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CAMBRIDGE
International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/42**

Paper 4 Theory (Extended) **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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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 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
	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 is too vague or there is insufficient detail in response
	incorrect point or mark not awarded

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Annotation	Meaning
SEEN	point has been noted, but no credit has been given or blank page seen
	key point attempted / working towards marking point / incomplete answer / response seen but not credited / blank page seen
BP	blank page
	unclear response
LNK	two statements are linked
FT	follow through
IR	irrelevant material that does not answer the question

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Question	Answer	Marks	Guidance
1(a)(i)	diaphragm ; bronchiole ;	2	**NOT** bronchus
1(a)(ii)	larynx labelled ;	1	
1(b)(i)	*any **two** from:* thin ; good blood supply ; good ventilation ; AVP ;	2	**IGNORE** large surface area **ALLOW** one cell thick wall / thin wall / thin membrane **NOT** thin cell walls / thin cell membrane **ALLOW** surrounded by capillaries **ALLOW** moist
1(b)(ii)	concentration gradient ; distance ;	2	**IGNORE** surface area / temperature / reference to cells **ALLOW** difference in concentration / water potential gradient / difference / pressure difference **ALLOW** thickness of the membrane **ALLOW** permeability of the membrane **IGNORE** thin / thick / wind speed / humidity
1(c)(i)	*letter:* **D** AND thin(ner) wall ; larg(er) lumen ;	2	**NOT** letter **E** (no marks) **ALLOW** less muscular (wall) **NOT** thin cell wall
1l(ii)	*any **two** from:* white blood cells produce antibodies ; white blood cells with reference to, phagocytosis / engulfing ; **platelets** clot blood which prevents entry of pathogens ;	2	**ALLOW** WBC / lymphocyte / phagocyte as AW for white blood cell **ALLOW** platelets clot AW and prevents infection (pathogen in stem of question)

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Question	Answer	Marks	Guidance
2(a)(i)	amylase / protease ;	1	**ALLOW** trypsin / trypsinogen note check any other named enzyme to see if correct
2(a)(ii)	fats / oil ; fatty acids **and** glycerol ;	2	**ALLOW** lipids both needed either order
2(b)	(pH 7 is) optimum pH for enzyme / lipase activity ; *then any **two** from:* increased frequency of collisions OR **most** effective collisions ; enzymes / they have complementary shapes to fit substrate ; enzyme-substrate complexes form ;	3	**ALLOW** best pH for maximum enzyme / lipase activity **ALLOW** successful as AW for 'effective' **ALLOW** fewer enzyme active sites have changed shape **IGNORE** no enzymes denature
2I(i)	22 ÷ 3 OR 7.3(3) ; 7 (gas bubbles per minute) ;	2	 correct answer no working = 2 marks
2I(ii)	higher (percentage) concentration (of carbon dioxide) greater the rate (of photosynthesis) / ora ;	1	**IGNORE** just 'increases' / bubbles per minute / references to levelling off / proportional / correlation

Question	Answer	Marks	Guidance
3(a)(i)	anther ;	1	
3(a)(ii)	wind ; stigma ;	2	**ALLOW** air **IGNORE** style

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Question	Answer	Marks	Guidance
3(b)	*any **four** from:* (similarities) fusion of nuclei ; both involve (male and female) gametes ; (differences) humans use sperm (not pollen) ; ovule in plants, and eggs in humans ; occurs in oviduct of humans and in ovary of plants ;	**4**	**IGNORE** outcomes of fertilisation e.g. seeds / zygotes, genetic traits etc / cell division **ALLOW** for fusion of nuclei, doubling of chromosomes / haploid to diploid **ALLOW** valid comparative points whether written under ‘similarities’ or ‘differences’. **ALLOW** ovum / ova for egg

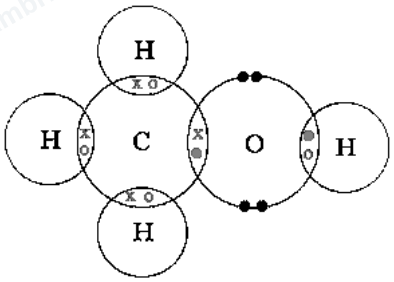
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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4(a)</td><td>
<table>
<tr><td>formula of ion</td><td>number of protons</td><td>number of neutrons</td><td>number of electrons</td></tr>
<tr><td>Li^+</td><td>3</td><td>4</td><td>2</td></tr>
<tr><td>F^-</td><td>9</td><td>10</td><td>10</td></tr>
<tr><td>Na^+</td><td>11</td><td>12</td><td>10</td></tr>
</table>
;;;;</td><td>4</td><td>One mark per column</td></tr>
<tr><td>4(b)(i)</td><td>chlorine ;</td><td>1</td><td></td></tr>
<tr><td>4(b)(ii)</td><td>iodine ;</td><td>1</td><td></td></tr>
<tr><td>4(c)(i)</td><td>displacement ;</td><td>1</td><td>ALLOW redox / oxidation-reduction</td></tr>
<tr><td>4(c)(ii)</td><td>from colourless ;
to orange or brown ;</td><td>2</td><td>ALLOW yellow / yellow-brown / orange-brown
ALLOW red-brown but NOT red</td></tr>
</table>

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Question	Answer	Marks	Guidance
5(a)	contains oxygen / does not contain **only** carbon and hydrogen ;	**1**	**ALLOW** it contains O **IGNORE** it contains molecules of oxygen / O
5(b)	 M1 shared pair with each hydrogen atom ; M2 shared pair between carbon and oxygen ; M3 two lone pairs on oxygen correctly shown ;	**3**	**ALLOW** any symbols for electrons of oxygen **NOT** M1 if additional electrons on C or H for **ALLOW** 4 non-bonding e on oxygen – don't need to be shown paired
5(c)(i)	M1 **minimum** energy needed for a reaction ; M2 for colliding particles (to react) ;	**2**	**ALLOW** least / lowest **ALLOW** successful collision / bond changes as AW for reaction **IGNORE** just, the energy needed for particles to collide
5(c)(ii)	oxygen **and** O_2 ; CO_2 ; balancing **3** O_2 and **2** CO_2 ;	**3**	
5(c)(iii)	(bubble through) limewater **and** turns milky ;	**1**	**ALLOW** cloudy / white ppt

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Question	Answer	Marks	Guidance
6(a)(i)	particulates ; carbon monoxide ;	**2**	
6(a)(ii)	city **K** ; (contains) highest mass / 276 μg, / most of oxides of nitrogen and sulfur dioxide ;	**2**	**ALLOW** SO_2 and NOx
6(a)(iii)	(211 + 55 + 5 =) 271 (μg) ;	**1**	
6(b)	*planting trees* removes carbon dioxide / increases photosynthesis / act as a carbon store ; *reducing livestock farming* reduces **methane** emissions / fewer animals to release **methane** ;	**2**	**ALLOW** trees photosynthesise **ALLOW** livestock produce methane

Question	Answer	Marks	Guidance
7(a)(i)	evidence of $P = VI$ **or** 2.5×0.26 ; 0.65 (W) ;	**2**	**ALLOW** equation in any form correct answer no working = 2 marks
7(a)(ii)	arrow, to the left / clockwise around the circuit **AND** the flow of electrons is from negative to positive ;	**1**	**ALLOW** clockwise arrow at any position **ALLOW** towards positive **IGNORE** charge / pole
7(a)(iii)	$I_1 = I_2 + I_3$;	**1**	**ALLOW** equation in any form
7(b)	d.c. is only in one direction **OR** a.c. changes direction ;	**1**	**IGNORE** a.c. can change direction
7(c)	(Q =) $4.7 \times 10^{19} \times 1.6 \times 10^{-19}$ OR 7.52 ; $I = Q \div t$ OR $7.52 \div 5.0$; 1.5 (A) ;	**3**	**ALLOW** equation in any form **ALLOW** 1.504 correct answer no working = 3 marks **ALLOW** if no working, MP1 for 37.6 (MP1 × 5)

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Question	Answer	Marks	Guidance
8(a)(i)	light / electromagnetic / named electromagnetic wave ;	**1**	**ALLOW** S waves / water-ripples / water-wave / rope-wave / ocean-wave
8(a)(ii)	(pressure) compression is higher **or** rarefaction is lower ; (distance) compression, (particles are) closer **or** rarefaction, (particles) more distance ;	**2**	**ALLOW** compression high **OR** rarefaction low **ALLOW** distance is small in compression OR large in rarefaction. Note: 'between particles' is in stem of question **ALLOW** if not specified, that the answers refer to compressions
8(b)	particles in a solid are closer together than particles in a gas / **ORA** ; forces between particles in a gas are weaker than forces between particles in a solid / **ORA** ;	**2**	**ALLOW** if not specified, that the answers refer to solids
8(c)	**M1** by **vibrations** passed from particle to, neighbouring particles or lattice ; **M2** ref to movement / delocalised / free **electrons** ; **M3 electrons** transfer energy, by collisions / by travelling through the solid / from region of hot to cold ;	**3**	**ALLOW** molecules, lattice atoms, ions as AW for particle **NOT** transfer of vibrations from particles to electrons **NOT** heat particles in M1

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Question	Answer	Marks	Guidance
9(a)	*any **two** from:* geothermal ; nuclear (fission) ; tidal ;	**2**	**IGNORE** hydro(electric)
9(b)	(nuclear) fusion ; hydrogen into helium ;	**2**	**ALLOW** fussion but **NOT** fision **IGNORE** references to atoms / molecules **ALLOW** lighter elements form heavier elements **NOT** hydrogen with helium
9(c)(i)	$E_k = ½\ mv^2$ **OR** $½ \times m \times 0.25^2 = 1.25 \times 10^{-3}$ J ; substitution to determine mass = 0.04 kg ; substitution of mass and final speed in KE = $½ \times 0.04 \times 1.25^2 = 0.031(25)$ J ;	**3**	**Alternative method** **NOTE: 1.** since mass is constant, the final speed is 5× faster and then **2**. the final KE is the initial KE $\times 5^2$ evidence of $E_k = ½\ mv^2$ / $E_k \propto v^2$; (1.25 ÷ 0.25 =) 5 ; $25 \times 1.25 \times 10^{-3}$ / 0.03125 (J) ;

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Question	Answer	Marks	Guidance
9(c)(ii)	M1 finds time: (t = $\Delta v \div a$ =) 1.00 ÷ 0.40 OR 2.5 (s) ; M2 finds average speed: = (0.25 + 1.25) ÷ 2 OR 0.75 (m/s) ; M3 (uses distance = average speed × time) 0.75 × 2.5 ; M4 1.9 (m) ;	**4**	**ALLOW** M3 their time × their speed (but **NOT** if acceleration 0.4) **ALLOW** 3 marks for 1.25 [note that this is the triangular component of the area of the s – t graph] **ALLOW** 1.875 (m) / answers that round to 1.9 at 2 s.f. correct answer no working = 4 marks Use of $1.25^2 = 0.25^2 + 2 \times 0.4 \times s$ may lead to all 4 marks **Alternative method:** Alt M1 calculation of force from mass of car in **9(c)(i)** × acceleration (0.4): = 0.04 × 0.4 **OR** 0.016 (N) Alt M2 calculation of energy transfer from (0.031–1.25E–3) = 0.02975 (J) Alt M3 use of equation distance = energy transfer / force / correct substitution must be seen Alt M4 evaluated correctly

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