CAMBRIDGE
International Education

# Cambridge IGCSE™

**PHYSICS** **0625/31**

Paper 3 Theory (Core) **May/June 2024**

MARK SCHEME

Maximum Mark: 80

**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.

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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 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.

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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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Acronyms and shorthand in the mark scheme

| **Acronym / shorthand** | **Explanation** |
|---|---|
| A mark | Final answer mark which is awarded for fully correct final answers including the unit. |
| C mark | Compensatory mark which may be scored when the final answer (A) mark for a question has not been awarded. |
| B mark | Independent mark which does not depend on any other mark. |
| M mark | Method mark which must be scored before any subsequent final answer (A) mark can be scored. |
| Brackets ( ) | Words not explicitly needed in an answer, however if a contradictory word / phrase / unit to that in the brackets is seen the mark is not awarded. |
| Underlining | The underlined word (or a synonym) must be present for the mark to be scored. If the word is a technical scientific term, the word must be there. |
| **/** or **OR** | Alternative answers any one of which gains the credit for that mark. |
| owtte | Or words to that effect. |
| ignore | Indicates either an incorrect or irrelevant point which may be disregarded, i.e., not treated as contradictory. |
| insufficient | An answer not worthy of credit on its own. |
| CON | An incorrect point which contradicts any correct point and means the mark cannot be scored. |
| ecf [question part] | Indicates that a candidate using an erroneous value from the stated question part must be given credit here if the erroneous value is used correctly here. |
| cao | Correct answer only. |
| ORA | Or reverse argument. |

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| Question | Answer | Marks |
|---|---|---|
| 1(a)(i) | line from S to moving with constant speed | **B1** |
| | line from T to decelerating | **B1** |
| 1(a)(ii) | 17.8 (m / s) | **B1** |
| 1(a)(iii) | 40 (m) | **A3** |
| | ½ × 4 × 20 | (C2) |
| | (distance travelled =) area under the graph **OR** ½ × b(ase) × h(eight) | (C1) |
| 1(b) | (velocity is defined as)<br>speed in a stated / given direction **OR**<br>change in displacement per unit time | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 2(a) | (average thickness =) 0.9 (cm) | **A2** |
| | (average thickness =) 5.4 ÷ 6 | (C1) |
| 2(b) | any **two** from:<br>• (measuring) cylinder (partially) filled with water<br>• (initial) volume of water (in measuring cylinder) measured or recorded / noted / read<br>• mass(es) in water **OR** water covers all mass(es)<br>• new volume measured or recorded / noted / read | **B2** |
| | difference between two values (of water with and without masses is determined) | **B1** |

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| Question | Answer | Marks |
|---|---|---|
| 3(a)(i) | (200 – 80 =) 120 (N) | **B1** |
| | forwards **OR** to the right **OR** in same direction as 200 (N force) | **B1** |
| 3(a)(ii) | friction **OR** air / water / wind resistance **OR** drag (from water) | **B1** |
| 3(a)(iii) | constant / steady / uniform velocity | **B1** |
| 3(b) | 3000 **OR** 30 | **A3** |
| | 60 × 50 **OR** 60 × 0.5(0) | (C2) |
| | moment = force × distance from pivot | (C1) |
| | N cm **OR** N m | **B1** |

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| Question | Answer | Marks |
|---|---|---|
| 4(a) | any **two** from:<br>• (they) (contribute to) global warming<br>• (they) (contribute to) atmospheric / air pollution<br>• (they are) non-renewable (energy source)<br>• idea of energy security (for the country) | **B2** |
| 4(b)(i) | any **three** from:<br>• water is stored behind a dam / in reservoir / lake<br>• water (behind dam) has gravitational **OR** potential energy<br>• water flows down / moves in / goes through pipe **OR** through (HEP) station **OR** through turbine<br>• water turns / moves / rotates / spins turbine<br>• (turbine) turns / moves / rotates / spins generator | **B3** |
| 4(b)(ii) | any **two** from:<br>• (large area of) land flooded<br>• relocation of population<br>• damage to (land / valley) habitats **OR** migration of fish (upriver) interrupted owtte<br>• vulnerable to drought<br>• idea of limited suitable sites<br>• reduced water supply downstream owtte | **B2** |
| 4(c) | any **one** from:<br>• (energy stored) in battery<br>• idea of pumping water / raising weight to higher level | **B1** |

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| Question | Answer | Marks |
|---|---|---|
| 5(a) | any **three** from (particles / molecules of gas are / have):<br>• random arrangement<br>• widely spaced (compared to solid / liquid)<br>• random motion<br>• colliding (with each other / walls)<br>• high speed / KE | **B3** |
| 5(b)(i) | 5.4 (J) | **A3** |
| | (work done =) 30 × 0.18 | (C2) |
| | (work done =) force × distance (moved in direction of force) | (C1) |
| 5(b)(ii) | (pressure) increases | **M1** |
| | (because) collisions are more frequent / often (of gas particles with walls) | **A1** |

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| Question | Answer | Marks |
|---|---|---|
| 6(a) | idea of measure / read / note / compare how much wax melts (along each rod) **OR** how quickly the wax melts | **B1** |
| | idea of:<br>the better the conductor the shorter the length of unmelted wax (remaining)<br>**OR** the better the conductor the further the wax melts (along rod)<br>**OR** the better the conductor the shorter the time for the wax to melt | **B1** |
| 6(b)(i) | (frequency =) $1.5 \times 10^{14}$ (Hz) | **A3** |
| | (frequency =) $3(.0) \times 10^{8} \div 2(.0) \times 10^{-6}$ | (C2) |
| | velocity = frequency × wavelength | (C1) |
| 6(b)(ii) | (region) microwaves **OR** radio waves | **B1** |
| | valid use that is consistent with radiation in stated region | **B1** |

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| Question | Answer | Marks |
|---|---|---|
| 7(a)(i) | angle of reflection identified | **B1** |
| 7(a)(ii) | 40 (°) | **B1** |
| 7(b)(i) | horizontal ray drawn to continue through $F_2$ | **B1** |
| | ray to centre drawn to continue undeviated | **B1** |
| 7(b)(ii) | (image drawn / identified) where rays cross | **B1** |
| 7(c)(i) | dispersion | **B1** |
| 7(c)(ii) | all 7 colours **AND** in correct order | **A2** |
| | 6 of the seven colours given | (C1) |

| Question | Answer | Marks |
|---|---|---|
| 8(a)(i) | (soft) iron | **B1** |
| 8(a)(ii) | 8 (cells) | **A2** |
| | (number of cells =) 12 ÷ 1.5 **OR** battery e.m.f ÷ e.m.f. of 1 cell | (C1) |
| 8(b)(i) | (plotting) compass | **B1** |
| 8(b)(ii) | north **OR** N (pole) | **B1** |
| 8(c) | ($V$ =) 9.6 (V) | **A3** |
| | ($V$ =) 8(.0) × 1.2 | (C2) |
| | $R = V \div I$ in any form **OR** ($V$ =) $I \times R$ | (C1) |

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| Question | Answer | Marks |
|---|---|---|
| 9(a)(i) | live (wire)<br>neutral (wire)<br>earth (wire)<br><br>3 correct – 2 marks<br>1 or 2 correct – 1 mark | **B2** |
| 9(a)(ii) | idea of (cable) <u>overheating</u> **OR** (insulation) melting / burning | **B1** |
| 9(b)(i) | (secondary coil voltage $V_s$ =) 16 (V) | **A3** |
| | 230 / $V_s$ = 720 / 50 **OR** ($V_s$ =) {230 × 50} ÷ 720 | (C2) |
| | ($V_p$ / $V_s$) = ($N_p$ / $N_s$) in any form | (C1) |
| 9(b)(ii) | ($P$ =) 320 (W) | **A3** |
| | ($P$ =) 1.4 × 230 | (C2) |
| | ($P$ =) $I \times V$ | (C1) |

| Question | Answer | Marks |
|---|---|---|
| 10(a)(i) | (number of neutrons =) 52 | **A2** |
| | nucleon number – proton number = number of neutrons **OR** 90 – 38 | (C1) |
| 10(a)(ii) | 38 | **B1** |
| 10(b) | (beta-particles are fast-moving / negatively charged) electrons | **B1** |
| 10(c) | (29 × 3 =) 87 years | **A2** |
| | idea of 3 <u>half-lives</u> **OR** 16 ÷ $2^3$ (= 2) | (C1) |

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| Question | Answer | Marks |
|---|---|---|
| 11(a) | any **two** from:<br>• minor / dwarf planet(s)<br>• asteroid(s) **OR** asteroid belt<br>• comet(s)<br>• (planetary) moon(s) | **B2** |
| 11(b) | Milky Way (galaxy) | **B1** |
| 11(c) | any **three** from:<br>• (light from distant galaxies or it) is redshifted<br>• compared to light on Earth<br>• (redshift is an) increase in (the observed) wavelength (of light)<br>• (because) galaxies are moving away / receding (from Earth) **OR** moving apart<br>• (Big Bang theory predicts / has) an expanding Universe | **B3** |

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