GCE A LEVEL MARKING SCHEME

SUMMER 2017

**A LEVEL (NEW)
PHYSICS - UNIT 5
1420U50-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2017 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.

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.

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

EXPERIMENTAL TASK

Question		Marking details	Marks available					
			AO1	AO2	AO3	Total	Maths	Prac
(a)		Trial reading taken and recorded [between at least 1.00 m to 0.60 m] (1) Graph to be drawn of x against t^2 (1) Accept reverse and x against $t^2 \div 2$ and $2x$ against t^2 Repeat readings to be taken **and** suitable range chosen at least 1.00 m to 0.60 m (1) Clear method – reference to starting and stopping the stopwatch (1) **Don't award any marks from the table for any of the above** Risk assessment stated as no significant risk / very low (1)	1	1 1	1 1	5		5
(b)		Clear table with headings and units including uncertainty and t^2 (1) Minimum of 5 sets of readings with repeats and sequential (1) t mean calculated correctly (1) Uncertainties for t^2 correct (1) Resolution of stopwatch 0.01 s and ruler 0.001 m stated or in table (1) **No sig fig penalties for this part of the question**	1 1	1 1 1		5	2	5
(c)		Titles and units on the axis correct (1) allow **ecf** Suitable scale chosen so that all data points occupy at least half of each axes and not involving awkward factors e.g. 3 (1) All points plotted correctly to within ±½ small square division consistent with readings (1) All error bars plotted correctly on the t^2 axis that are consistent with readings (1) N.B. if error bars too small candidate needs to state this Max / min lines of fit drawn correctly through at least half of the points (1) N.B. any points that candidates class as being anomalous must be identified If not possible to draw any error bars then suitable single line of best fit drawn through at least half of the points	1	1 1 1 1		5	4	5

Question			Marking details	Marks available				Maths	Prac
				AO1	AO2	AO3	Total		
(d)	(i)		Both max and min gradients correct from graph (1) Mean gradient correct allow **ecf** (1) If only possible to draw single line if candidate stated not possible to draw 2 lines award this mark Percentage uncertainty correct to max of 2 sig figs. (1) If only drawn single line need to state % zero or very small or difficult to determine		3		3	3	3
	(ii)		Acceleration correct with units (1) Absolute uncertainty correct to 1 or 2 sig figs **ecf** (1)			2	2	2	2
(e)	(i)		**Teacher assessed marks:** Height for the track, above the bench, measured to be 0.100 m or greater. It should be written to the nearest mm with correct units. (1) $\sin\theta$ is correctly calculated to within $\pm$ 0.03 of the centre value (1) Accept answer expressed as a fraction			2	2	1	2
	(ii)		Calculation of $g\sin\theta$ and correct conclusion consistent with results			1	1		1
	(iii)		Sphere rotates / friction / air resistance / drag (1) Retarding forces increase with time / velocity [so acceleration falls] or resultant force decreases with velocity / time (1)			2	2		2
			Question total	**4**	**12**	**9**	**25**	**12**	**25**

PRACTICAL ANALYSIS TASK

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
1			Volume = $7.62 \times 10^{-5}\,\text{m}^3$ no unit penalty(1) Mass = 0.130 kg no sig fig penalty but must have unit (1) % uncertainty (V) = 0.5[7]% no sig fig penalty (1) % uncertainty (ρ) = 2[.4]% no sig fig penalty (1) Absolute uncertainty (M) = 0.004 [kg] **ecf** accept 1 or 2 sig figs(1) Alternative method using max and min values is acceptable		5		5	5	5
2	(a)		Correct (working) circuit drawn with correct symbols with minimum of capacitor, resistor and voltmeter included (1) Voltmeter correctly connected across resistor or capacitor (1)	2			2		2
	(b)	(i)	Equation re-arranged as $\ln U = n \ln V + \ln k$ (1) (accept any logarithm) Graph of $\ln U$ on the y-axis and $\ln V$ on the x-axis stated to be plotted or explicit comparison with $y = mx + c$ (accept any logarithm) (1)	1	1		2	2	2
		(ii)	All values of $\ln U$ and $\ln V$ correct with no units (accept $\ln (V/V)$ and ($\ln (U/J)$ (1) Don't accept $\ln V$ (V) and $\ln U$ (J) d.p. used consistently for all columns of data to a maximum of 3 d.p.s (1)		2		2	1	2
	(c)		Axes labelled correctly – and no units (or alternative; see part (c)) **ecf** from (b) (1) Suitable scale so that data points occupy half of each axis (1) All points plotted correctly to within ½ small square division (1) Good line of best fit consistent with data (1)	1	1 1 1		4	3	4

4

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)		Large triangle (should be close to extremities of the line of best fit i.e. over half the line used) (1) Gradient calculated correctly (1) Gradient = n clearly stated (1)			3	3	3	3
	(e)		From equation $n = 2$ (1) Comparison with value obtained from part (d) and comment (1)			2	2	2	2
	(f)		Parallel so total capacitance = 200 [mF] or tolerance used correctly on 100 mF (1) Data point used from line of graph (1) k correctly determined as 100 ± 10 [mF] or inverse ln used (1) Capacitance correctly calculated [from value of k ($2 \times k$)] (1) Valid comment for conclusion i.e. some comparison made (1)			5	5	5	5
			Question total	**4**	**11**	**10**	**25**	**21**	**25**

A2 UNIT 5: PRACTICAL EXAMINATION

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
Practical Analysis Task	4	11	10	25	21	25
Experimental Task	4	12	9	25	12	25
TOTAL	**8**	**23**	**19**	**50**	**33**	**50**

WJEC GCE A Level Physics Unit 5 MS/Summer 2017/ED