UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS GCE Advanced Subsidiary Level and GCE Advanced Level

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for the guidance of teachers

9702 PHYSICS

9702/51

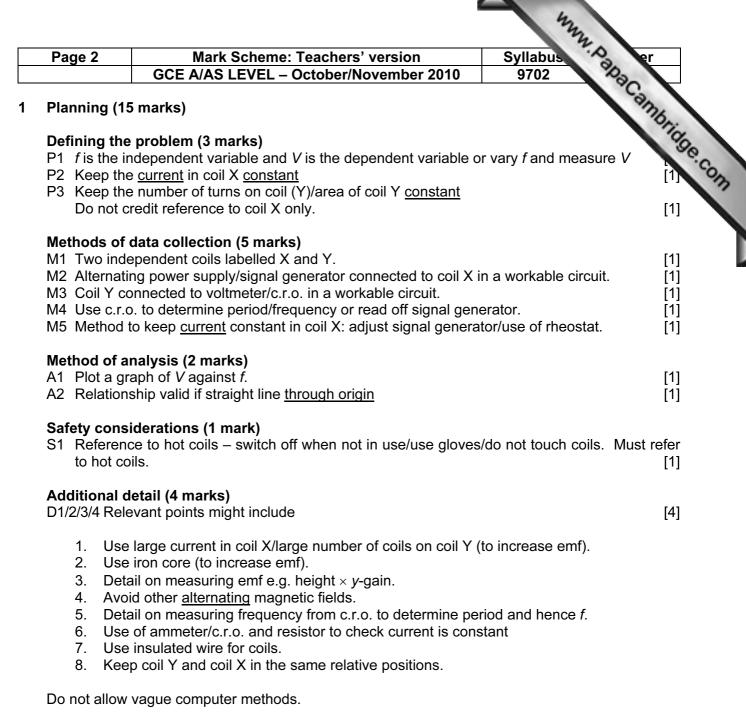
Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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[Total: 15]

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Analysis, conclusions and evaluation (15 marks) 2

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|-----------|--------------------|--|--|--|
| Part Mark | | Expected Answer | Additional Guidance | |
| (a) | A1 | Gradient = <i>b</i> <i>y</i> -intercept = lg <i>a</i> | Allow log a but not ln a | |
| (b) | T1 T2 | 1.97770.292 or 0.29231.92940.265 or 0.26481.87510.241 or 0.24051.81290.210 or 0.20951.74040.170 or 0.17031.65320.127 or 0.1271 | T1 for lg <i>l</i> column – ignore rounding errors; min 2 dp. T2 for lg <i>T</i> column – must be values given A mixture is allowed | |
| | U1 | From \pm 0.004 or \pm 0.005 to \pm 0.006 or \pm 0.007 | Allow more than | one significant figure. |
| (c) (i) | G1 | Six points plotted correctly | Must be within half a small square; penalise ≥ half a small square. Penalise 'blobs' ≥ half a small square. Ecf allowed from table. | |
| | U2 | Error bars in lg (<i>T</i> /s) plotted correctly. | last point. Must | st be plotted. Check first and be accurate within half a small \geq half a small square. |
| (ii) | G2 | Line of best fit | line should pass (1.65, 0.128) and pass between (2 Allow ecf from po | ed correctly then lower end of between (1.65, 0.124) and d upper end of line should .00, 0.300) and (2.00, 0.306). bints plotted incorrectly; five ed – examiner judgement. |
| | G3 | Worst acceptable straight line. Steepest or shallowest possible line that passes through <u>all</u> the error bars. | Should pass from of bottom error b | learly labelled or dashed. n top of top error bar to bottom ar or bottom of top error bar to or bar. Mark scored only if all otted. |
| (iii) | C1 | Gradient of best fit line | length of the drav | d should be at least half the wn line. Check the read offs. nall square; penalise \geq half a |
| | U3 | Uncertainty in gradient | | nining absolute uncertainty rst gradient and gradient. |
| (iv) | C2 | y-intercept | Must be negative from line into <i>c</i> = Allow ecf from (c | • |

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| | U4 | Uncertainty in <i>y</i> -intercept | Difference in wo | mining absolute uncer rst <i>y</i> -intercept and <i>y</i> -inter from false origin read-off of from (c)(iv). |
| (d) | C3 | $a = 10^{y-\text{intercept}}$ | | be used. Expect an answer of X expect answer of about 1.3. |
| | C4 | b = gradient <u>and</u> in the range 0.495 to 0.520 <u>and</u> to 2 or 3 sf | Allow 0.50 to 0.5 Penalise 1 sf or | |
| | U5 | Absolute uncertainty in a and b | Difference in <i>a</i> a Uncertainty in <i>b</i> uncertainty in the | should be the same as the |

[Total: 15]

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Uncertainties in Question 2

(c) (iii) Gradient [U3]

- Uncertainty = gradient of line of best fit gradient of worst acceptable line 1.
- 2. Uncertainty = 1/2 (steepest worst line gradient – shallowest worst line gradient)
- (c) (iv) [U4]
 - 1. Uncertainty = y-intercept of line of best fit y-intercept of worst acceptable line
 - Uncertainty = $\frac{1}{2}$ (y-intercept of steepest worst line y-intercept of shallowest worst 2. line)

(d) [U5] 1. Uncertainty = 10 ^{best y-intercept} - 10 ^{worst y-intercept}