GradeMax

CAMBRIDGE
International Education

# Cambridge International AS & A Level

**PHYSICS** **9702/33**

Paper 3 Advanced Practical Skills 1 **February/March 2026**

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 February/March 2026 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **13** printed pages.

© Cambridge University Press & Assessment 2026

**[Turn over**

GradeMax



**PUBLISHED**

## 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 descriptions 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.

© Cambridge University Press & Assessment 2026

GradeMax



| |
|---|
| 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. |

© Cambridge University Press & Assessment 2026

GradeMax



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.

© Cambridge University Press & Assessment 2026

GradeMax



## Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

## Annotations

| Annotation | Meaning |
|---|---|
| AE | arithmetic error |
| AWK | awkward scale used on graph |
| BOD | benefit of the doubt given |
| CON | contradiction in response, mark not awarded |
|  | correct point or mark awarded |
| ECF | error carried forward applied |
| FO | false origin used on graph |
|  | incorrect point or mark not awarded |
| ^ | information missing or insufficient for credit |
| POT | power of ten error |

© Cambridge University Press & Assessment 2026

GradeMax



| Annotation | Meaning |
|---|---|
| RO | read-off from graph |
| SH | supervisor's help given |
| SR | supervisor's report taken into account |
| SV | supervisor's value/sample results taken into account |
| TE | transcription error |
| IR | value in range |
| OOR | value out of range |

PapaCambridge papacambridge.com

© Cambridge University Press & Assessment 2026

GradeMax



| **Abbreviations** | |
|---|---|
| / | Alternative and acceptable answers for the same marking point. |
| ( ) | Bracketed content indicates words which do not need to be explicitly seen to gain credit but which indicate the context for an answer. The context does not need to be seen but if a context is given that is incorrect then the mark should not be awarded. |
| ___ | Underlined content must be present in answer to award the mark. This means either the exact word or another word that has the same technical meaning. |
| owtte | "Or words to that effect" - alternative wording that conveys the same principle as the answer given can be given credit. |
| OOR | Given value is not within the range given |
| SV | Supervisor value given in the results provided by the centre |
| POT | Power of Ten (typically units conversion factor e.g. $cm^2$ to $m^2$) |
| ecf | Error Carried Forward – credit given for correct use of an incorrect value |
| FO | False Origin (x-axis not starting with x = 0) |
| SF | Significant figures |

© Cambridge University Press & Assessment 2026

GradeMax



| Question | Answer | Marks |
|---|---|---|
| 1(a) | Final value for *x,* with unit, in the range 25.0 to 40.0 cm | **1** |
| | Final value of $\theta$ in range 65° to 85° **and** raw values to the nearest degree | **1** |
| 1(b) | Six sets of readings (*x* all different values) and without help: 3 marks, five sets: 2 marks. | **3** |
| | Trend correct | **1** |
| | Values recorded in a table for all raw quantities. | **1** |
| | Range:<br>($x_{max} - x_{min}$) $\geqslant$ *8.0 cm* and $x_{max} \geqslant$ 44.0 cm | **1** |
| | Column headings:<br>Each column heading must contain a quantity and a unit where appropriate.<br>The presentation of quantity and unit must conform to accepted scientific convention e.g. *x* / cm.<br>sin(90° – $\theta$) must have no unit. | **1** |
| | Consistency:<br>All values of *x* must be given to the nearest mm. | **1** |
| | Significant figures:<br>All values of sin(90° – $\theta$) given to three SF | **1** |
| | Values of sin(90° – $\theta$) calculated correctly. | **1** |

© Cambridge University Press & Assessment 2026

GradeMax



| Question | Answer | Marks |
|---|---|---|
| 1(c)(i) | Axes:<br>Axes must be labelled **with the correct quantities.**<br>Scales must be chosen so that the plotted points occupy at least half the graph grid in both *x* and *y* directions.<br>Scale markings are no more than 2 cm (one large square) apart.<br><br>Sensible linear scales must be used, no awkward scales (e.g. 3:10 or fractions) or awkward offset. | **1** |
| | Plotting of points:<br>All observations **in the table** must be plotted on the grid.<br>Diameter of plotted points must be ⩽ half a small square.<br>Points must be plotted to an accuracy of half a small square in both *x* and *y* directions. | **1** |
| | Quality:<br>All points in the table must be plotted (at least 5) for this mark to be awarded.<br>The trend must be positive.<br>It must be possible to draw a straight line that is within ± **0.03** on the $\sin(90^\circ - \theta)$ axis of **all** plotted points (including any indicated anomalous point). | **1** |
| 1(c)(ii) | Line of best fit:<br>'Best fit' is judged by the balance of all points on the grid (at least 5 points) about the candidate's line.<br>There must be an even distribution of points either side of the line along the full length.<br>Lines must straight with a thickness less than half a square (1 mm).<br>Some candidates may choose to identify an anomalous point. If they identify **one** point as anomalous (e.g. by circling or labelling) then this point is to be disregarded when judging the line of best fit. There must be at least 5 points left after the anomalous point is disregarded. | **1** |

© Cambridge University Press & Assessment 2026

| Question | Answer | Marks |
|---|---|---|
| 1(c)(iii) | Gradient: gradient sign on answer line consistent with graph drawn.<br><br>The hypotenuse of the triangle used should be greater than half the length of the drawn line.<br><br>Both read-offs must be accurate to half a small square in both the *x* and *y* directions.<br><br>Method of calculation must be correct, i.e. $\Delta y / \Delta x$. | **1** |
| | *y*-intercept:<br>**Either**<br>Intercept read directly from the graph, with read-off at<br>$x = 0$, accurate to half a small square in *y* direction.<br><br>**Or**<br>Correct read-off from a point on the line is substituted into $y = mx + c$ or an equivalent expression.<br>Read-off accurate to half a small square in both *x* and *y* directions | **1** |
| 1(d) | *p* equal to candidate's gradient value, and *q* equal to candidate's intercept value.<br>Values must be written to 2 or more significant figures. | **1** |
| 1(e) | Units for *p* and *q* correct and consistent with readings<br>(e.g. $cm^{-1}$ for *p* and no unit for *q*) | **1** |

© Cambridge University Press & Assessment 2026

| Question | Answer | Marks |
|---|---|---|
| 2(a)(i) | Final value for $L$ in the range **3.0cm ⩽ $L$ ⩽ 5.0cm**, with unit (somewhere) **and** raw $L$ to the nearest mm. | **1** |
| 2(a)(ii) | Raw value(s) for $D$ to the nearest mm, with unit. | **1** |
| 2(a)(iii) | Absolute uncertainty of 2 to 5 mm and correct method of calculation shown to obtain percentage uncertainty in $D$.<br>If several readings have been taken, then the absolute uncertainty can be half the range, with working shown clearly, but not zero if values are equal. | **1** |
| 2(b)(i) | Second value of $L$. | **1** |
| 2(b)(ii) | Second value of $D$. | **1** |
| | Value for second $D$ greater than first $D$. | **1** |
| 2(c)(i) | Two values of $k$ calculated correctly, shown to 2 SF or more. Values not written as fractions. | **1** |
| 2(c)(ii) | Justification based on the significant figures in $D$ **and** $L$.<br>E.g. 'Number of SF in $k$ is the least number of SF out of the SF in D and $L$, or one more' owtte | **1** |
| 2(d) | Calculation of percentage difference between candidate's two $k$ values.<br>Comparison of percentage difference with **15%** leading to a consistent conclusion. | **1** |
| 2(e)(i) | Final value for $w$ in range **0.80 cm to 1.40 cm** | **1** |
| | All raw values for $t$ to nearest 0.001 cm (or all to nearest 0.0001 cm)<br>and final value in range **0.050 cm to 0.090 cm** | **1** |
| 2(e)(ii) | Correct calculation of $E$ | **1** |

© Cambridge University Press & Assessment 2026

GradeMax



| Question | Answer | Marks |
|---|---|---|
| 2(f)(i) | Two readings are not enough to draw a conclusion owtte e.g. reference to relationship / Not enough *k* values to draw a conclusion.<br>Difficulty with measuring *L*, e.g. parallax error / finding centre of bob / bob moves when touched by rule<br>Difficulty with measuring *D*, e.g. parallax error / finding centre of masses<br>Difficulty in judging when (i.e. for which value of *D*) amplitude is maximum / difficult to compare amplitudes (for different Ds)<br>Problem with oscillation described e.g. movement of masses along blade whilst oscillating / slipping of clip or string whilst oscillating<br>Difficulty in measuring *w* with reason e.g. serrated edge / teeth / edge is not uniform<br><br>**4 max** | **4** |
| 2(g)(ii) | Take more readings (for different *L*) and plot a graph / calculate more *k* values and compare<br>Measure above and below bob and average / measure diameter of bob with calipers and add radius to string length.<br>Clamp rule / use pointers with rule<br>Use calipers to measure first L<br>Measure to each side of masses and average /<br>measure diameter of mass (with calipers) and add radius to distance from wood block<br>Clamp rule horizontally (with pointers)<br>Video with ruler / grid in view /<br>Plot graph of pendulum amplitude vs *D* to find *D* at max amplitude<br>Description of improved method of fixing string or masses to blade<br>Method to measure to bottom of teeth e.g. travelling microscope<br><br>**4 max** | **4** |

Check there is a number beside each square bracket. Add up the marks for **Q2**, by counting marks by the square brackets. Write total for **Q2** in a ring on page 12. Transfer this mark to the **Q2** mark box on the front page.
On the front, add up the two question totals to give a total mark for the paper out of 40. Now go through the **whole** paper and count all the ticks and check this adds up to the total on the front. Check that there is an indication on page 2 and page 7 to show that they have been seen.
Then go through the **whole** paper again and count the crosses to see if the total number of ticks and crosses added together is equal to 40. This will ensure that no marking point is missed, and that the marks for the individual questions have been correctly added together to give the total mark on the front.

© Cambridge University Press & Assessment 2026

GradeMax



## Sample results

t=0.058 cm
w=1.15 cm
m=0.200 kg
E=4mgk / $tw^3$ g=9.81 N $kg^{-1}$

| L(m) | D(m) | k($m^2$) | E(MNm–2) | k($cm^2$) | E(N / $cm^{-2}$) |
|---|---|---|---|---|---|
| 0.043 | 0.107 | 0.0285 | 249 | 285 | 24900 |
| 0.249 | 0.203 | 0.0336 | 302 | 336 | 30200 |

© Cambridge University Press & Assessment 2026