GCSE MARKING SCHEME

SUMMER 2018

GCSE (NEW)
PHYSICS - UNIT 1 (FOUNDATION TIER)
3420U10-1

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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 1: ELECTRICITY, ENERGY AND WAVES (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)*	(i)		Microwaves	1			1		
		(ii)		Microwaves	1			1		
	(b)			Radio [waves] / X-rays / Gamma [rays]	1			1		
	(c)			3rd and 4th boxes ticked (1) + (1). Additional boxes ticked −1 per box (minimum 0)	2			2		
	(d)	(i)		Substitution: 170 × 2 (1) [Not: multiple selections unless correct final answer given] Waves speed = 340 [m/s] (1)	1	1		2	2	
		(ii)		Wavelength increases [or equiv] (1) [not: just stating the wavelengths] ..[so] speed increases (1) NB Independent marks.		2		2		
				Question 1 total	**6**	**3**	**0**	**9**	**2**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	*(a)*	(i)		Top label – neutral Middle label – earth Bottom label – live 3 correct = 2 marks 1 or 2 correct = 1 mark		2		2		
		(ii)		parallel (1) thinner (1) current (1)	3			3		
	(b)	(i)		Substitution: 1.2 × 0.5 (1) Units used = 0.60 [kWh](1)	1	1		2	2	
		(ii)		Substitution: 0.60 **ecf** × 15 (1) Cost = 9 [p] (1) [N.B. not £0.09p]	1	1		2	2	
				Question 2 total	**5**	**4**	**0**	**9**	**4**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	*(a)*			**Indicative content:** 1. Measure the mass of the block with a balance. 2. Put sufficient water e.g. 20 cm^3 into a measuring cylinder 3. Record the volume. 4. Place the metal in the water and ensure it is fully submerged 5. Record the new volume. 6. Calculate the volume of the metal by subtracting volume of water from volume of water + metal. 7. Calculate the density by dividing mass by volume. **5 – 6 marks** Fully describes a workable method, including statement 7 *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.* **3 – 4 marks** Identifies relevant apparatus and describes a method to allow density to be calculated. Uses measuring cylinder method for volume but misses some detail or misses detail on how to calculate results. *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** Mentions some relevant apparatus or measurements or refers to volume of a regular shape *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.*	6			6		6

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		Iron (1) It is the closest value [or equiv, e.g. most similar] given (1) N.B. 2nd mark only available if the first mark is awarded.			2	2		2
		(ii)		Any one for (1) of • Value is in between 2 metals • Value is not very close to one metal • Could be another metal not listed • None of the metals have the exact density • Tin and/or copper have a similar density [accept 'iron has a similar density' if tin or copper given in *(b)*(i)]			1	1		1
		(iii)		Use higher resolution measuring cylinder / higher resolution balance Or measure {volume / mass} to {a higher resolution / more significant figures} [Accept: measure to a higher resolution]			1	1		1
	(c)	(i)		Answer = 400 [cm^3]		1		1	1	1
		(ii)		Substitution: 19.32 × 400 **ecf** (1) Mass = 7 728 [g] (1)	1	1		2	2	2
				Question 3 total	**7**	**2**	**4**	**13**	**3**	**13**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	*(a)*			Box under 1st diagram ticked (1)	1			1		
	(b)	(i)		**Any 1 (1) from** • Reverse field [accept: swap magnets; not just change field] • reverse current [accept: change current direction] • reverse voltage / switch around power supply	1			1		
		(ii)		Stronger {field / magnets} [accept: move poles closer together / add iron core] [not: more magnets] (1) Larger current / voltage (1) [power = neutral] Not: reference to area or turns on coil	2			2		
	(c)	(i)		50 [J]		1		1	1	
		(ii)		Substitution: $\left(\frac{50\,\textbf{ecf}}{200}\right)\left[\times 100\right]$ (1) ecf only allowed on E_{in} < 200 % efficiency = 25 (1) NB. 0.25 on answer line → substitution mark awarded	1 1			2	2	
				Question 4 total	**5**	**2**	**0**	**7**	**3**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	*(a)*			As time increases temperature increases (1) at a constant rate / increase is linear (1) [Temperature <u>increase</u> [directly] proportional to time → (2)] Every 2 minutes temperature increase = 18 °[C] or equiv (2) Temperature ∝ time → 1 mark		2		2		
	(b)	(i)		100 [°C]		1		1		
		(ii)		80 [°C] c.a.o.		1		1	1	
		(iii)		Substitution: 0.2 × 4 200 × 80 **ecf** (1) Thermal energy = 67 200 [J](1)	1	1		2	2	
	(c)			Water is changing state / becoming a gas / changing into steam Not: boiling or evaporating Accept answer in terms of molecules, e.g. particles getting further apart **or** bonds between {particles / molecules} broken			1	1		
				Question 5 total	**1**	**5**	**1**	**7**	**3**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	*(a)*			1st and 3rd boxes (1) + (1).	2			2		
	(b)			Coal produces most CO_2 [or more CO_2 than oil or gas] (1) which is a greenhouse gas / which adds to the greenhouse effect (1) [2nd mark can be awarded as long as CO_2 mentioned]		2		2		
	(c)			Coal decreased and gas increased (1) Coal changed more than gas / some numerical <u>comparison</u> (1) **Or** Correct quantitative answer e.g. coal has dropped from 41% to around 6%, gas has increased from 27% to 46% award (1 – not enough for second mark)		2		2		
	(d)	(i)		[From 2015 – 2016 the percentage has] has decreased [slightly] / It was 0.5% less in 2016 Accept the converse, e.g. it was 0.5% more in 2015		1		1		
		(ii)		No, [an increase was expected] because more [renewable] {power stations / wind turbines} built (1)			1	1		
	(e)	(i)		Not enough electricity [being generated] / to meet demand or w.t.t.e [Reference to variation in demand neutral].		1		1		
		(ii)		[Around] 18.00 or 6 <u>pm</u> [Accept 17.30 ± 30 min]		1		1		
				Question 6 total	**2**	**7**	**1**	**10**	**0**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	*(a)*	(i)		Same distance between lamp and LDR (1) Same {ambient / background / room} lighting (1)	2			2		2
		(ii)		Enclose lamp and LDR in a container e.g. tube or box / carry out experiment in a darkened room (1) So no ambient light affects LDR (1)			2	2		2
	(b)	(i)		Scales y-axis: 2 kΩ per 2 cm (1) The 6 points between P = 4 and 24 W plotted correctly to within ± < small square division (2) 5 correct plots (1) Smooth curve of best fit between P = 4 & 24 with ± < small square division tolerance ; may miss one point (1) [No hairy lines] (1) Non-linear scale → total mark 0.	1	2 1		4	4	4
		(ii)		Read from graph e.g. 2600 Ω / 2.6 k [Ω]		1		1	1	1
		(iii)		From 12 [W] to 24 [W] the resistance goes from 2.2 [kΩ] to 1.1 [kΩ], **or** 8 to 16, from 3 to 1.5 (1) Other doubling e.g. 2 W to 4 W resistance goes from 19.5 [kΩ] to 10.3 [kΩ] **or** 4 to 8, from 10.3 to 3 (1) Therefore sometimes true, sometimes not (1) NB 3rd mark only given following arguments for first and second mark presented (whether marks awarded or not)			3	3	1	3
				Question 7 total	**3**	**4**	**5**	**12**	**6**	**12**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8	*(a)*			Ticks in boxes 3, 4 and 5 i.e. 3 × (1)	3			3		
	(b)	(i)	I	8 min 20 s		1		1	1	
			II	6 min 40 s		1		1	1	
		(ii)		Arrival time of P waves: 00 : 16 : 00 (1) Time difference: 00 : 02 : 40 ecf (1) [unless P wave arrival time > 18:40:00] Distance to epicentre: 1.6 ± 0.2 [$\times 10^3$ km] ecf from Δt (1) [no ecf on $d > 10 \times 10^3$ km] 1:40 $\rightarrow$ d = 1 2:00 $\rightarrow$ d = 1.2 d = 1.4, 1.6, 1.8 in tolerance 3:20 $\rightarrow$ d = 2			3	3	3	
		(iii)		Conversion to 360 s (1) Speed = 8.89 [km/s] (1) [or with correct rounding] c.a.o.		2		2	2	
		(iv)		2 crosses at intersections		1		1		
		(v)		The top intersection point identified (1) no ecf The distance of the epicentre from BC is shorter than the distances of MC and BH [or circle centred on BC crossing through the top intersection point seen] (1) NB. If a 3rd circle is drawn which does not have a common intersection with the others, identification + justification e.g. it is the closer point.			2	2	1	
				Question 8 total	**3**	**5**	**5**	**13**	**8**	**0**

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FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	6	3	0	9	2	0
2	5	4	0	9	4	0
3	7	2	4	13	3	13
4	5	2	0	7	3	0
5	1	5	1	7	3	0
6	2	7	1	10	0	0
7	3	4	5	12	6	12
8	3	5	5	13	8	0
TOTAL	**32**	**32**	**16**	**80**	29	25

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