CAMBRIDGE
International Education

Cambridge IGCSE™

PHYSICS **0625/43**

Paper 4 Theory (Extended) **May/June 2025**

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.

Cambridge International is publishing the mark schemes for the May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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: 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: 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	<u>'List rule' guidance</u> 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.

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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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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
	correct point or mark awarded
	incorrect point or mark not awarded
^	information missing or insufficient for credit
A	allow or accept
AE	evaluation attempted
I	incorrect or insufficient point ignored while marking the rest of the response
CON	contradiction in response, mark not awarded
BOD	benefit of the doubt given
ECF	error carried forward applied
NAQ	response has not answered question

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Annotation	Meaning
RE	rounding error
SEEN	point has been noted, but no credit has been given or blank page seen
SF	error in number of significant figures
TE	transcription error
TV	response is too vague or there is insufficient detail in response
T	answer outside the tolerance of the mark scheme
	used to highlight parts of an extended response
	used to highlight parts of an extended response
MO	mandatory mark not awarded
SC	special case

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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)	11.5 m / s	**B1**
1(b)	45 m	**A3**
	(distance =) area under graph **OR** ½ *bh* (+ *bh*)	C1
	{0.5 × 20} + ½ {20 × 3.5} **OR** {10 + 35} **OR** [{0.5 + 4} ÷ 2] × 20	C1
1(c)	5.7 m / s^2	**A3**
	(deceleration =) (∆)*v* ÷ ∆*t* **OR** deceleration = gradient	C1
	(0 –) 20 ÷ {4(.0) - 0.5} **OR** 20 ÷ 3.5	C1

Question	Answer	Marks
2(a)	(*p* =) *mv* **OR** mass × velocity	**B1**
2(b)	7790 m / s	**A3**
	momentum before (collision) = momentum after (collision) **OR** $m_c v_c + m_n v_n = 6.55 \times 10^6$ **OR** (momentum of cone =) 120 × 7850 **OR** 9.42×10^5	C1
	$720v + \{120 \times 7850\} = 6.55 \times 10^6$ **OR** (momentum after collision =) $6.55 \times 10^6 - 9.42 \times 10^5$ **OR** 5.6×10^6	C1
2(c)	12 000 kg	**A2**
	120 000 (N) **OR** (*m* =) *W* ÷ *g* **OR** (*m* =) $1.2 \times 10^N \div 9.8$	C1

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Question	Answer	Marks
3(a)	(F =) $W \div d$ **OR** $W = Fd$	**B1**
	110 ÷ 0.45 **OR** 244 (N)	**B1**
3(b)(i)	86 m / s	**A3**
	$E_k = ½ mv^2$ **OR** $110 = ½ mv^2$ **OR** $110 = ½ \times 0.03 \times v^2$	C1
	(v =) √ [{2 × 110} ÷ 0.03] **OR** v^2 = {2 × 110} ÷ 0.03 **OR** v^2 = 7333	C1
3(b)(ii)	air resistance / drag / friction	**B1**
	energy lost to surroundings **/** energy transferred to thermal / internal energy	**B1**

Question	Answer	Marks
4(a)	any **three** from: • (copper / metal contains) free / delocalised <u>electrons</u> • <u>electrons</u> carry (thermal) energy through metal • <u>electrons</u> collide with (distant) ions • lattice vibrations transfer energy (to neighbouring ions) **OR** ions vibrate and cause (nearby / adjacent) ions to vibrate	**B3**
4(b)(i)	energy transferred per unit mass per unit temperature change	**A2**
	(thermal) energy (transferred) per unit temperature change	C1
4(b)(ii)	0.51 J / (g °C)	**A3**
	(energy lost by metal =) 54 × c × 69 **OR** (energy gained by water =) 50 × 4.2 × 9 **OR** 1890	C1
	energy lost by metal = energy gained by water **OR** 54 × c × 69 = 50 × 4.2 × 9	C1

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Question	Answer	Marks
5(a)	(refractive index is) the ratio of the speed of light in two different mediums **OR** (refractive index =) $\frac{\text{speed of light in air}}{\text{speed of light in water}}$ **OR** (refractive index =) $\frac{\text{sine of angle of incidence}}{\text{sine of angle of refraction}}$	**B1**
5(b)	P continues vertical	**B1**
	Q refracted away from normal in the correct direction	**B1**
5(c)	1.3	**A2**
	(n =) 1 ÷ sin 49 **OR** (n =) 1 ÷ sin c	C1
5(d)	any **two** from: • (ray travelling from) dense to less dense medium **OR** water is more dense than air • critical angle = 49° • angle of incidence exceeds critical angle / 49°	**B2**

Question	Answer	Marks
6(a)	sound with a frequency higher than 20 kHz	**B1**
6(b)	vibrations (of the wave / particles) are parallel to the direction of propagation	**B1**
6(c)(i)	(pulse of) ultrasound / sound / wave (sent into water) reflects from object	**B1**
	time to travel to object and back measured	**B1**
	depth = speed × time	**B1**

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Question	Answer	Marks
6(c)(ii)	any **one** from: • non-destructive testing of materials • medical scanning (of soft tissue)	**B1**

Question	Answer	Marks
7(a)	0.5(0) A	**B1**
7(b)	3(.0) V	**A2**
	(V =) IR **OR** 0.5(0) × 6(.0)	C1
7(c)	12 – 3(.0)	**B1**
7(d)	180 Ω	**A3**
	I_2 = 9.0 ÷ 20 **OR** I_2 = 0.45 (A) **OR** I_1 = 0.05 (A)	C1
	(R =) 9 ÷ 0.05	C1

Question	Answer	Marks
8(a)(i)	(region) where (an electric) charge experiences a force **OR** (region) where a force acts on a (an electric) charge	**B1**
8(a)(ii)	**four** radial straight field lines starting at charge	**B1**
	at least **one** arrow on a field line towards the charge	**B1**

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Question	Answer	Marks
8(b)	1600 C	**A3**
	$V = W / Q$ **OR** $(Q =)\ W / V$	C1
	$(Q =)\ 4.5 \times 10^N \div 2.9 \times 10^8$ **OR** 1.6×10^N	C1
8(c)	240 C	**A2**
	$(Q =)\ It$ **OR** $2(.0) \times 120$	C1

Question	Answer	Marks
9(a)(i)	any **three** from: • (current in the primary coil generates a) changing magnetic field (in primary coil) • (iron) core transfers the magnetic field (to the secondary coil) • secondary coil cuts the magnetic field / secondary coil is in (changing) magnetic field • an e.m.f. is induced (in the secondary coil) • (induced) current changes direction because the magnetic field changes direction	**B3**
9(a)(ii)	240 V	**A2**
	$V_s \div V_p = N_s \div N_p$ **OR** $(V_s =)\ 12 \times 20(\div 1)$	C1
9(b)	0.16 A	**A2**
	$P = I^2R$ **OR** $I^2 = P \div R$ **OR** $I^2 = 1.25 \times 10^{-3} \div 0.05(0)$ **OR** $I^2 = 0.025$	C1
9(c)	any **two** from: • less power / heating / energy losses • thinner / cheaper cables • pylons further apart / fewer pylons • transfer energy over long(er) distance	**B2**

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Question	Answer	Marks
10(a)	distance travelled (in the vacuum of space) by light in one year	**B1**
10(b)	1.5×10^{11} m	**A2**
	9.5×10^{15} (m) **OR** (c =) $3(.0) \times 10^{8}$ (m / s) **OR** $3(.0) \times 10^{N} \times 490$	C1
10(c)	2.5×10^{-18} per second	**A3**
	(Hubble's constant =) gradient **OR** (H_0 =) $v \div d$	C1
	$2.5 \times 10^{4}(-0) \div \{100 \times 10^{20}(-0)\}$	C1
10(d)	electromagnetic radiation / light from (distant) galaxies	**B1**
	(observed) increase in wavelength (compared to wavelength measured on the Earth)	**B1**

Question	Answer	Marks
11(a)	time taken for half the nuclei (in any sample) to decay	**B1**
11(b)(i)	^{234}(U)	**B1**
	$_{92}$U	**B1**
	+ $^{0}_{-1}\beta$	**B1**
11(b)(ii)	neutron changes to a proton (plus an electron)	**B1**
11(c)	(α particles have) greater <u>kinetic</u> energy (than β particles)	**B1**
	(α particles have) greater charge (than β particles)	**B1**

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