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CAMBRIDGE
International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/43**

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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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th>name of part</th><th>letter</th><th>function of part</th></tr>
<tr><td>stigma</td><td>P</td><td>pollination</td></tr>
<tr><td>filament</td><td>S</td><td>holds up anther</td></tr>
<tr><td>petal</td><td>T</td><td>attracts insects</td></tr>
</table>
;;;
one mark each row
</td><td>3</td><td>ALLOW supports / AW

ALLOW attracts pollinators
IGNORE attracts animals</td></tr>
<tr><td>1(b)</td><td>pollen (grains) transferred (in pollination) ;

fertilisation involves fusion of nuclei (of pollen and ovule) ;</td><td>2</td><td>ALLOW ovule is not used in pollination

ALLOW fertilisation is the fusion of, gametes / ovule and pollen
ALLOW contact between male and female gametes / pollen enters, reaches ovule / ovum IGNORE pollen reaches ovary</td></tr>
<tr><td>1(c)</td><td>any three from:
required for uptake of mineral ions ;
lower concentration (of minerals ions) in soil ;
movement against a concentration gradient ;
uses / requires energy (from respiration) ;</td><td>3</td><td>ALLOW ATP as alternative wording (AW) for energy
IGNORE references to water</td></tr>
</table>

Question	Answer	Marks	Guidance
2(a)(i)	**D** ; **C** ;	**2**	
2(a)(ii)	**X** (valve) / it ensures one-way flow (of blood) / prevents backflow (of blood) ; **Y** (muscle) it **contracts** to push / pump (blood) ;	**2**	**IGNORE** just, one-way valve **ALLOW** compresses / squeezes, to push… **IGNORE** just, it contracts

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Question	Answer	Marks	Guidance
2(b)(i)	144 and 68 (seen) **or** 76 ; (76 × 100) ÷ 68 ; 112(%) ;	**3**	**ALLOW** 112 no working = 3 marks **ALLOW** $\frac{144}{68} \times 100 - 100$ **ALLOW** 111.7647… / 110% (2 s.f.) **ALLOW** max 2 for incorrect readings but correct method (1) and evaluation (1)
2(b)(ii)	*any **three** from:* less muscle contraction ; (muscles) require less energy ; (muscles) require less oxygen ; decrease in respiration ;	**3**	mention of decrease / less only required once **IGNORE** heart contraction **ALLOW** less oxygen needed by the body **ALLOW** more energy needed by the body **IGNORE** provide oxygen

Question	Answer	Marks	Guidance
3(a)(i)	as nitrogen ;	**1**	**ALLOW** sulfur / S / N
3(a)(ii)	lipase acts on / digests / is specific to, fats / oils / lipids ; **active site** is not complementary (to proteins / substrate) ; no enzyme-substrate complexes form (with proteins) ;	**3**	**ALLOW** protease digests proteins **ALLOW** as AW complementary: does not fit protein / wrong shape for protein / can't bind with protein
3(b)(i)	herbivore ;	**1**	more than one circled = 0 marks
3(b)(ii)	Sun ; chlorophyll ; chemical ; <u>inchworm</u> ;	**4**	**ALLOW** sunlight

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4(a)(i)</td><td>$2Na + Cl_2 \rightarrow 2NaCl$; ;

M1 correct formulae
M2 balancing, dependent on correct formula</td><td>2</td><td>IGNORE state symbols
ALLOW multiples / fractional balancing
ALLOW max 1 if only mistake is 2Cl</td></tr>
<tr><td>4(a)(ii)</td><td>(pale) yellow – green ;</td><td>1</td><td>ALLOW green
NOT yellow</td></tr>
<tr><td>4(a)(iii)</td><td><table><tr><th>statement</th><th>true</th><th>false</th></tr><tr><td>Chlorine contains covalent bonds.</td><td>✓</td><td></td></tr><tr><td>Chlorine is less reactive than bromine.</td><td></td><td>✓</td></tr><tr><td>Chlorine displaces iodine from aqueous potassium iodide.</td><td>✓</td><td></td></tr><tr><td>Chlorine bleaches damp litmus paper.</td><td>✓</td><td></td></tr></table>;;;</td><td>3</td><td>4 correct = 3 marks
2–3 correct = 2 marks
1 correct = 1 mark</td></tr>
<tr><td>4(b)</td><td>8 cross electrons on outer shell of sodium ion ;

7 dot electrons on outer shell of the chloride ion and 1 cross electron ;

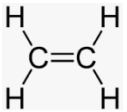
(1)+ charge on sodium ion and (1) – charge on chloride ion ;</td><td>3</td><td>ALLOW all dots / all crosses / any combination provided the number of e is correct

IGNORE inner electrons</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5(a)(i)</td><td>
<table>
<tr><th>name</th><th>formula</th><th>atoms in the formula</th></tr>
<tr><td>potassium hydroxide</td><td>KOH</td><td>1 potassium
1 oxygen
1 hydrogen</td></tr>
<tr><td>ammonium hydroxide</td><td>NH_4OH</td><td>1 nitrogen
5 hydrogens
1 oxygen ;</td></tr>
<tr><td>sodium hydrogencarbonate</td><td>$NaHCO_3$;</td><td>1 sodium
1 hydrogen
1 carbon
3 oxygen</td></tr>
</table>
</td><td>2</td><td>ALLOW elements in any order</td></tr>
<tr><td>5(a)(ii)</td><td>some bases are not soluble (in water) ;</td><td>1</td><td>ALLOW an alkali is a soluble base</td></tr>
<tr><td>5(b)(i)</td><td>salt + water ;</td><td>1</td><td>either order</td></tr>
<tr><td>5(b)(ii)</td><td>increasing temperature increases the kinetic energy of the particles / particles move faster ;
frequency of (successful) collisions increases / the chance of (successful) collisions increases ;
more collisions have the activation energy for a reaction ;</td><td>3</td><td>ALLOW reactants as AW for particles</td></tr>
</table>

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Question	Answer	Marks	Guidance
6(a)	M1 refinery gas at left end and bitumen at right end ; M2 correct order for naphtha and diesel oil ;	**2**	**ALLOW** 1 mark for any two in the right order / correct order reversed refinery gas – naphtha – diesel oil – bitumen = 2
6(b)(i)	$C_{10}H_{22}$;	**1**	**ALLOW** $H_{22}C_{10}$
6(b)(ii)	alkane ;	**1**	
6(b)(iii)	**M1** conditions: high temperature **and** catalyst ; **M2** for a double bond / indication that an alkene is formed ; **M3** for correct number of hydrogens on each carbon ;	**3**	**ALLOW** 450–700°C AW high temperature **ALLOW** high pressure or 70 atm **and** catalyst or zeolite  **ALLOW MP3 for** C_2H_4
6(c)(i)	sulfur dioxide ;	**1**	**ALLOW** oxides of nitrogen **/** sulfur oxide **IGNORE** water / SO
6(c)(ii)	*any **two** from:* planting trees / plants ; decreasing use of fossil fuels ; increasing use of renewable energy ; AVP ;	**2**	**IGNORE** reduction in livestock farming **ALLOW** named renewable energy **AVP** e.g. qualified lifestyle changes / carbon capture / use public transport

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Question	Answer	Marks	Guidance
7(a)(i)	microwave ;	1	
7(a)(ii)	transverse: water / (named) electromagnetic / S – waves ; longitudinal: sound / P – waves ;	2	**ALLOW** any named electromagnetic wave / ocean – wave / rope – wave
7(b)(i)	(v =) $2\pi r \div T$ =in any form (numerical or algebraic) e.g. $2\pi \times 3.85 \times 10^5 \div 27.3 \times 24$ **OR** = $2\pi \times 3.85 \times 10^5 \div 655.2$; 3690 (km / h) ;	2	 **ALLOW** 3692 / 3700 / 3.7×10^3
7(b)(ii)	(speed =) distance ÷ time in any form (numerical or algebraic) e.g. $3.85 \times 10^8 \times 2 \div 3.0 \times 10^8$; 2.6 (s) ;	2	**ALLOW** $3.85 \times 10^5 \div 3.0 \times 10^n$ **or** 1.28×10^n **or** 2.6×10^n or **their** distance ÷ **their** light – speed **ALLOW** answers that round to 2.6 at two s.f.

Question	Answer	Marks	Guidance
8(a)(i)	$W = mg$ = 6 500 × 9.8 = 63 700 ; (= 64 000 N)	1	**ALLOW** shows that the ratio of weight ÷ mass = 9.8 (at two s.f.)
8(a)(ii)	M1 total area: 2 × 0.65 OR 1.30 seen (m^2) ; M2 use of $p = \frac{F}{A}$ OR 64 000 ÷ 1.30 ; M3 49 000 ; Pa or N / m^2 ;	4	**NOT** M2 or M3 if use of mass = 6 500 **ALLOW** answers that round to 49 000 at 2 s.f. **IGNORE** 50 000 (1 s.f. on answer line) **ALLOW** 2 marks for 98 000 (one foot) **ALLOW** Pascals / pascals / pa / 49 kPa / 49 kN / m^2

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Question	Answer	Marks	Guidance
8(b)	M1 Use of KE equation to find final speed: e.g. 52 000 = ½ 6 500 × v^2 **OR** v = √(2 × 52 000 ÷ 6 500) **OR** ½ mv^2 ; M2 final speed = 4.0 (m / s) ; M3 change in speed (= 4.0 – 1.0 =) 3.0 (m / s) ; M4 *evidence of a* = $\frac{\Delta v}{\Delta t}$ / 3.0 ÷ 15 ; M5 0.20 (m / s^2) ;	**5**	**ALLOW** candidate substitutes $v = a \times t$ into KE equation and evaluates consistently (= 2 marks)
9(a)	M1 heating element **particles** vibrate / gain KE / move faster ; M2 collisions transfer energy (to water particles) / energy is transferred from particle to particle ;	**2**	**IGNORE** refs to electrons / convection / water particles gain KE in M1

Question	Answer	Marks	Guidance
9(b)(i)	use of $E = Pt$ / 2.2 × 5.0 × 60 ; 660 kJ ; efficiency = $\frac{\text{useful (energy) output}}{\text{total (energy) input}} \times 100\%$ OR $\frac{610}{660} \times 100\%$; 92(%) ;	**4**	**ALLOW** 92.4 **ALLOW** 3 marks for 0.92
9(b)(ii)	one heater still works if other breaks ORA / both heaters receive full supply p.d. ;	**1**	**ALLOW** lower (total) resistance / more current (in circuit) / greater heating effect / can be operated independently

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Question	Answer	Marks	Guidance
9(b)(iii)	M1 use of $P=IV$ to find total current I = 2 200 / 230 = : 9.6 A ; M2 calculation of current in heater **B** = 9.6 – 4.2 = : 5.4 A ; M3 use of $R=V/I$ = 230 ÷ 5.4 = : 43 (Ω) ;	**3**	**ALLOW** 42.593… **ALLOW** for 1 mark, 230 ÷ **their** current OR **their** voltage ÷ **their** current

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