## Mark Scheme (Results) June 2010

## CCE

## GCE Physics (6PH08) Paper 1

Unit 6B: Experimental Physics
International Alternative to Internal Assessment

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| Question Number | Answer | Mark |
| :---: | :---: | :---: |
| 1 (a) (i) | Ignore the anomalous 0.77 OR add the four good readings and divide by four | (1) |
| (ii) | 0.27 mm | (1) |
| (iii) | Divides 0.015 or 0.02 or 0.03 <br> by their mean value to calculate correct percentage <br> Example of calculation $0.02 / 0.27=7 \%$ | (1) <br> (1) |
| 1 (b) (i) | Use of $\pi r^{2} l$ <br> Produces correct answer with consistent unit <br> Example of calculation $\pi\left(0.135 \times 10^{-3} \mathrm{~m}\right)^{2} \times 663 \times 10^{-3} \mathrm{~m}=3.80 \times 10^{-8} \mathrm{~m}^{3}$ | (1) <br> (1) |
| 1 (b) (ii) | Use of mass/volume <br> Answer to 2 s.f. with unit for density consistent with mass used <br> Example of calculation $0.32 \times 10^{-3} \mathrm{~kg} / 3.80 \times 10^{-8} \mathrm{~m}^{3}=8400 \mathrm{~kg} \mathrm{~m}^{-3}$ | (1) <br> (1) |
| 1 (c) | Material is Nichrome <br> Thickness is 32 (swg) | (1) <br> (1) |
|  | Total for question 1 | 10 |


| Question Number | Answer | Mark |
| :---: | :---: | :---: |
| 2(a) | metre rule shown to be vertical with set square on floor OR set square aligned with weight and rule OR eye level with bottom of weight | (1) |
| 2 (b)(i) | Uncertainty in h is 1 or 2 mm (1) | (1) |
| 2(ii) | Uncertainty in t is 0.26 or 0.27 or 0.52 s only | (1) |
| 2(iii) | $\mathrm{V}=0.584 \mathrm{~m} \mathrm{~s}^{-1}$ | (1) |
| 2(iv) | Calculates value for kinetic energy <br> Example of calculation $0.5 \times 0.96 \mathrm{~kg} \times\left(0.584 \mathrm{~m} \mathrm{~s}^{-1}\right)^{2}=0.164 \mathrm{~J}$ | (1) |
| 2(v) | Calculates \% uncertainty in h and t (or v) <br> Example of calculation <br> $0.11 \%$ and $8.6 \%$ <br> Combines \% uncertainties <br> Example of calculation $2 \times 0.11 \%+2 \times 8.6 \%=17 \%$ | (1) <br> (1) |
|  | Total for question 2 | 7 |


| Question <br> Number | Answer | Mark |
| :--- | :--- | :--- |
| 3(a) | Red shift <br> OR Doppler shift <br> OR frequency of electromagnetic radiation/light <br> OR wavelength of electromagnetic radiation/light | (1) |
| 3(b)(i) | Line of best fit | (1) |
| 3(b)(ii) | large triangle used <br> gradient in range $62.0-66.0$ with 2/3SF <br> Example of calculation <br> (16000 - 0)/(250 -0$)=64$ (ignore unit) | (1) |
| 3(c)(i) | Yes, as best fit line is straight and passes through origin <br> OR No, as best fit line does not pass through origin | (1) |
| 3(c)(ii) | Percentage difference calculated using 71 as denominator <br> Example of calculation | (1) |
|  | (71 - 64)/71 $=10 \%$ | (1) |
|  | Total for question 3 | 6 |



| Question Number | Answer | Mark |
| :---: | :---: | :---: |
| 4 (a) | Record background count (rate) <br> Place thick aluminium/thin lead between source \& detector OR Distance greater than 25 cm between source and detector <br> Count rate detected above background | (1) <br> (1) <br> (1) |
| 4 (b) | Keep distance between the source and detector constant <br> Any four from: <br> - Record count (rate) for different thicknesses <br> - Record count for a specified time <br> - Subtract background count <br> - Take several readings at each thickness <br> - Measure thickness with micrometer screw gauge/vernier callipers <br> Keep people away from source/use tongs to handle source /use tongs to handle lead sheets/ensure source held securely | (1) <br> (1) <br> (1) <br> (1) <br> (1) <br> (1) <br> (Max 4) <br> (1) |
| 4 (c) | $\ln A=-\mu X+\ln A_{0}$ <br> and identifies $-\mu$ as gradient | (1) |
| 4 (d) | Corrected count rate to at least 3SF and with correct units and $\ln A$ to at least 3SF and with correct units <br> Axes labelled for suitable graph(ignore units) <br> Suitable scales <br> Plots <br> Line | (1) <br> (1) <br> (1) <br> (1) <br> (1) |
| 4 (e) | Triangle base at least 40 small squares and correct calculation of gradient (ignore sign and unit) <br> $\mu=0.050$ to $0.052 \mathrm{~mm}^{-1}$ with unit and 2/3SF (no ecf) <br> Example of calculation $(5.40-6.86) /(28.8-0)=0.0507 \mathrm{~mm}^{-1}$ | (1) <br> (1) |
|  | Total for question 4 | 17 |


| $\mathrm{x} / \mathrm{mm}$ | Measured Count <br> ${\text { Rate } / \text { minute }^{-1}}$ | Corrected Count <br> ${\text { Rate } / \text { minute }^{-1}}$ | In (Corrected Count <br> ${\text { Rate } / \text { minute }^{-1} \text { ) }}$ |
| :---: | :---: | :---: | :---: |
| 0 | 1002 | 962 | 6.87 |
| 6.30 | 739 | 699 | 6.55 |
| 12.74 | 553 | 513 | 6.24 |
| 19.04 | 394 | 354 | 5.87 |
| 25.44 | 304 | 264 | 5.58 |
| 31.74 | 232 | 192 | 5.26 |



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