## GCSE MARKING SCHEME

## SUMMER 2018

## PHYSICS - COMPONENT 1 FOUNDATION TIER C420U10-1

## 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.

## GCSE PHYSICS

## SUMMER 2018 MARK SCHEME <br> COMPONENT 1 - CONCEPTS IN PHYSICS

## FOUNDATION TIER

## 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.

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




| Question |  |  | Marking details | Marks available |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | A01 | AO2 | AO3 | Total | Maths | Prac |
| 4 | (a) |  |  | 2 concentric circles on either side (1) Anticlockwise arrows around left side (1) Clockwise arrows around right side (1) | 1 | $\begin{aligned} & 1 \\ & 1 \end{aligned}$ |  | 3 |  | 3 |
|  | (b) | (i) | Becomes weaker [ignore reference to current] | 1 |  |  | 1 |  | 1 |
|  |  | (ii) | Reverses [accept changes] direction | 1 |  |  | 1 |  | 1 |
|  |  | (iii) | Becomes stronger | 1 |  |  | 1 |  | 1 |
|  |  | (iv) | Becomes stronger | 1 |  |  | 1 |  | 1 |
|  |  |  | Question 4 total | 5 | 2 | 0 | 7 | 0 | 7 |





| Question |  |  |  | Marking details | Marks available |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | A01 | AO2 | AO3 | Total | Maths | Prac |
| 8 | (a) | (i) |  |  | $8\left[\mathrm{~cm}^{3}\right]$ |  | 1 |  | 1 |  | 1 |
|  |  | (ii) |  | $\begin{aligned} \text { Substitution: } & \frac{7.2}{8 \mathrm{ecf}}(1) \\ = & 0.9\left[\mathrm{~g} / \mathrm{cm}^{3}\right](1) \end{aligned}$ | 1 | 1 |  | 2 | 2 | 2 |
|  |  | (iii) |  | Mass stays the same (1) <br> Volume of water is less (since density is greater) (1) |  | 2 |  | 2 |  | 2 |
|  | (b) | (i) |  | It is reversible (1) <br> if energy is removed or so recovers original properties or because atoms do not combine or because no new compounds [or different ions] formed / (1) | 2 |  |  | 2 |  |  |
|  |  | (ii) |  | Vibrate more / KE increases [not just energy] (1) <br> Breaking of bonds (1) <br> Vibrate more / Move around faster / KE increases (1) | 3 |  |  | 3 |  | 3 |
|  |  | (iii) |  | $\begin{aligned} & \text { Selection of: } Q=m L(1) \text { or by implication } \\ & \text { Substitution: } 7.2 \times 334 \text { (1) } \\ & =2404.8 \text { OR } 2405 \text { OR } 2400 \text { [J] (1) } \end{aligned}$ | $\begin{aligned} & 1 \\ & 1 \end{aligned}$ | 1 |  | 3 | 2 | 3 |
|  | (c) |  |  | Density decreases (1) as molecules get further apart (1) | 2 |  |  | 2 |  | 2 |
|  |  |  |  | Question 8 total | 10 | 5 | 0 | 15 | 4 | 13 |


| Question |  |  | Marking details | Marks available |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | A01 | AO2 | AO3 | Total | Maths | Prac |
| 9 | (a) | (i) |  | $V=V_{1}+V_{2}+V_{3}$ | 1 |  |  | 1 |  | 1 |
|  |  | (ii) | 0.2 [A] | 1 |  |  | 1 |  | 1 |
|  |  | (iii) | $\begin{align*} & \text { manipulation i.e } \frac{12}{0.2} \text { or } \frac{12}{\text { answer to (a)(ii) }} \text { (1 }  \tag{1}\\ & =60 \Omega(1) \text { c.a.o. } \end{align*}$ |  | 2 |  | 2 | 2 | 2 |
|  |  | (iv) | $\begin{aligned} & 20+15[=35](1) \\ & 60 \text { ecf }-35=25 \Omega(1) \end{aligned}$ |  | 2 |  | 2 | 1 | 2 |
|  | (b) |  | [Resistance decreases so] Current increases [when $R_{3}$ removed] <br> (1) <br> so voltage across other resistors increases (1) <br> OR <br> Now $V=V_{1}+V_{2}$ (1) <br> so $V_{1} / V_{2}$ increase so agree (1) <br> ...must say agree with statement for 2 marks |  |  | 2 | 2 |  | 2 |
|  | (c) | (i) | $I_{\text {tot }}=I_{1}+I_{2}+I_{3}$ | 1 |  |  | 1 |  | 1 |
|  |  | (ii) | Decreases (1) <br> Stays the same (1) | 1 | 1 |  | 2 |  | 2 |
|  |  |  | Question 9 total | 4 | 5 | 2 | 11 | 3 | 11 |


| Question |  |  | Marking details | Marks available |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | A01 | AO2 | AO3 | Total | Maths | Prac |
| 10 | (a) |  |  | $\begin{aligned} & \text { Output power transfer }=900[\mathrm{~W}](1) \\ & \text { Use of: Efficiency } \frac{\text { output power transfer }}{\text { input power transfer }}(1) \text { [or by implication] } \\ & \qquad=0.6 \text { (1) } \\ & \text { (Accept } \left.\frac{6}{10} \text { or } 60 \%\right) \end{aligned}$ | 1 | $1$ $1$ |  | 3 | 2 |  |
|  | (b) | (i) | Electrical energy generated $=1000 \times 9000=9.0$ million $\mathrm{J}(1)$ <br> No of g of $\mathrm{CO}_{2}$ saved $=9.0 \times 120=1080$ which agrees with the claim (1) <br> ALTERNATIVE $\frac{1000}{120}=8.33 \text { million J (1) }$ <br> With either: 1000 W could be generated for 8333 s <br> Or: 1153 W could be generated for 9000 s - to save 1 kg of $\mathrm{CO}_{2}$ emissions so this agrees with the claim (1) |  |  | 2 | 2 | 2 |  |
|  |  | (ii) | $\mathrm{CO}_{2}$ contributes towards global warming / climate change Or: To slow down global warming / climate change | 1 |  |  | 1 |  |  |




| Question |  |  | Marking details | Marks available |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | A01 | AO2 | AO3 | Total | Maths | Prac |
| 11 | (a) |  |  | 1.2 in second column (1) <br> 7.4 in third column (1) |  | 2 |  | 2 | 1 | 2 |
|  | (b) | (i) | Suitable scales using at least half of the graph in each direction and avoiding multiples of 3 (1) <br> All six points plotted to within $\pm 1 / 2$ small square (2) <br> Five points plotted to within $\pm 1 / 2$ small square (1) <br> Four or fewer points plotted to within $\pm 1 / 2$ small square (0) <br> Best fit straight line through the origin drawn with a ruler (1) |  | 4 |  | 4 | 4 | 4 |
|  |  | (ii) | Reading to be taken from candidate's graph - expect $1.10 \pm$ half square tolerance (i.e. 0.01) [N] |  | 1 |  | 1 |  | 1 |
|  |  | (iii) | Recall and substitution: e.g. $k=\frac{F}{x}=\frac{1.1 \text { (e.c.f.) }}{4.4}$ <br> Conversion of 4.4 to 0.044 (1) <br> $k=25[\mathrm{~N} / \mathrm{m}]$ (1) [accept $k=0.25$ for 2 marks] <br> Values should be taken from the graph not the table. Apply values from the graph. Do not accept extensions of 2.5 or 3.1 which do not lie on the line of best fit. Conversion mark is still available. | 1 | $\begin{align*} & 1  \tag{1}\\ & 1 \end{align*}$ |  | 3 | 3 | 3 |
|  |  | (iv) | Straight line from origin above the original line (1) Exactly double the gradient of the original line (1) |  | 2 |  | 2 | 1 | 2 |
|  |  |  | Question 11 total | 1 | 11 | 0 | 12 | 9 | 12 |


| Question |  |  |  | Marking details | Marks available |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 12 | (a) | (i) |  | Recall moment $=F \times d$ (1) [or by implication] <br> Substitution: $650 \times 18\left[\times 10^{-2}\right]$ (1) $=11700 \mathrm{Ncm}=117[\mathrm{~N} \mathrm{~m}](1)$ <br> Allow 1 mark for correct conversion $\rightarrow 0.18 \mathrm{~m}$ if no other calculation mark given. | $\begin{aligned} & 1 \\ & 1 \end{aligned}$ | 1 |  | 3 | 2 |  |
|  |  | (ii) |  | 1300 [N] |  | 1 |  | 1 | 1 |  |
|  | (b) | (i) |  | The range of ratios available on the second gear are all available on either first or third gear on the chain-ring |  |  | 1 | 1 |  |  |
|  |  | (ii) | 1 | $\text { Recall } \begin{aligned} f & =\frac{1}{T}(1) \text { [or by implication] } \\ & =\frac{1}{0.8}=1.25[\mathrm{~Hz}](1) \end{aligned}$ | 1 | 1 |  | 2 | 1 |  |
|  |  |  | II | $\begin{aligned} & \text { Gear ratio }=1.58: 1 \text { or 38:24 [or equiv or by implication] (1) } \\ & \begin{aligned} \text { No of rotations per second } & =1.25 \text { ecf } \times 1.58 \text { ecf }(1) \\ & =1.975 \text { ecf }(1) \end{aligned} \end{aligned}$ |  |  | 3 | 3 | 3 |  |
|  |  |  | III | $\begin{aligned} & \text { Circumference }=2.36 \mathrm{~m}(1) \text { for conversion } \\ & \text { Speed }=2.356 \times 1.975 \mathrm{ecf}=4.66[\mathrm{~m} / \mathrm{s}](1) \end{aligned}$ |  | 2 |  | 2 | 2 |  |
|  |  |  |  | Question 12 total | 3 | 5 | 4 | 12 | 9 | 0 |

## COMPONENT 1 - Concepts in Physics

## FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

| Question | A01 | AO2 | AO3 | TOTAL MARK | MATHS | PRAC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 6 | 0 | 0 | 6 | 0 | 0 |
| 2 | 3 | 2 | 0 | 5 | 0 | 0 |
| 3 | 0 | 5 | 0 | 5 | 0 | 0 |
| 4 | 5 | 2 | 0 | 7 | 0 | 7 |
| 5 | 4 | 4 | 2 | 10 | 2 | 0 |
| 6 | 5 | 4 | 3 | 12 | 5 | 9 |
| 7 | 5 | 3 | 5 | 13 | 5 | 0 |
| 8 | 10 | 5 | 0 | 15 | 4 | 13 |
| 9 | 4 | 5 | 2 | 11 | 3 | 11 |
| 10 | 2 | 2 | 8 | 12 | 7 | 0 |
| 11 | 1 | 11 | 0 | 12 | 9 | 12 |
| 12 | 3 | 5 | 4 | 12 | 9 | 0 |
| TOTAL | 48 | 48 | 24 | 120 | 46 | 52 |

