GCSE MARKING SCHEME

SUMMER 2019

PHYSICS COMPONENT 1 – FOUNDATION TIER C420U10-1

INTRODUCTION

This marking scheme was used by WJEC for the 2019 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.

GCSE PHYSICS

COMPONENT 1 – CONCEPTS IN PHYSICS

FOUNDATION TIER

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.

<u>Marking abbreviations</u>

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

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
1	*(a)*		Live wire — Neutral wire — Fuse — Earth wire (box matching diagram) Award one mark for each correct line. Deduct one mark for each line in excess of 5	5			5		
	(b)	(i)	Alternating [voltage] (accept a.c.and accept sinusoidal)	1			1		
		(ii)	0.01, 0.02, 0.03 in the boxes		1		1	1	
		(iii)	230 [V]	1			1		
	(c)		Period = $\dfrac{1}{60}$ (1 – sub) = 0.017 [s] (1) Accept 0.02 0.016 on its own on answer line (1) Do not accept 0.016 for the final mark	1	1		2	1	
			Question 1 total	**8**	**2**	**0**	**10**	**2**	**0**

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		At least 5 curved lines from pole to pole outside the magnet (Accept dotted or dashed lines) (1) Lines to be symmetrical above and below the magnet (1)	2			2		2
	(b)	(i)	Place a compass at various points near the magnet (1) Direction of field is the direction of compass pointer (N) (1)			2	2		2
		(ii)	At least one arrow on diagram from N towards S. There must be no conflict if more than one arrow is drawn.	1			1		1
	(c)	(i)	Attraction between the two	1			1		
		(ii)	The magnet is permanent (1) The iron is temporary (1)	2			2		
			Question 2 total	**6**	**0**	**2**	**8**	**0**	**5**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	*(a)*			Electrostatic (1) Gravitational (1) Reaction (1)	3			3		
	(b)			3.6×10^{22} [N] (1) Arrow on the Sun towards the Earth (1)		2		2		
				Question 3 total	**3**	**2**	**0**	**5**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			As one doubles, the other does not double (or similar statement) **OR** For example: a depth change of 0 to 1 m, and then 1 m to 2 m, the speed changes are not equal.			1	1	1	
	(b)	(i)		4.4 [m/s]		1		1		
		(ii)		Use of $v = f\lambda$ (1-recall) $f = \dfrac{4.4ecf}{6}$ (1-sub & manip) = 0.73 [Hz] (1)	1	1 1		3	2	
		(iii)		$\dfrac{30}{6} = 5$		1		1	1	
		(iv)		Scale of 1 m/s for each 2 cm square (1) Horizontal line at 3.1 m/s from 0 m to 10 m (1) Horizontal line at 4.4 m/s from 10 m to 40 m (1) Diagonal line from 4.4 m/s down to 3.1 m/s between 40 m and 45 m [Accept straight or curved line] (1) Horizontal line at 3.1 m/s from 45 m to 50 m (1)			5	5	5	
				Question 4 total	**1**	**4**	**6**	**11**	**9**	**0**

Question			Marking details	AO1	AO2	AO3	Total	Maths	Prac
5	*(a)*		The gap of 40 m is bigger than the thinking distance (1) of 21 m so it is a suitable gap to recommend (1)		2		2		
	(b)	(i)	Use of distance = speed × time i.e. $t = \dfrac{21}{30}$ (1 – sub & manip) = 0.7 [s] (1)		2		2	2	
		(ii)	The 2 s rule gives a gap of 2 seconds which is bigger than the thinking time (1) of 0.7 (**ecf**) so it is a suitable gap to recommend (1) **ALTERNATIVE:** Distance travelled in 2 s = 60 m which is bigger than the thinking distance (1) of 21 m so it is a suitable gap to recommend (1)			2	2		
	(c)	(i)	$t = \dfrac{(0 \text{-} 30)}{\text{-}6}$ (1-sub & manip) = 5 [s] (1) Accept $t = \dfrac{30}{6}$ for the first mark		2		2	1	
		(ii) I	Either $x = \tfrac{1}{2}(u+v)t = \tfrac{1}{2}(30+0) \times 5$ **ecf** (1-sub) = 75 [m] (1) **OR** $x = ut + \tfrac{1}{2}at^2 = 30 \times 5 + \tfrac{1}{2}(\text{-}6)5^2$ (1 – sub) = 75 [m] (1)	1	1		2	1	
		II	75 (**ecf**) + 21 = 96 [m]		1		1		

Question				Marking details	AO1	AO2	AO3	Total	Maths	Prac
		(iii)		$F = ma$ = 2000 × 6 = 12 000 [N]		1		1	1	
		(iv)		Larger brakes / a bigger braking force is needed for the lorry		1		1		
				Question 5 total	**1**	**10**	**2**	**13**	**5**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	*(a)*			Both rays converging towards the principal focus [on the paper] (1) Paper moved to get sharp image (1) The distance from lens to the paper (1) [gives the focal length]	3			3		
	(b)			**Any 2 of the following rays drawn:** (2) - Ray parallel to the principal axis passes through the focus and beyond - Ray through the optical centre passes through un-deviated - Ray passing through the principal focus emerges parallel to the principal axis (Rays need to be drawn carefully enough that the final image is within 0.4 cm of actual position in mark scheme to get 2 marks) Image drawn where the rays meet to the principal axis (vertically) (1) The image is inverted (1) Real (1) Value taken from diagram ± 0.2 cm: expect 2 cm high (1) Value taken from diagram ± 0.2 cm: expect 6 cm from the lens (1)		7		7		
				Question 6 total	**3**	**7**	**0**	**10**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		Potential difference = current $\times$ resistance Resistance= $\dfrac{6.0}{0.3}$ (1- sub & manip.) = 20 (1)		2		2	2	2
		(ii)		Conversion of time to 2 $\times$ 60 = 120 [s] Charge = 0.3 $\times$ (2 $\times$ 60) (1-conv & sub) = 36 [C] (1)		2		2	2	
		(iii)		Energy = 36 (**ecf**) $\times$ 6 (1 – sub) = 216 [J] (1)	1	1		2	1	2
		(iv)		The cell / battery. Accept chemical energy		1		1		1
	(b)	(i)		Is more than 0.3 A		1		1		1
		(ii)		Equal to 0.3 A		1		1		1
		(iii)		Is less than 0.3 A		1		1		1
		(iv)		Is more than 0.3 A		1		1		1
	(c)			Bigger voltage (1) … gives bigger current (1) …reference to $P = V \times I$ giving an even bigger power – so agree (1)			3	3		3
				Question 7 total	1	10	3	14	5	12

10

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			All are 100% efficient (1) as input and output powers are equal for all of them (1)		2		2		2
	(b)	(i)		$I = \dfrac{P}{V} = \dfrac{20}{5}$ (1- sub & manip.) = 4 [A] (1)		2		2	2	2
		(ii)		A and B (both required)		1		1	1	1
	(c)	(i)		1 is A (1) 2 is D (1)			2	2		2
		(ii)		A is the only step-up transformer (1) D is the only step-down transformer that has an output potential difference of 3 V from an input potential difference of 12 V (1)			2	2		2
				Question 8 total	**0**	**5**	**4**	**9**	**3**	**9**

11

	Question			Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)			**Indicative content:** The Sun was formed from gas and dust which were drawn together by gravity. This caused fusion reactions which release energy as heat and light. The Sun became stable when the inner force of gravity and the outward gas and radiation pressure became balanced. During the formation of the Sun, solid matter was pulled into orbit near to the Sun which collected into four inner rocky planets consisting of Mercury, Venus, Earth and Mars. The less dense matter, gas, was pulled together into orbit as the four outer giant planets, consisting of Jupiter, Saturn, Uranus and Neptune. **5-6 marks** Full and logical account. Complete answer including much of the formation of the Sun, formation and nature of the inner and outer four planets, names of the planets as required from the question. *There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant to the argument.* **3-4 marks** Partially complete account which includes some of the following: formation of the Sun, the difference between the inner four and outer four planets, their names. *There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.*	6			6		

Question				Marking details	AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks One of the following: formation of the Sun, formation and nature of inner and outer four planets, names of planets. *There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of information not relevant to the argument.* **0 marks** *No attempt made or no response worthy of credit.*						
	(b)			Asteroids are lumps of rock, whereas comets are made from rock and ice (1) Asteroids are positioned between the orbits of Mars and Jupiter (1) Asteroids have (nearly) circular orbits whereas comets have highly elliptical orbits (1) Comets pass well outside of Pluto's/Neptune's orbit (1)	4			4		
				Question 9 total	10	0	0	10	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	*(a)*			[Positively charged] nucleus (1) surrounded by [negatively charged] electrons (1) electrons in different orbits or energy levels or shells with the nuclear radius much smaller than that of the atom / almost all of the mass in the nucleus (1)	3			3		
	(b)			Any single digit number $\times\ 10^{-15}$	1			1		
				Question 10 total	**4**	**0**	**0**	**4**	**0**	**0**

	Question			Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
11	(a)	(i)		Temperature is measured from the thermometer (1) Volume is measured from the syringe (1) Measure volume at different temperatures (1)	3			3		3
		(ii)		Temperature	1			1		1
		(iii)		Mass of air / air pressure	1			1		1
	(b)	(i)		Scales: t on x-axis including labels and units - 0 to 50 (2 cm per 10 °C **and** V: either 0 to 60 (2 cm per 10 cm^3) or 50 to 60 (1 cm per 1 cm^3) (1) All points plotted correctly (2) 5 points plotted correctly (1) 4 or less points plotted correctly (0) Straight line (1) Does not pass through origin so do not agree (1)			5	5	4	5
		(ii)		As temperature increases the molecules gain energy / speed up (1) And their separation increases (1)	2			2		
				Question 11 total	**7**	**0**	**5**	**12**	**4**	**10**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
12	(a)	(i)		Substitution: KE = $0.5 \times 450\,000 \times 80^2$ (1) KE $= 0.5 \times 450\,000 \times 6\,400$ (1) $= 1\,440\,000\,000$ or 1.44×10^9 [J] (1)	1	1 1		3	2	
		(ii)		Work done = gain in KE (1) Force $= \dfrac{1\,400\,000\,000}{950}$ subs and manip (1) $= 1\,515\,789$ or 1.5×10^6 [N] (1)	1	1 1		3	2	
		(iii)		Drag force also acts [on aeroplane as it speeds up] (1) Thrust = RF + drag so agree OR RF = Thrust – drag (1)			2	2		
	(b)	(i)		PE = mgh or by implication (1) $= 450\,000 \times 10 \times 9\,200$ (subs and conv) (1) $= 41\,400\,000\,000$ [J] (1) Answer of $41\,400\,000$ gets (2) 4.14×10^n where n not equal to 10 (2)	1	1 1		3	2	
		(ii)		Power $= \dfrac{\text{work done}}{\text{time}}$ (1) or by implication $= \dfrac{41\,400\,000\,000}{1\,200}$ **ecf** on numerator (subs and conv) (1) $= 34\,500\,000$ [W] (1) Answer of $2\,070\,000\,000$ (2) (20 min used)	1	1 1		3	2	
				Question 12 total	**4**	**8**	**2**	**14**	**8**	**0**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	8	2	0	10	2	0
2	6	0	2	8	0	5
3	3	2	0	5	0	0
4	1	4	6	11	9	0
5	1	10	2	13	5	0
6	3	7	0	10	0	0
7	1	10	3	14	5	12
8	0	5	4	9	3	9
9	10	0	0	10	0	0
10	4	0	0	4	0	0
11	7	0	5	12	4	10
12	4	8	2	14	8	0
TOTAL	48	48	24	120	36	36

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