Mark Scheme (Results)

Summer 2017

Pearson Edexcel International Advanced Level
in Physics (WPH07)
SET A Physics Practical Examination

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

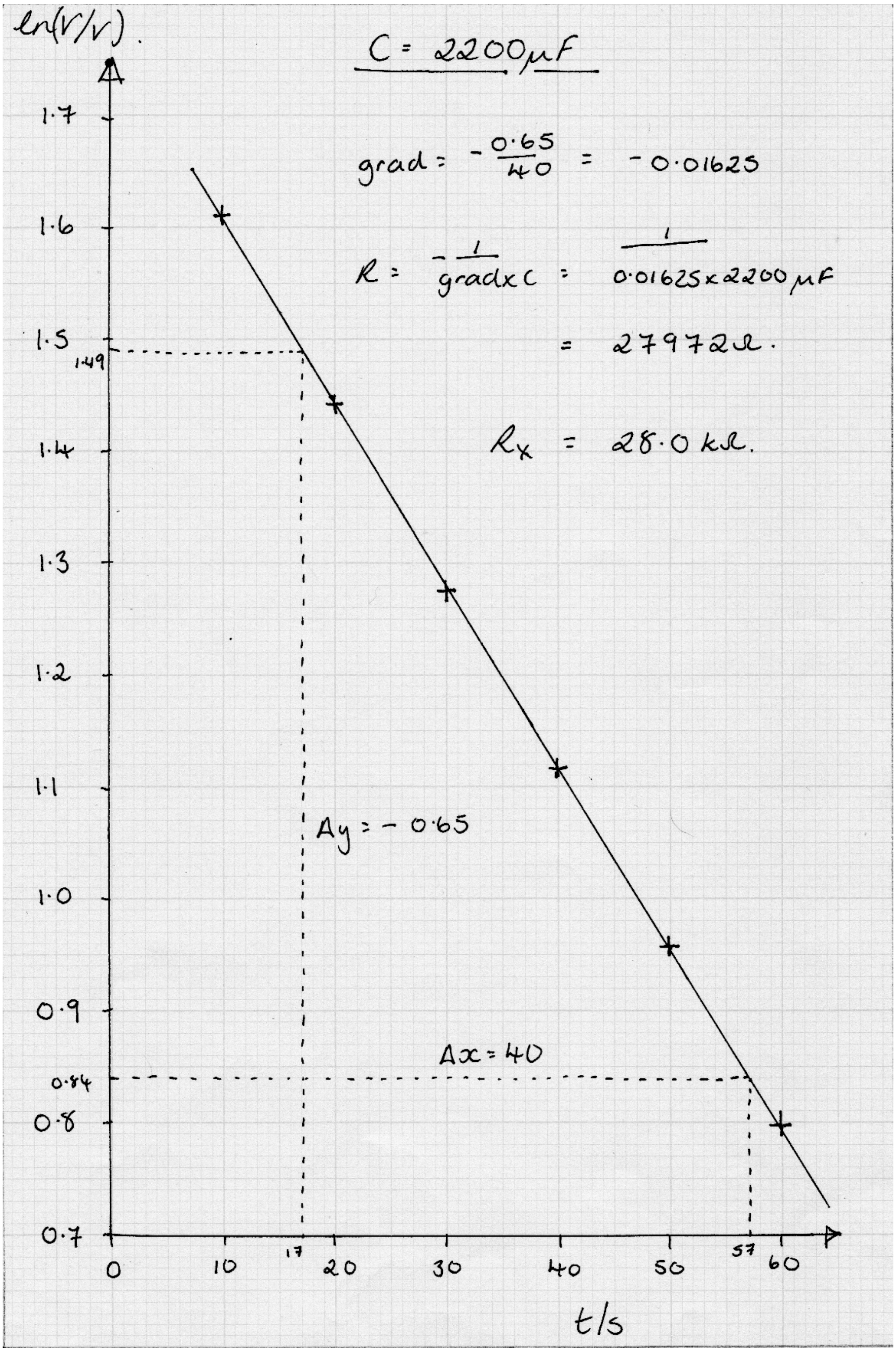
Question Number	Answer		Mark
1(a)(i)	Mean value within ± 0.2 s of centre measurement and a minimum of three measurements	(1)	**1**
1(a)(ii)	Uses half range of repeated measurements (accept whole range) Correct calculation of percentage uncertainty (A candidate who uses the precision of the instrument to correctly calculate the percentage scores one mark)	(1) (1)	**2**
1(b)(i)	Value within ± 1 mm of centre measurement	(1)	**1**
1(b)(ii)	Correct calculation of percentage uncertainty using 1 mm or 2 mm as the uncertainty in Δh	(1)	**1**
1(b)(iii)	Correct calculation of *g* using their data with unit <u>Example of calculation</u> $g = \frac{4\times 0.8^2}{0.043\times 1.93^2} = 10.4$ m s^{-2}	(1)	**1**
1(b)(iv)	2 × percentage uncertainty in time from (a)(ii) **Or** 2 × percentage uncertainty in *s* Correct calculation of percentage uncertainty with consistent sf	(1) (1)	**2**
1(b)(v)	Calculates maximum and minimum values using percentage uncertainty in 1(b)(iv) Suitable comment comparing accepted value of *g* to calculation. **Or** Calculates percentage difference between their value for *g* and accepted value Suitable comment that compares the percentage uncertainty from (b)(iv) with the percentage difference MP2 dependent on MP1 <u>Example of calculation</u> %D = 100 × (10.15 – 9.81)/9.81 = 3.5 % As this is less than the %U of 4.6 % the value is accurate	(1) (1) (1) (1)	**2**
	Total for Question 1		**10**

Question Number	Answer: Note parts b i-iv are to be marked holistically		Mark
2 (a)	When an object is driven/forced to oscillate at/near its natural frequency Oscillations are at the maximum amplitude **Or** there is maximum energy transfer	(1) (1)	2
2 (b)(i - iv)	*(i) Measurements to be taken* Mass of hanging masses using a top pan balance **and** length l using a meter ruler. Frequency from the signal generator **Or** frequency from timing oscillations *(ii) Justification* **Either** Top pan balance has a precision of 0.1g/0.01g So percentage uncertainty of 0.1%/0.01% (based on precision and 100g mass) is small **Or** Meter ruler has a precision of 1 mm So percentage uncertainty of 0.1% (based on precision and 1 m length) is small. [Accept values based on sensible value of mass/length] *(iii) Graph to be plotted* **Either** Plot f^2 against m^2 where gradient = $g/4l^2\mu$ (and is constant) **Or** Plot f against $1/l$ where gradient is $\frac{1}{2}\sqrt{(mg/\mu)}$ (and is constant) *(iv) Source of error and experimental technique* Judging the point of maximum amplitude/resonance Suitable experimental technique: e.g. driving the system at a frequency just past the resonance, use of a black card behind the system (no credit for uncertainty in length/mass but max 1 for uncertainty in determining frequency by timing oscillations)	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	8
	Total for Question 2		**10**

Question Number	Answer		Mark
3(a)	Time taken for potential difference/charge to fall to 1/e of its initial value [accept 37% of its initial value] $t = RC$	(1) (1)	**2**
3(b)(i)	(2) marks with no help (1) mark with some help, e.g. connection of a component 0 marks with significant help, e.g. circuit set up completely be supervisor	(2)	**2**
3(b)(ii)	Values of V recorded to precision of voltmeter consistently Minimum of 6 values of V and t recorded in a total of 60s Ln(V/V) values recorded in table and correct to 3/4 s.f.	(1) (1) (1)	**3**
3(b)(iii)	See $\ln(V) = \ln(V_0) - t/RC$ as y = c + mx where the gradient m = $-1/RC$ which is constant	(1) (1)	**2**
3(b)(iv)	Axes labelled with quantity and units Suitable scales Plots accurate to ± 1mm Line of best fit	(1) (1) (1) (1)	**4**
3(b)(v)	Use of two pairs of values from the graph Large triangle for gradient Use of gradient = $-1/RC$ Correct value of R to 3 s.f. with unit	(1) (1) (1) (1)	**4**
3(c)	Can record V and t simultaneously **Or** can record many readings in a short time interval	(1)	**1**
3(d)	Use of $V = V_0 e^{-t/RC}$ R = 197 kΩ (using 6 V or candidate's value when t= 0) <u>Example of calculation</u> $R = -\frac{5\times60}{2200\times10^{-6}\times\ln 0.5} = 196731$	(1) (1)	**2**
	Total for Question 3		**20**

$R_X = 27\ \text{k}\Omega$

t / s	V/V	ln(V/V)
10	5.01	1.611
20	4.23	1.442
30	3.58	1.275
40	3.06	1.118
50	2.61	0.959
60	2.22	0.798



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