Cambridge Assessment International Education

# Cambridge IGCSE™

**PHYSICS** **0625/41**

Paper 4 Extended Theory **May/June 2020**

MARK SCHEME

Maximum Mark: 80

**Published**

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

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

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.



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**[Turn over**

**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. |

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5 'List rule' guidance

For questions that require ***n*** responses (e.g. State **two** reasons …):

- The response should be read as continuous prose, even when numbered answer spaces are provided
- Any response marked *ignore* in the mark scheme should not count towards ***n***
- Incorrect responses should not be awarded credit but will still count towards ***n***
- 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
- Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

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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| Question | Answer | Marks |
|---|---|---|
| 1(a)(i) | (a =) $(v - u) / t$ OR $(62 - 6.0) / 35$ OR $56 / 35$ | **C1** |
| | $1.6\ m / s^2$ | **A1** |
| 1(a)(ii) | ($F$ =) $ma$ OR $\Delta p / \Delta t$ OR $2.5 \times 10^5 \times 1.6$ OR $(62 \times 2.5 \times 10^5 - 6.0 \times 2.5 \times 10^5) / 35$ | **C1** |
| | $4.0 \times 10^5$ N | **A1** |
| 1(a)(iii) | ($p$ =) $mv$ OR $2.5 \times 10^5 \times 6.0$ | **C1** |
| | $1.5 \times 10^6$ kg m / s | **A1** |
| 1(b) | curve of decreasing gradient from (0,0) to a point along dashed line | **B1** |
| | straight line of positive gradient after $t = 35$ s | **B1** |
| | gradient not zero at $t = 35$ s OR no change of gradient (at $t = 35$ s) | **B1** |
| 1(c) | thermal energy AND in something specific (e.g. brakes / air / tyres) OR kinetic energy of air | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 2(a) | 0 (N) AND 8.0 N | **B1** |
| 2(b) | ($k$ =) $F / x$ OR $8.0 / 0.15$ | **C1** |
| | 53 N / m OR 0.53 N / cm | **A1** |
| 2(c)(i) | elastic potential (energy) | **B1** |
| 2(c)(ii) | 15 cm | **B1** |
| 2(c)(iii) | 7.5 cm OR 2(c)(ii) / 2 | **B1** |

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| Question | Answer | Marks |
|---|---|---|
| 3(a) | liquid levels in the two limbs of the tube are equal | **B1** |
| 3(b) | molecules collide with the walls (of the container) | **B1** |
| | momentum of molecules changes (reverses) | **B1** |
| | this causes a force AND force spread out (over area of walls) | **B1** |
| 3(c)(i) | ($p_2$ =) $p_1V_1 / V_2 = 1.0 \times 10^5 \times 60 / 50$ | **C1** |
| | $1.2 \times 10^5$ Pa | **A1** |
| 3(c)(ii) | $p_2 = p_{atm} + h\rho g$ OR $1.2 \times 10^5 - 1.0 \times 10^5$ OR $2.0 \times 10^4$ OR ($\rho$ =) $2.0 \times 10^4 / (0.15 \times 10)$ | **C1** |
| | $1.3 \times 10^4$ kg m$^{-3}$ | **A1** |

| Question | Answer | Marks |
|---|---|---|
| 4(a) | <u>temperature</u> at which liquid turns into gas | **B1** |
| 4(b)(i) | ($E$ =) $mc\Delta T$ OR $0.30 \times 4200 \times (100 - 95)$ | **C1** |
| | 6300 J | **A1** |
| 4(b)(ii) | ($C$ =) $E / \Delta T$ OR 6300 / 84 | **C1** |
| | 75 J / °C | **A1** |
| 4(b)(iii) | molecules do work against attractive force as they evaporate | **B1** |
| | more energetic molecules more likely to escape | **B1** |
| | average energy of remaining molecules decreases | **B1** |

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| Question | Answer | Marks |
|---|---|---|
| 5(a) | (point) where incident parallel rays meet after passing through lens OR origin of rays that emerge parallel after passing through lens | **M1** |
| | on principal axis OR use of term paraxial OR centre line | **A1** |
| 5(b)(i) | **enlarged virtual upright**<br>two correct answers underlined AND no more than one wrong answer underlined | **M1** |
| | three correct answers underlined AND no wrong answer underlined | **A1** |
| 5(b)(ii)1 | both principal focuses marked at points 5.0 cm from the optical centre | **B1** |
| 5(b)(ii)2 | any **two** construction lines from:<br>• line from top of I towards far principal focus and traced back from lens horizontally<br>• line from top of I to (and through) centre of lens<br>• horizontal line from top of I to lens and traced back to near principal focus | **B2** |
| | O marked with top at intersection | **B1** |
| 5(b)(iii) | 2.7 cm $\geqslant$ distance $\geqslant$ 3.1 cm | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 6(a) | ($\lambda$ =) $v$ / $f$ OR 340 / 20 000 OR 340 / 20 | **C1** |
| | 0.017 m AND 17 m | **A1** |
| 6(b) | (longitudinal wave) <u>vibration</u> direction parallel to propagation / energy travel direction | **B1** |
| | transverse wave <u>vibration</u> direction perpendicular to propagation / energy travel direction | **B1** |
| | consists of rarefactions AND compressions | **B1** |

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| Question | Answer | Marks |
|---|---|---|
| 6(c) | diffraction mentioned | **B1** |
| | wavelength of sound from drum / low frequency sound greater (than wavelength of high frequency sound) | **B1** |
| | more diffraction of sound from drum OR less diffraction of high frequency sound | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 7(a)(i) | (copper) contains free electrons | **B1** |
| | good electrical conductor | **B1** |
| 7(a)(ii) | magnetic material OR easily magnetised | **B1** |
| | temporary magnetic material OR easily demagnetised | **B1** |
| 7(b)(i) | alternating / changing / varying magnetic field (produced by X) | **B1** |
| | (electromagnetic) induction in Y | **B1** |
| | (alternating) electromotive force (e.m.f.) between terminals of Y / in Y | **B1** |
| 7(b)(ii) | current in X increases | **B1** |
| | to supply the power used in Y / the lamp | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 8(a) | 990 / (54 / 1.2) OR 990 / 45 OR (number of cells in pack =) 54 / 1.2 OR 45 | **C1** |
| | 22 | **A1** |
| 8(b)(i) | ($P$ =) $EI$ OR $1.2 \times 3.5$ | **C1** |
| | 4.2 W OR 4.2 J / s | **A1** |

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| Question | Answer | Marks |
|---|---|---|
| 8(b)(ii) | thick wires have a smaller resistance | **B1** |
| | less thermal energy generated in wires | **B1** |
| | more efficient OR less risk of fire / insulation melting | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 9(a) | digital signal: consists of high and low states / voltages | **B1** |
| | analogue signal: continuously varying voltage | **B1** |
| 9(b)(i) | AND gate  AND OR gate  | **B1** |
| 9(b)(ii) | when the inputs differ AND ‘AND gate’ produces 0 AND ‘OR gate’ produces 1 | **B1** |
| 9(c)(i) | both inputs to upper NOR gate are 0s | **B1** |
| 9(c)(ii) | two (identical) inputs to NAND gate are 1s | **M1** |
| | lower input to lower NOR gate is 1 | **M1** |
| | output Q is 0 | **A1** |

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| Question | Answer | Marks |
|---|---|---|
| 10(a) | equal number of electrons OR equal number of protons | **B1** |
| 10(b)(i) | $^{13}_{5}X$ | **C1** |
| | $^{0}_{-1}\beta$ | **C1** |
| | $^{13}_{6}Y$ | **A1** |
| 10(b)(ii) | any **three** from:<br>• β-particles have charge of smaller size<br>• β-particles have smaller mass<br>• β-particles have less energy<br>• β-particles travel faster / less time near to air molecule<br>• effect / force on electrons in air molecules less | **B3** |

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