CAMBRIDGE
International Education

Cambridge IGCSE™ (9–1)

PHYSICS **0972/31**

Paper 3 Theory (Core) **May/June 2026**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

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General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: • the specific **content** defined in the mark scheme • the specific **skills** defined in the mark scheme or in the level descriptions • the **standard of response** required as exemplified by the standardisation scripts.
2	Examiners must award **whole marks** (not half marks, or other fractions).
3	Examiners must award marks **positively**. This means that: • marks are not deducted for errors or omissions • marks are awarded for correct/valid answers as defined in the mark scheme and also for **other valid answers** which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate • the quality of spelling, punctuation and grammar are judged **only** when the mark scheme indicates that these features are **specifically assessed** in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must **consistently** apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the **full range of marks** defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and **must not** award marks with grade thresholds or grade descriptions in mind.

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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 or **I**	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

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Question	Answer	Marks	Guidance
1(a)	(distance travelled =) 16 (m)	**A3**	
	(distance travelled =) ½ × 4(.0) × 8(.0)	C2	
	(distance travelled =) area under graph **OR** ½ × *b* × *h*	C1	in any form words or symbols **accept** (*d* =) *s* × *t* **OR** *b* × *h* **ignore** distance = speed ÷ time 32 (m) scores 1 mark
1(b)(i)	(from time = 0 s to time = 4.0 s) (speed) increasing	**B1**	**accept** accelerating **OR** acceleration **OR** velocity increasing **condone** increasing / changing / decreasing acceleration **CON** deceleration speed / velocity changing is too vague
1(b)(ii)	(from time = 4.0 s to time = 12 s) (speed is) constant **OR** steady **OR** not changing **OR** the same	**B1**	**accept** velocity for speed **accept** 8(.0) m / s **accept** moving with zero acceleration **condone** constant motion at rest or stationary is **CON** for correct answer
1(c)	(average speed =) 11 (m / s)	**A3**	**accept** answer to 1 SF 10 (m / s)
	(average speed =) 220 ÷ 20	C2	
	(average speed =) (total) distance (travelled) ÷ (total) time	C1	in any form words or symbols **condone** (*s* =) *d* ÷ *t*

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Question	Answer	Marks	Guidance
2(a)	any **three** from: idea of straightening stack **OR** detail of measuring from 0 on ruler use of ruler measure thickness / depth / height of a stack (of more than 2 discs) divide (total) thickness by 8 / number of discs (measured)	**B3**	**accept** idea of eye level with (reading on) ruler, this would score MP1 and MP2 **ignore** scale **accept** measure width (of discs) **OR** how tall the discs are owtte **OR** measure thickness / depth / height of all the discs **condone** calculate for measure measure the whole stack **OR** measure the total length are TV **alternative method:** idea of measuring thickness of one disc with calipers / micrometer (1) at a number of different points on disc (1) find average of the measurements (1)
2(b)	(density =) 1.2 (g / cm^3)	**A3**	**accept** answer to 1 sf 1 (g / cm^3)
	(density =) 24 ÷ 20	C2	
	(density =) mass ÷ volume	C1	in any form words or symbols

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Question	Answer	Marks	Guidance
3(a)	any t**wo** from: (for container A) centre of gravity/mass is low(er) idea that area of base (of A) is big(ger) idea that a larger (angle of) tilt is needed for (vertical line through centre of gravity to fall outside area of base)	**B2**	**assume** that the answer is about container A unless stated otherwise. **condone** base (of A) is big(ger) **OR** base is wide(r) only award mark if clear that candidate is referring to area in contact with the table e.g. container A is wider is TV (container A) has a larger surface area is TV (container A) has a higher base is TV **accept** idea of a larger tilt / push (is needed) for container to topple
3(b)	(pressure =) 5.3 (N/cm^2)	**A3**	**accept** any rounding to at least 2 sf of 5.333333
	(pressure =) 64 ÷ 12	C2	
	(pressure =) force ÷ area	C1	in any form words or symbols
3(c)	arrow (vertically) upward labelled drag force	**B1**	**accept** friction(al) **OR** resistive **OR** resistance **condone** viscous **OR** upthrust **OR** air resistance **ignore** buoyant/upward as TV
	arrow (vertically) upward labelled 1.2 N	**B1**	**ignore** any ± signs

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Question	Answer	Marks	Guidance
4(a)(i)	kinetic (energy store)	**B1**	**condone** thermal / internal (energy store) **ignore** mechanical energy / sound energy as these are not energy stores
4(a)(ii)	(energy transferred =) 860 (J)	**A3**	**accept** 864 **OR** 900 (J)
	(energy transferred =) 1.2 × 30 × 24	C2	
	(energy transferred =) $I \times t \times V$	C1	in any form words or symbols **condone** *(P =)* $I \times V$ **OR** 24 × 1.2 **OR** 28.8 **OR** 0.96 seen for 1 mark
4(a)(iii)	(some input energy is transferred as) thermal / internal energy	**B1**	**accept** heat (for thermal energy) **condone** sound (energy) **ignore** (some) energy is lost / wasted as this is in stem
	to surroundings / air / motor / drive belt	**B1**	**accept** due to friction **condone** frictional energy for 1 mark **condone** motor / belt / wheel produces heat / thermal energy for 2 marks **accept** energy is dissipated to surroundings / air for 1 mark **BUT** heat / thermal / internal / sound energy is dissipated to surroundings / air for 2 marks

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Question	Answer	Marks	Guidance
4(b)(i)	any **four** from: (burning fossil fuel) produces / gives thermal energy water is boiled / heated steam is produced steam drives turbine turbine drives generator	**B4**	**accept** heat for thermal energy **NB** water is boiled / heated scores mp1 and mp2 **condone** vapour for steam **accept** moves / turns / spins owtte for drives **condone** activates for drives alternative approach: any **four** from: chemical energy (in fuel) (transfers / changes to) thermal energy or heat thermal energy transfers to / becomes kinetic / mechanical energy of steam kinetic / mechanical energy of steam transfers to / becomes kinetic / mechanical energy turbine
4(b)(ii)	any **two** from**:** atmospheric / air pollution emits carbon dioxide / CO_2 (fossil fuels are) non-renewable (fuels) description of an environmental impact	**B2**	**ignore** references to costs and sound pollution **accept** acid rain **OR** sulfur dioxide produced / emitted **condone** toxic gases environmental/noise pollution **OR** unqualified pollution are TV **accept** (contributes to) global warming / climate change **OR** emits greenhouse gases **accept** cannot be replaced easily / quickly **OR** idea that fossil fuels will run out / finish BUT supplies are limited is TV need clear description of impact e.g. pipelines damaging environment **OR** use of fossil fuels for transport **BUT** damages the environment **OR** not environmentally friendly are TV

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Question	Answer	Marks	Guidance
5(a)	(heated air) expands **OR** air particles move apart	**B1**	**CON** air particles / they expand
	(heated air) is less dense	**B1**	**condone particles /** they become less dense i.e. do not want to penalise expanding particles twice **condone** cold air is more dense **ignore** references to convection **ignore** becomes light / lighter TV
5(b)	any **three** from: idea that (gas particles) have high kinetic energy **OR** move fast collide with balloon (surface) exert a force owtte pressure = force ÷ area	**B3**	 **condone** (particles have) more kinetic / internal energy gas particles increase movement is TV **accept** idea that particles hit balloon (surface) e.g. particles bounce off the balloon **condone** collisions as stem refers to inside of balloon **ignore** collide with each other
5(c)	(temperature in kelvin =) 393 (K)	**A2**	**accept** 393.15 **OR** 393.2 **OR** 390 (K) **condone** 393.3 (K)
	(temperature in kelvin = temp in °C) + 273	C1	**condone** use of 273 **OR** –153 (K) **OR** –150 (K) seen

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Question	Answer	Marks	Guidance
6(a)(i)	order is: increasing wavelength	**B1**	
6(a)(ii)	(vibration is) perpendicular / at right angles	**B1**	
	to direction of propagation / energy transfer	**B1**	**accept** direction wave is travelling / moving **BUT** direction of the wave is TV
6(a)(iii)	4.1×10^{-8} (m)	**A3**	
	(λ =) $3.0 \times 10^{8} \div 7.3 \times 10^{15}$ **OR** (λ =) 4.1×10^{N} (m) **OR** (λ =) 3.0 / 7.3	C2	
	wave speed = frequency × wavelength **OR** $v = f\lambda$ **OR** (λ =) v / f	C1	in any form words or symbols
6(b)(i)	any **one** from: treatment of cancer detection of cancer sterilising	**B1**	 **ignore** unqualified cancer **ignore** (use of) radioisotopes **OR** chemotherapy **condone** medical imaging / scanning **ignore** X-rays and radioscopy
6(b)(ii)	mutation **OR** damage to cells / DNA (in the body)	**B1**	**accept** cancer / hair loss / burns / radiation sickness **condone** damage to skin / eyes / tissue harms skin / cells **OR** skin disease are TV **condone** unqualified mutation

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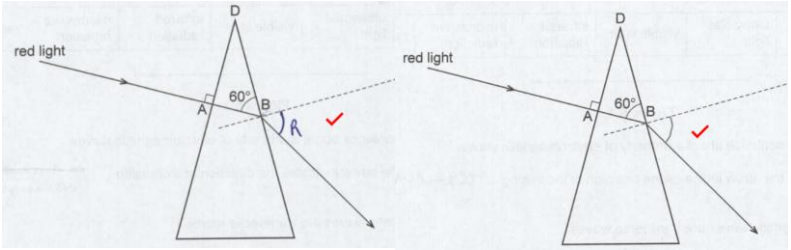
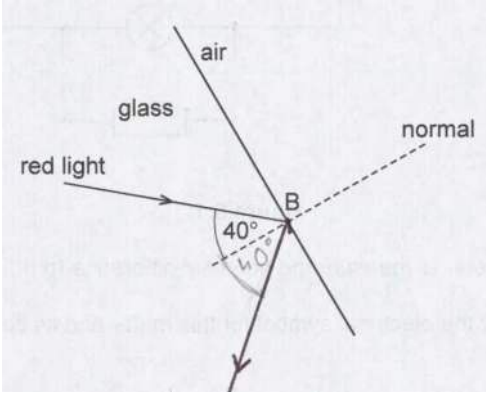
Question	Answer	Marks	Guidance
7(a)(i)	30(°)	**B1**	
7(a)(ii)	correct angle labelled	**B1**	**accept** any clear labelling for the angle of refraction between the normal and the refracted ray. Letter R is not needed  angle arc symbol is not needed
7(b)(i)	(value of the) <u>angle of incidence</u> when angle of refraction = 90°	**B1**	**accept** idea of <u>the angle of incidence</u> when no light leaves the glass / material
7(b)(ii)	ray is totally reflected at B	**B1**	**CON** if there is a refracted ray **OR** if ∠i very different from ∠r  **ignore** any arrows

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Question	Answer	Marks	Guidance
8(a)	voltmeter symbol seen	**B1**	**ignore** line through meter
	voltmeter symbol connected in parallel with the lamp	**B1**	**accept** wrong symbol connected in parallel with the lamp e.g. resistor symbol **ignore** small gaps in their construction **ignore** line through their symbol
8(b)	(R =) 6.5 (Ω)	**A3**	
	(R =) 3.9 ÷ 0.6	C2	
	$V = I \times R$ **OR** (R =) $V \div I$	C1	in any form words or symbols
8(c)	brightness of lamp decreases / becomes dim(mer)	**B1**	**accept** becomes dull(er)
	and any **two** from: temperature <u>of thermistor</u> decreases (so) resistance (of thermistor / circuit) increases current in lamp decreases	**B2**	 **accept** idea of inverse relationship of resistance and temperature for 1 mark thermistor changes resistance with temperature is TV **accept** idea of inverse relationship of resistance and current for 1 mark e.g. temperature of thermistor increases and so resistance of thermistor decreases giving a bigger current (in the lamp) scores 2 marks **ignore** idea of slower / faster current

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Question	Answer	Marks	Guidance
9(a)	left side of magnet labelled N **OR** right side labelled S	**B1**	two N's OR 2 S's is **CON** **condone** N and S near horizontal arrows
9(b)	any **two** from: (soft-iron) bar becomes an induced magnet with S pole / opposite pole on side nearest N pole / left side unlike poles attract	**B2**	 **accept** becomes magnet(ised) **OR** becomes a temporary magnet **ignore** iron is a magnetic material **accept** P becomes a S (pole) **accept** opposite poles attract **CON** references to charges for this mark opposite sides attract owtte is TV
9(c)(i)	any **two** from: increase speed of magnet use a stronger magnet / magnetic field increase the number of turns (on the coil)	**B2**	 **accept** use more magnets **ignore** bigger magnet **OR** bring magnet closer **accept** use more coils **ignore** longer coil (of wire) **OR** thicker / thinner wire
9(c)(ii)	any **two** from: move S pole out from coil move N pole into coil reverse connections on (sensitive) ammeter **OR** reverse coil connections	**B2**	 **accept idea** of move the magnet up / the opposite direction **OR** move the magnet the other way **accept** idea of turning the magnet / coil round (and then inserting into coil) e.g. move S pole into coil from below **OR** move S pole into the other side of coil **accept** change connections on meter **BUT** invert the ammeter is TV

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Question	Answer	Marks	Guidance
10(a)(i)	95	**B1**	
10(a)(ii)	146	**B1**	award one mark if answers to **10(a)(i)** and **10(a)(ii)** are interchanged
10(b)	$^{242}_{95}Am$	**B1**	**accept** numbers on right hand side
10(c)	alpha is stopped (by paper) **AND** beta can penetrate (paper)	**B1**	**accept** only alpha is stopped (by paper) **OR** only beta can penetrate (paper) owtte **accept** alpha is blocked (by paper) AND beta are not blocked (by paper) beta penetrates more / better than alpha is **TV** **ignore** beta penetrates (paper) faster than alpha **ignore** any references to gamma radiation

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Question	Answer	Marks	Guidance
11(a)(i)	3. Earth 4. Mars 5. Jupiter 8. Neptune	**B3**	**condone** Marte for Mars all correct in correct positions scores 3 marks three correct in correct positions scores 2 marks two in correct positions scores 1 mark three or four planets named scores 1 mark
11(a)(ii)	asteroid belt	**B1**	**accept** asteroids **OR** asteroid field **ignore** Kuiper belt **condone** accretion disc
11(a)(iii)	gravitational attraction	**B1**	**accept** (force of) gravity **OR** gravitational (force / pull) **condone** gravitational field strength
11(b)	any **four** from: (redshift / it) is the increase in the (observed) wavelength (of radiation / light / electromagnetic waves) light / radiation / electromagnetic waves from (distant) galaxies (is observed / measured on Earth) the increase in wavelength / redshift is caused by galaxies moving away (from Earth) more distant galaxies have longer wavelengths / more redshift more distant galaxies are moving away faster (than nearer galaxies)	**B4**	**ignore** references to planets in **11(b)** **accept** light (from distant galaxies) has a longer wavelength (compared to same light on Earth) **accept** light / em radiation is shifted toward the red end of the spectrum **condone** (redshift) is a <u>decrease in frequency</u> (of light / radiation / em waves) **condone** stars for galaxies **accept** galaxies are moving away from each other

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