GCSE MARKING SCHEME

SUMMER 2018

SCIENCE (DOUBLE AWARD)
PHYSICS - UNIT 6
FOUNDATION TIER
3430U60-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2018 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.

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GCSE PHYSICS

SUMMER 2018 MARK SCHEME

UNIT 6: (Double Award) PHYSICS 2 (FOUNDATION TIER)

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

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.

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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

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	*(a)*			18 (1) 74 (1) **ecf** [1st answer + 56]		2		2	2	
	(b)	(i)		No effect [on thinking distance] (1) Increases / longer [braking distance] (1) NB. '[Take] longer to brake' or 'longer for..' imply time so not credited. [No reference to time for either or physical cause]	2			2		
		(ii)		Increases / longer [thinking distance] (1) NB. '[Take] longer to think' implies time so not credited. No effect [on braking distance] (1) [No reference to time for either or physical cause]	2			2		
				Question 1 total	**4**	**2**	**0**	**6**	**2**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	*(a)*			Gas [or gases] / hydrogen (1) and dust [not rocks / earth](1)	2			2		
	(b)	(i)		Temperature drops [accept, gets colder] (from Venus) <u>as distance increases [or converse]</u> NB. Must be expressed as a trend<u>.</u>		1		1		
		(ii)		Venus / Mercury		1		1		
		(iii)	I	Answers in the range −21 to −149			1	1	1	
			II	Answers in the range 3 to 11			1	1	1	
		(iv)		Mars has less mass than Earth (1) but has more moons (1) [Accept: Mars has less mass than Earth but has 2 moons → (2)] **Or** Mars has less mass than Venus (1) but has more moons (1) <u>Or</u> Uranus has less mass than Neptune [or. eg Uranus is 15 [× Earth] mass and Neptune is 17[× Earth] mass] (1) but has more moons (1) NB1. Answers must name two relevant planets, i.e. two planets which disagree with the statement. NB2. To obtain 2 marks 'disagree' [or equiv.] must appear. Accept: 'smaller' or 'less weight'			2	2		
				Question 2 total	**2**	**2**	**4**	**8**	**2**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	*(a)*	(i)		50 [N]		1		1	1	
		(ii)		Has passed elastic limit / E [accept – no longer obeys Hooke's law] (1) [Not: graph doesn't go up to 58] so will remain permanently stretched / no longer returns to its original length (1) NB. To obtain 2 marks 'unsuitable' [or equiv.] must appear. Not: 'it breaks'		2		2		
	(b)	(i)		Pair of values from straight part of graph e.g. 50 and 2.5 / 40 and 2.0 [even 60 / 3 from the extrapolated straight line] (1) Substitution: e.g. $\frac{50}{2.5}$ (1) Answer of 20 [N/cm] (1) NB. Answer only of 0.05 without workings $\rightarrow$ 1 mark	1	1 1		3	2	
		(ii)		Straight(ish) line of different gradient through origin [within < 1 small square] (1) less steep line than one given (1) [Independent mark]		2		2	2	
				Question 3 total	**1**	**7**	**0**	**8**	**5**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	*(a)*	(i)		[160 × 90 =] 14 400 [g]		1		1	1	
		(ii)		[$\frac{160}{32}$ =] 5 [litres]		1		1	1	
	(b)	(i)		30 & 12 (1) Substitution: $\frac{30}{12}$ (1) = 2.5 [m/s^2] (1) NB. Answer only of 0.4 without workings → 1 mark	1 1	 1		3	3	
		(ii)		Substitution: 2.5 (**ecf**) × 1 100 (1) = 2 750 [N] (1)	1	1		2	2	
	(c)			Any 1 of e.g. [more] streamlined (or aerodynamic) [designs] / correctly inflated tyres / stop – start (or stop & go) / lighter cars / better tyres / eco-mode. Not: reference to electric cars / solar panels	1			1		
				Question 4 total	**4**	**4**	**0**	**8**	**7**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	*(a)*	(i)		Maximum [or fastest, highest] speed [or velocity] /constant speed [when forces are balanced] Accept: <u>speed</u> when forces are balanced	1			1		
		(ii)		**Indicative content:** **Preparation** 1. Set up the apparatus as shown, with the pointer (e.g.) 150 cm above the floor 2. Use a balance to determine the mass of a cake case [e.g. weigh 10 and divide by 10] **Carrying out** 3. Drop a single cake case from (e.g.) 20 cm above the pointer. 4. Using a stopwatch, record the time it takes to fall from the level of the pointer to the floor. 5. Repeat step 4 (another 4 times) and calculate the mean time. 6. Repeat steps 4 and 5 with a stack of e.g. 2, 3, 4 [and 5] cake cases. **Analysis** 7. Use the equation speed = distance/time to calculate the speed **5 – 6 marks** Expect a full description of the method with at least 5 points mentioned from all areas. *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.*	6			6		6

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				3 – 4 marks Expect an outline description of the method with at least 3 points made from two of the areas *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks** Expect 1 - 2 points made. *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** *No attempt made or no response worthy of credit.*						
	(b)	(i)		Substitution into $s = \frac{d}{t} = \frac{1.5}{0.6}$ (1) [or by implication] = 2.5 [m/s] (1)	1	1		2	2	2
		(ii)		4 points plotted correctly (ignore (0,0) to within <1 small square division (2) **ecf** on *(b)*(i) 3 points plotted correctly (ignore (0,0) to within <1 small square division (1) **ecf** on *(b)*(i) 2 or less points plotted correctly (ignore (0,0) to within <1 small square division (0) **ecf** on *(b)*(i) Smooth curve <u>through (0,0)</u> < 1 small square tolerance between curve and points (1)		3		3	3	3

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		Pair of values of time (e.g. 1 and 2 cakes cases: 0.90 and 0.68 [s] **or** 2 and 4 cake cases: 0.68 and 0.56 [s]) (1) Calculation of ratio e.g. 0.8 / implied use of ratio e.g. half of 0.9 is 0.45 (1) Comparison to 0.5 **and** conclusion that suggestion is not supported (1) Alternative approach using speeds: Pair of values of speed (e.g. 1 case $\rightarrow$ 1.7 [m/s] and 2 cases $\rightarrow$ 2.2 [m/s]). (1) To halve the time means double speed (1) Comparison e.g $2.2 \neq 2 \times 1.7$/ 2nd speed should be 3.4 **and** so suggestion not supported (1)			3	3	2	3
				Question 5 total	**8**	**4**	**3**	**15**	**7**	**14**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	*(a)*			Ticks in 1st, 2nd and 3rd boxes 3 × (1) 4 boxes ticked maximum = 2 marks 5 boxes ticked maximum = 1 mark 6 boxes ticked = 0 marks	3			3		
	(b)			Beta emitters are most suitable as beta would be partly absorbed [accept: beta will pass through thin Al / blocked by a few mm [or thick] Al] / alpha totally absorbed **and** gamma not absorbed] (1) Increasing thickness decreases beta count rate [accept: changing thickness would change count rate] (1) Sr-90 has a long enough half-life so won't need frequent replacing / P-32 would need frequent replacing. [Must be in relation to β-emitter] (1) For 3 marks "agree" required.			3	3		
	(c)	(i)		It takes 29 years to halve (1) number of nuclei / atoms / mass / amount / activity / count rate [of strontium-90] (1)	2			2		
		(ii)		[1 →] $\frac{1}{2}$ → $\frac{1}{4}$ → $\frac{1}{8}$ or [100] →50→25→12.5% (1) multiple halving ending with $\frac{1}{8}$ (12.5%) so $\frac{1}{8}$ is 3 half-lives **ecf** on incorrect halving or incorrect counting of half lives (1) 3 **ecf** × 29 = 87 years (1) NB 87 years → 3 marks; 58 or 116 years → 2 marks		3		3	3	

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		150 ÷ time(1) = 0.5 [cps] (1) ans		2		2	2	2
		(ii)		Measure for a longer period of time (1) take repeat readings (1)			2	2		2
				Question 6 total	**5**	**5**	**5**	**15**	**5**	**4**

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FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	Marks Available					
	AO1	AO2	AO3	Total	Maths	Prac
1	4	2	0	6	2	0
2	2	2	4	8	2	0
3	1	7	0	8	5	0
4	4	4	0	8	7	0
5	8	4	3	15	7	14
6	5	5	5	15	5	4
Total	24	24	12	60	28	18

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