Cambridge Assessment International Education

# Cambridge IGCSE™

**PHYSICS** **0625/63**

Paper 6 Alternative to Practical **October/November 2021**

MARK SCHEME

Maximum Mark: 40

**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.



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**[Turn over**

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## Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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| |
|---|
| GENERIC MARKING PRINCIPLE 5:<br><br>Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen). |
| GENERIC MARKING PRINCIPLE 6:<br><br>Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind. |

**Science-Specific Marking Principles**

| | |
|---|---|
| 1 | Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly. |
| 2 | The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored. |
| 3 | Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection). |
| 4 | The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted. |
| 5 | ‘List rule’ guidance<br><br>For questions that require ***n*** responses (e.g. State **two** reasons …):<br><br>• The response should be read as continuous prose, even when numbered answer spaces are provided.<br>• Any response marked *ignore* in the mark scheme should not count towards ***n***.<br>• Incorrect responses should not be awarded credit but will still count towards ***n***.<br>• Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response.<br>• Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science. |

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6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient ($a$) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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**Examples of how to apply the list rule**
State **three** reasons…. [3]

**A**

| | | | |
|---|---|---|---|
| 1 | Correct | ✓ | **2** |
| 2 | Correct | ✓ | |
| 3 | Wrong | × | |

**B (4 responses)**

| | | | |
|---|---|---|---|
| 1 | Correct, Correct | ✓, ✓ | **3** |
| 2 | Correct | ✓ | |
| 3 | Wrong | ignore | |

**C (4 responses)**

| | | | |
|---|---|---|---|
| 1 | Correct | ✓ | **2** |
| 2 | Correct, Wrong | ✓, × | |
| 3 | Correct | ignore | |

**D (4 responses)**

| | | | |
|---|---|---|---|
| 1 | Correct | ✓ | **2** |
| 2 | Correct, CON (of 2.) | ×, (discount 2) | |
| 3 | Correct | ✓ | |

**E (4 responses)**

| | | | |
|---|---|---|---|
| 1 | Correct | ✓ | **3** |
| 2 | Correct | ✓ | |
| 3 | Correct, Wrong | ✓ | |

**F (4 responses)**

| | | | |
|---|---|---|---|
| 1 | Correct | ✓ | **2** |
| 2 | Correct | ✓ | |
| 3 | Correct<br>CON (of 3.) | ×<br>(discount 3) | |

**G (5 responses)**

| | | | |
|---|---|---|---|
| 1 | Correct | ✓ | **3** |
| 2 | Correct | ✓ | |
| 3 | Correct<br>Correct<br>CON (of 4.) | ✓<br>ignore<br>ignore | |

**H (4 responses)**

| | | | |
|---|---|---|---|
| 1 | Correct | ✓ | **2** |
| 2 | Correct | × | |
| 3 | CON (of 2.)<br>Correct | (discount 2)<br>✓ | |

**I (4 responses)**

| | | | |
|---|---|---|---|
| 1 | Correct | ✓ | **2** |
| 2 | Correct | × | |
| 3 | Correct<br>CON (of 2.) | ✓<br>(discount 2) | |

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**RM Assessor 3 annotations:**

| annotation | suggested use |
|---|---|
| tick | mark awarded (note the ticks are added up next to the tick annotation, check the total you enter agrees) |
| cross | no mark awarded |
| SEEN | indicates page seen |
| BOD | benefit of doubt given |
| NBOD | no benefit of doubt given |
| on page comment | gives a text box to write comment –much easier to use than in the previous version of RM assessor |
| ECF | error carried forward |
| ^ | omission mark |
| ? | unclear |
| U<br>UU | unit penalty applied<br>unit penalty not applied because already applied earlier in same question |

| annotation | suggested use |
|---|---|
| wavy line (horizontal or vertical) | used to highlight a particular point |
| CON | contradiction |
| | |
| NAQ | not answered question |
| PD | poor diagram |
| SF<br><br>SFSF | error in number of significant figures<br>significant figure error not penalized. |
| POT<br><br>POT POT | power-of-ten error<br><br>POT penalty not applied as already applied |
| TV | too vague |
| I | ignore |
| | |
| SC | special case |

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NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

| | |
|---|---|
| Brackets ( ) | Brackets around words or units in the mark scheme are intended to indicate wording used to clarify the mark scheme, but the marks do not depend on seeing the words or units in brackets, e.g. 10 (J) means that the mark is scored for 10, regardless of the unit given. However, if a word in brackets is replaced with another word that is clearly wrong then the mark should not be awarded. |
| Underlining | Underlining indicates that this **must** be seen in the answer offered, or something very similar. |
| OR / or | This indicates alternative answers, any one of which is satisfactory for scoring the marks. |
| eeoo. | This means "each error or omission". |
| owtte. | This means “or words to that effect”. |
| Ignore | This indicates that something which is not correct or irrelevant i.e. it is not a contradiction (CON) is to be disregarded and does not incur a penalty. |
| Spelling | Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit. However, do not allow ambiguities, e.g. spelling which suggests confusion between reflection / refraction / diffraction or thermistor / transistor / transformer. |
| Not/NOT | This indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate, i.e. right plus wrong penalty applies. |
| ecf | meaning "error carried forward" is mainly applicable to numerical questions, but may in particular circumstances be applied in non-numerical questions. This indicates that if a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by ecf may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate from being penalised more than once for a particular mistake, but **only** applies to marks annotated ecf in the mark scheme. **Always annotate ecf if applied.** |
| cao | correct answer only |
| Use of **NR** | (# or / key on the keyboard). Use this if the answer space for a question is completely blank or contains no readable words, figures or symbols. |

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| Question | Answer | Marks |
|---|---|---|
| 1(a) | $\theta_R$ = 21 (°C) | **1** |
| 1(b) | s, °C both correct | **1** |
| 1(c) | 2 suitable precautions e.g.:<br>view scale reading perpendicularly,<br>wait until readings stops rising (at start), avoid thermometer touching beaker | **2** |
| 1(d) | statement matching readings in table | **1** |
| | comparison of temperature changes over 180 s, matching statement (need to see values used in justification) | **1** |
| 1(e)(i) | correct calculation of $x_1$ | **1** |
| 1(e)(ii) | Correct unit °C / s | **1** |
| 1(f)(i) | beaker B without lid | **1** |
| 1(f)(ii) | statement matching data for beaker B with values quoted | **1** |
| | statement with comparison of data or cooling rates | **1** |

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| Question | Answer | Marks |
|---|---|---|
| 2(a) | ammeter in series connection or voltmeter in parallel connection | **1** |
| | second meter shown connected correctly and circuit complete | **1** |
| 2(b)(i) | $V$ = 2.8 | **1** |
| | $I$ = 0.32 | **1** |
| 2(b)(ii) | $R$ = 8.75 / ecf, 5.78, 5.00, 3.19 | **1** |
| | $R$ consistent to 2 or 3 significant figures | **1** |
| 2(b)(iii) | V, A, Ω all correct | **1** |
| 2(c)(i) | $P$ = 1.51 / ecf and $Q$ = 1.57 / ecf | **1** |
| 2(c)(ii) | statement matching results and values used | **1** |
| | justification matching statement<br>e.g. within limits of experimental accuracy / owtte | **1** |
| 2(d) | valid inherent source of inaccuracy e.g.: crocodile clip connection not even /<br>difficult to connect at exactly the correct length / resistance wires not uniform | **1** |

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| Question | Answer | Marks |
|---|---|---|
| 3(a) | $h$O = 2.0 (cm) | **1** |
| 3(b) | move screen backwards and forwards / move screen slowly | **1** |
| 3(c) | $1 / h_I = 0.18$ | **1** |
| 3(d) | graph:<br>• axes labelled with quantity and unit | **1** |
| | • appropriate scales (plots occupying at least ½ grid) | **1** |
| | • plots all correct to ½ small square, precise plots | **1** |
| | • well judged line and thin line | **1** |
| 3(e)(i) | triangle method seen on graph | **1** |
| 3(e)(ii) | $f$ in range 14.0cm to 16.0cm | **1** |
| 3(f) | any difficulty in measuring $h_I$ e.g.: ruler in way of light /<br>difficult to see top and bottom of image / edges of image blurred /<br>difficult not to move screen when placing ruler to measure image | **1** |
| | matching solution e.g.:<br>use graph paper on screen / mark top and bottom of image and measure later / use translucent screen and measure at back / use larger object / clamp screen (after obtaining focus) | **1** |

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| Question | Answer | Marks |
|---|---|---|
| 4 | MP1 **apparatus:**<br>factor stated and apparatus appropriate to its measurement<br>e.g. ammeter, voltmeter, coils ( no apparatus for measuring required ) | **1** |
| | MP2 **control variable:**<br>any variable appropriate to independent variable<br>(e.g. current if number of coils is the independent variable, number of coils if current is the independent variable. Same size / mass of paper clips) | **1** |
| | MP3 **method:**<br>measure independent variable<br>check number of paper clips supported | **1** |
| | MP4 repeat for new value of independent variable | **1** |
| | MP5 **table:**<br>columns, with units, for independent variable and number of paper clips | **1** |
| | MP6 **analysis:**<br>compare readings in the table to see if change in factor produces<br>change in strength,<br>plot line graph (with axes specified) | **1** |
| | MP7 **additional point** (one from)**:**<br>at least 5 sets of data taken,<br>repeat each measurement and take average,<br>2nd appropriate control variable stated,<br>repeat experiment for different variation (e.g. different no of coils if<br>current is factor)<br>arrangement of paper clips | **1** |

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