



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.

This document consists of **17** printed pages.

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.

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
	allow or accept
	evaluation attempted
	incorrect or insufficient point ignored while marking the rest of the response
	contradiction in response, mark not awarded
	benefit of the doubt given
	error carried forward applied
	response has not answered question

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

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.
<u>Underlining</u>	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., <u>not</u> treated as contradictory.
insufficient	an answer not worthy of credit <u>on its own</u> .
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

Question	Answer	Marks	Guidance
1(a)	(distance travelled =) 16 (m)	A3	
	(distance travelled =) $\frac{1}{2} \times 4(.0) \times 8(.0)$	C2	
	(distance travelled =) area under graph OR $\frac{1}{2} \times b \times h$	C1	in any form words or symbols accept ($d =$) $s \times t$ OR $b \times h$ ignore distance = speed $\div$ 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 <u>moving</u> 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 =) $220 \div 20$	C2	
	(average speed =) (total) distance (travelled) $\div$ (total) time	C1	in any form words or symbols condone ($s =$) $d \div t$

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 OR measure thickness / depth / height of all the discs condone calculate for 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 =) $1.2 \text{ (g / cm}^3\text{)}$	A3	accept answer to 1 sf $1 \text{ (g / cm}^3\text{)}$
	(density =) $24 \div 20$	C2	
	(density =) mass $\div$ volume	C1	in any form words or symbols

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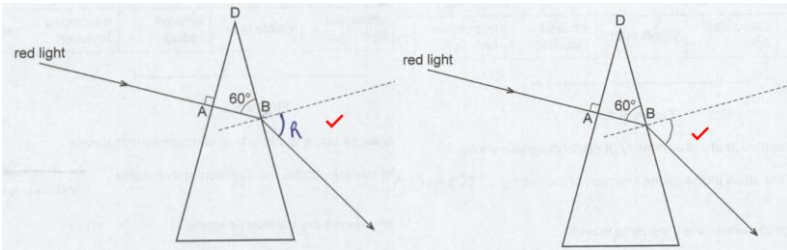
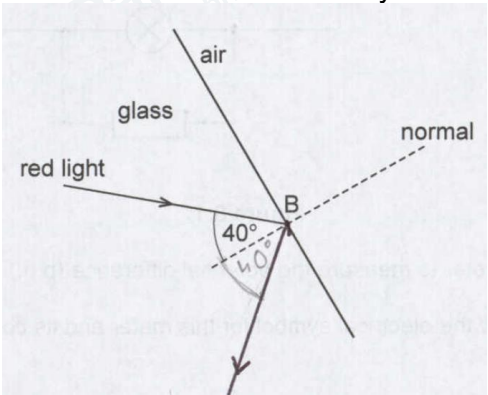
Question	Answer	Marks	Guidance
3(a)	any two from: (for container A) centre of gravity/mass is low(er) idea that area of base (of A) is big(ger) idea that a larger (angle of) tilt is needed for (vertical line through centre of gravity to fall outside area of base)	B2	assume that the answer is about container 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

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 =) $1.2 \times 30 \times 24$	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

Question	Answer	Marks	Guidance
4(b)(i)	any four from: (burning fossil fuel) produces / gives thermal energy water is boiled / heated steam is produced <u>steam</u> drives turbine <u>turbine</u> 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

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 on it 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 <u>–153</u> (K) OR <u>–150</u> (K) seen

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)	$4.1 \times 10^{-8} \text{ (m)}$	A3	
	$(\lambda =) 3.0 \times 10^8 \div 7.3 \times 10^{15}$ OR $(\lambda =) 4.1 \times 10^N \text{ (m)}$ OR $(\lambda =) 3.0 / 7.3$	C2	
	wave speed = frequency $\times$ wavelength OR $v = f \lambda$ OR $(\lambda =) v / f$	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

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 $\angle i$ very different from $\angle r$  ignore any arrows

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)	$(R =) 6.5 (\Omega)$	A3	
	$(R =) 3.9 \div 0.6$	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

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

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)	${}_{95}^{242}\text{Am}$	B1	accept numbers on right hand side
10(c)	alpha is stopped (by paper) AND beta can penetrate (paper)	B1	accept <u>only</u> alpha is stopped (by paper) OR <u>only</u> 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

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