |
| | | 16 + 0.5 = 16.5% adding | [1] | | |
| | | 16.5% of 9.0 = 1.5 to 1 d.p., max. 2 s.f. | [1] | | |
| | | Min/max method | | | |
| | | g value, max s, min t, subtract. [4] equivalent | | [4] | |
| | **(c)** | **(i)** 0.86 $ms^{-2}$ (Diff in their g value and 9.81) | [1] | | |
| | | 8.7% ($\frac{\text{Diff}}{9.81} \times 100\%$) | [1] | [2] | |
| | | **(ii)** • use automated timing ….. light gates, etc. | [1] | | |
| | | • repeat timings, evaluate average time at a distance | [1] | | |
| | | • graphical procedure from a range of distances, or calculate 'a' values from range of distances and average | [1] | [3] | 14 |
| | | | | **Total** | **50** |