



Cambridge O Level

COMBINED SCIENCE

5129/21

Paper 2 Theory

October/November 2022

MARK SCHEME

Maximum Mark: 100

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 October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **13** printed pages.

PUBLISHED**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 descriptors 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.

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 '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.

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.

Question	Answer	Marks
1	<pre> graph LR A[liver cell] --> G[enzyme production] B[mesophyll cell] --> H[alcohol breakdown] C[cell of pancreas] --> I[glucose production] D[red blood cell] --> J[antibody formation] E[root hair cell] --> K[oxygen transport] F[white blood cell] --> L[water absorption] </pre>	5

Question	Answer	Marks
2(a)(i)	distillation ;	1
2(a)(ii)	A = thermometer ; B = condenser ;	2
2(a)(iii)	ethanol ;	1
2(b)	solvent / coolant / hydroelectricity ;	1

Question	Answer	Marks
2(c)	vibrating ; touching ;	2

Question	Answer	Marks
3(a)(i)	30 (m / s) ;	1
3(a)(ii)	15 (s) ;	1
3(a)(iii)	2 (m / s ²) ;	1
3(b)	F = ma or 725 × 2 ; 1450 (N) ;	2
3(c)	friction ;	1

Question	Answer	Marks
4(a)	oak tree → caterpillar → sparrow → eagle ;;;	3
4(b)	any two from: (<i>in photosynthesis</i>) <ul style="list-style-type: none"> • plants produce food for herbivores / other animals obtain their food from herbivores ; • plants release oxygen for respiration ; • plants produce oxygen for animals (to breathe) ; • source of food for plants ; 	2

Question	Answer	Marks
5(a)(i)	carbon or carbon monoxide ;	1
5(a)(ii)	releases energy ;	1
5(a)(iii)	$\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$ all formulae correct ; correctly balanced ;	2
5(b)	hematite ;	1
5(c)	alloying ;	1

Question	Answer	Marks
6(a)	17 (N) ; moment = force \times distance or 17×0.24 ; 4.08 (Nm) ;	3
6(b)	(v =) $m \div \rho$ or $1.7 \div 6800$; 0.00025 (m ³) ;	2
6(c)	any one from: <ul style="list-style-type: none"> • equal anticlockwise moment ; • equal moment to the right of the pivot ; • moments balance ; • the weight of the beam produces an equal moment ; 	1

Question	Answer	Marks
7(a)	thinner ;	1
7(b)	towards ;	1
7(c)	carbon dioxide ;	1
7(d)	higher ;	1

Question	Answer	Marks
8(a)	ethene ;	1
8(b)	stainless steel ;	1
8(c)	helium ;	1
8(d)	zinc ;	1
8(e)	nitrogen ;	1
9(a)(i)	65 (beats per minute) ;	1
9(a)(ii)	student 3 ;	1
9(b)	any one from: <ul style="list-style-type: none"> • include more students in each group ; • repeats for each student (and average the results) ; • ensure each student group was of same age / health / size / sex ; • ensure that the 'exercise' was same (duration / level of activity) for all students ; • exercise for the same length of time ; 	1

Question	Answer	Marks
9(c)	any three from: <ul style="list-style-type: none"> • (to) increase blood supply to the muscles ; • (to provide) more oxygen ; • (to) increase respiration ; • (to) release more energy ; • (due to) increased respiration ; • more carbon dioxide to be removed ; 	3

Question	Answer	Marks
10(a)	point or cross plotted at (9.0, 7) ; straight line from 0, 0 to their plotted point ;	2
10(b)	reading taken from extrapolated straight line extension at 12 N ; OR 9.3 ± 0.1 (cm) OR uses proportional reasoning ($7 \times \frac{12}{9} = 9.3(3)$) (cm) ;	1
10(c)	it is (still) elastic (at 12 N) / extension and load are (directly) proportional ;	1

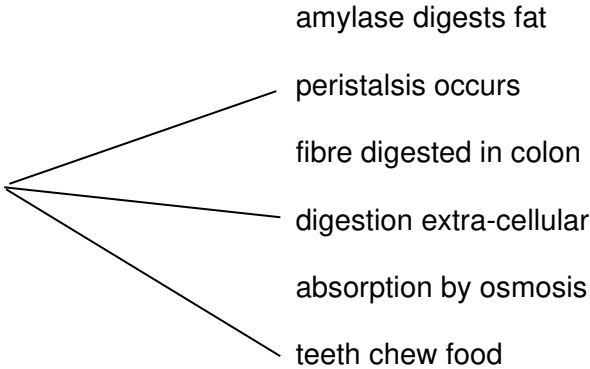
Question	Answer	Marks
11(a)	C_2H_6O ;	1
11(b)	solvent ;	1
11(c)(i)	fermentation ; addition ;	2
11(c)(ii)	blue litmus ; turns red ; OR UI paper ; turns orange / yellow ;	2

Question	Answer	Marks
12(a)(i)	nuclear ;	1
12(a)(ii)	kinetic ;	1
12(a)(iii)	electrical ;	1
12(b)(i)	(one hour =) 3600 (s) ; (I =) $Q \div t$ or $4.1 \div 3600$; $0.0011(389)$ or $1.11(389) \times 10^{-3}$ (A) ;	3
12(b)(ii)	(P =) $V \times I$ or $9 \times 1.11(389) \times 10^{-3}$; $1.025 \times 10^{-2} \approx 1.0 \times 10^{-2}$ (W) ;	2

Question	Answer	Marks															
13(a)	any one from: asexual <ul style="list-style-type: none"> genetically identical offspring offspring genetically identical to parent needed for growth / for repair / replacement sexual <ul style="list-style-type: none"> genetically different offspring offspring genetically different to parent used only for increasing numbers of individual organisms 	1															
13(b)	<table border="1"> <thead> <tr> <th>letter</th> <th>name</th> <th>function</th> </tr> </thead> <tbody> <tr> <td>A</td> <td></td> <td>transports eggs / ova to uterus / place where fertilisation occurs ;</td> </tr> <tr> <td>B</td> <td>ovary ;</td> <td>produces eggs / ova ;</td> </tr> <tr> <td>C</td> <td>uterus ;</td> <td>place where baby / fetus develops ;</td> </tr> <tr> <td>D</td> <td>vagina ;</td> <td></td> </tr> </tbody> </table>	letter	name	function	A		transports eggs / ova to uterus / place where fertilisation occurs ;	B	ovary ;	produces eggs / ova ;	C	uterus ;	place where baby / fetus develops ;	D	vagina ;		6
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C	uterus ;	place where baby / fetus develops ;															
D	vagina ;																
13(c)	(<i>mechanical</i>) condom ; (<i>surgical</i>) vasectomy ;	2															

Question	Answer	Marks
14(a)(i)	2 ; 4 ;	2
14(a)(ii)	2+ ;	1
14(b)	same number of protons ; different number of neutrons ;	2

Question	Answer	Marks
15(a)	four + signs on sphere B ;	1
15(b)	positive ; and any two from: <ul style="list-style-type: none"> • sphere A is attracted and sphere B is repelled ; • like charges repel or unlike charges attract ; • charge on C is larger than charge on B ; 	3

Question	Answer	Marks
16(a)	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">in the alimentary canal</div>  </div> <p style="text-align: right;">amylase digests fat</p> <p style="text-align: right;">peristalsis occurs</p> <p style="text-align: right;">fibre digested in colon</p> <p style="text-align: right;">digestion extra-cellular</p> <p style="text-align: right;">absorption by osmosis</p> <p style="text-align: right;">teeth chew food</p> <p style="text-align: right;">...</p>	3
16(b)	any one from: (hydrochloric acid) <ul style="list-style-type: none"> • breaks down / destroys amylase / the enzyme ; • changes the activity of amylase / the enzyme ; • slows down the rate at which the enzyme acts ; 	1

Question	Answer	Marks
17(a)(i)	limewater ; turns cloudy / milky ;	2
17(a)(ii)	(both) use oxygen ; (both) produce water ;	2
17(b)	Toxic / poisonous ;	1

Question	Answer	Marks
18(a)(i)	voltmeter ;	1
18(a)(ii)	move wire (up / down) ;	1
18(a)(iii)	from north to south ;	1
18(b)	the strength of the magnetic field ; the speed of movement (of the wire) ;	2