GCE A LEVEL MARKING SCHEME

SUMMER 2023

A LEVEL
PHYSICS – UNIT 5
PRACTICAL ANALYSIS TASK
1420U50-1

INTRODUCTION

This marking scheme was used by WJEC for the 2023 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

WJEC GCE A LEVEL PHYSICS

UNIT 5 – PRACTICAL ANALYSIS TASK

SUMMER 2023 MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (except for the extended response question).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

<table>
<tr><th colspan="2" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>1</td><td>(a)</td><td>All values for corrected count correct
<table><tr><th>Distance, x / m</th><th>Count</th><th>Corrected count, N</th></tr><tr><td>0.12</td><td>123</td><td>66</td></tr><tr><td>0.14</td><td>111</td><td>54</td></tr><tr><td>0.16</td><td>101</td><td>44</td></tr><tr><td>0.18</td><td>89</td><td>32</td></tr><tr><td>0.20</td><td>82</td><td>25</td></tr></table></td><td></td><td>1</td><td></td><td>1</td><td>1</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>Use of $b = Nx^2$ (1)
Minimum of 3 values of b calculated e.g. 1.00, 1.04, 1.13, 1.06, 0.95 (1)
Treat any conclusions as being neutral</td><td>1</td><td>1</td><td></td><td>2</td><td>2</td><td>2</td></tr>
<tr><td></td><td>(c)</td><td>All values used to calculate mean = 1.04 or 1.03 ecf ignore s.f. (1)
Absolute uncertainty = 0.09 ecf accept 1 or 2 s.f only (1)</td><td>1</td><td>1</td><td></td><td>2</td><td>2</td><td>2</td></tr>
<tr><td></td><td></td><td>Question 1 total</td><td>2</td><td>3</td><td>0</td><td>5</td><td>5</td><td>5</td></tr>
</table>

<table>
<tr><th colspan="3" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>1 mark for each correct column including units in column one and six (4)
<table>
<tr><th rowspan="2">l / m</th><th rowspan="2">l^3 / m^3</th><th colspan="3">Time for 20 oscillations / s</th><th rowspan="2">T /s</th><th rowspan="2">T^2 / s^2</th></tr>
<tr><th>Trial 1</th><th>Trial 2</th><th>Mean</th></tr>
<tr><td>0.900</td><td>0.73</td><td>15.54</td><td>15.26</td><td>15.40</td><td>0.770</td><td>0.593</td></tr>
<tr><td>0.800</td><td>0.51</td><td>12.90</td><td>12.67</td><td>12.79</td><td>0.640</td><td>0.410 or 0.409</td></tr>
<tr><td>0.700</td><td>0.34</td><td>9.94</td><td>10.46</td><td>10.20</td><td>0.510</td><td>0.260</td></tr>
<tr><td>0.600</td><td>0.22</td><td>8.68</td><td>8.48</td><td>8.58</td><td>0.429</td><td>0.181</td></tr>
<tr><td>0.500</td><td>0.13</td><td>6.45</td><td>6.35</td><td>6.40</td><td>0.320</td><td>0.102</td></tr>
</table>
All s.f. correct in all columns (1)</td><td>1</td><td>3

1</td><td></td><td>5</td><td>5</td><td>5</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Both axes labelled and units included ecf – either orientation (1)
Suitable scales chosen so that the data points occupy at least ½ of each axis and not involving awkward factors, e.g. 3 (1)
All points plotted correctly to within ± ½ small square division ecf (1)
Correct line of best fit (1)</td><td>1</td><td>1
1
1</td><td></td><td>4</td><td>4</td><td>4</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>Any 2 × (1) from:
• Straight line graph
• All points close to line of best fit
• Positive gradient
• (0,0) intercept</td><td></td><td></td><td>2</td><td>2</td><td></td><td>2</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Gradient identified as k or implied (1)
Gradient calculated correctly (expected value 0.80 ± 0.05) (1)</td><td></td><td></td><td>2</td><td>2</td><td>2</td><td>2</td></tr>
</table>

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)	Rearrange the equation: $E = \frac{30}{bd^3 \times \text{gradient}}$ (1) E = (9.5 ± 0.2) × 10^9 Pa / Nm^{-2} ignore s.f. but **must** have units **ecf** on gradient (1) % uncertainty in b = 0.4 **and** % uncertainty in d = 0.2 ignore s.f. (1) % uncertainty in $d \times 3$ and added to b and 5 % / total uncertainty = 6 % ignore s.f. (1) Absolute uncertainty correct (expected value 0.6 ± 0.1) **ecf** (1) E given to 2 or 3 s.f **and** uncertainty to 1 or 2 s.f. (1)			6	6	6	4
		(ii)	[Digital / vernier] callipers / micrometer **and** resolution of at least 0.01 mm stated			1	1		1
			Question 2 total	**2**	**7**	**11**	**20**	**17**	**20**

GCE A LEVEL UNIT 5 – PRACTICAL ANALYSIS TASK

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	3	0	5	5	5
2	2	7	11	20	17	20
TOTAL	**4**	**10**	**11**	**25**	**22**	**25**