



Cambridge O Level

COMBINED SCIENCE

5129/21

Paper 2 Theory

May/June 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 May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **12** 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	<p><u>'List rule' guidance</u></p> <p>For questions that require <i>n</i> responses (e.g. State two reasons ...):</p> <ul style="list-style-type: none"> • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked <i>ignore</i> in the mark scheme should not count towards <i>n</i>. • Incorrect responses should not be awarded credit but will still count towards <i>n</i>. • 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 <i>n</i> 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(a)(i)	cabbage and beans ;	1
1(a)(ii)	beans ;	1
1(a)(iii)	18(%) ;	1
1(b)	adds bulk to the contents of the alimentary canal / encourages peristalsis ;	1
1(c)	any two from: <ul style="list-style-type: none"> • a child will need more protein (as they are growing / making new cells) ; • an active person / child / manual work will need a diet higher in energy ; • an older person requires less energy (from the diet) ; • a pregnant woman will need more protein ; • a pregnant woman needs more energy (from the diet) ; 	2

Question	Answer	Marks
2(a)(i)	102 ;	1
2(a)(ii)	1020 ; 1120 ; 1600 ;	3
2(b)	aircrafts parts ; strong / low density ; or food containers ; resistant to corrosion ;	2

Question	Answer	Marks
3(a)(i)	A – pupil ; B – iris ;	2
3(a)(ii)	circular pupil drawn ; smaller diameter with iris the same diameter as in (a)(i) ;	2
3(b)	gland ; blood ; target ; liver ;	4

Question	Answer	Marks
4(a)	8.0 (mm) ;	1
4(b)(i)	($R =$) 2.9 – 3.1 ;	1
4(b)(ii)	24 (mm) ;	1
4(c)	water / liquid in measuring cylinder ; (volume =) difference in readings / volumes ;	2

Question	Answer	Marks
5(a)(i)	halogens ;	1
5(a)(ii)	(substance that) contains one type of atom ;	1
5(b)	2,8,7 ;	1
5(c)(i)	get darker ;	1
5(c)(ii)	answer between –34 and 184 ;	1

Question	Answer	Marks
5(d)	$Cl_2 + \underline{2} NaBr \rightarrow \underline{2} NaCl + Br_2;$	1

Question	Answer	Marks
6(a)	170000 or $F \times d$ or 200×850 ; 170×10^3 or 17×10^4 or 1.7×10^5 ; Nmm ;	3
6(b)	$E = P \times t$ or $E = 2 \times 1.5$; 3 J ; $W = F \times d$ or $W = mgh$ or $3 = 5 \times d$; (d =) 0.6 (m) ;	4

Question	Answer	Marks																		
7	<table border="1"> <thead> <tr> <th>letter</th> <th>name</th> <th>function</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>liver ;</td> <td>produces bile</td> </tr> <tr> <td>B</td> <td>pancreas</td> <td>produces enzymes / amylase ;</td> </tr> <tr> <td>C</td> <td>colon</td> <td>absorbs water ;</td> </tr> <tr> <td>D</td> <td>ileum ;</td> <td>absorbs digested food</td> </tr> <tr> <td>E</td> <td>anus</td> <td>egestion ;</td> </tr> </tbody> </table>	letter	name	function	A	liver ;	produces bile	B	pancreas	produces enzymes / amylase ;	C	colon	absorbs water ;	D	ileum ;	absorbs digested food	E	anus	egestion ;	5
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Question	Answer	Marks
8(a)(i)	C_8H_{16} ;	1
8(a)(ii)	contains a C=C ;	1
8(b)(i)	any two from: <ul style="list-style-type: none"> • sample below solvent level ; • sample below pen line ; • sample too large ; • starting line drawn in pen ; 	2
8(b)(ii)	one dot formed ;	1

Question	Answer	Marks
9(a)	conduction ;	1
9(b)	particles move further apart ; (causing) expansion / wire gets longer ;	2
9(c)	radiation ;	1
9(d)	heated air becomes less dense ; heated air rises / convection of heated air ;	2

Question	Answer	Marks
10	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>structure</p> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 60px; margin: 5px auto;">anthers</div> </div> <div style="margin-bottom: 10px;"> <div style="display: flex; align-items: center; margin: 5px auto;"> ↓ <div style="border: 1px solid black; padding: 5px; width: 60px; margin: 5px auto;">carpels</div> </div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 60px; margin: 5px auto;">petals</div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 60px; margin: 5px auto;">sepals</div> </div> </div> <div style="width: 45%;"> <p>function</p> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">attracts insects</div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">produces ovules</div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">produces pollen</div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">produces the testa</div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 5px auto;">protects the flower when forming</div> </div> </div> </div>	4

Question	Answer	Marks
11(a)	one bonding pair between H and Cl ; three lone pairs on Cl ;	2
11(b)	A – water ; B – ethene ; C – nitrogen ;	3
11(c)	(hydrogen) gains oxygen ;	1

Question	Answer	Marks
12(a)(i)	100 (°C) ;	1
12(a)(ii)	1000 (°C) ;	1
12(b)	energy ; per unit charge ;	2

Question	Answer	Marks						
13(a)	(palisade) mesophyll (layer) ;	1						
13(b)	any two from <ul style="list-style-type: none"> • chloroplasts contain chlorophyll ; • (needed to) carry out photosynthesis ; • absorbs / traps, light (energy) ; • light energy converted to chemical energy ; 	2						
13(c)	to reduce / prevent water loss (from the top of the leaf) ;	1						
13(d)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td style="text-align: center;">one gas moving in</td> <td style="text-align: center;">two gases moving out</td> </tr> <tr> <td style="text-align: center;">carbon dioxide ;</td> <td style="text-align: center;">oxygen ;</td> </tr> <tr> <td style="background-color: #e0e0e0;"></td> <td style="text-align: center;">water vapour ;</td> </tr> </tbody> </table>	one gas moving in	two gases moving out	carbon dioxide ;	oxygen ;		water vapour ;	3
one gas moving in	two gases moving out							
carbon dioxide ;	oxygen ;							
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Question	Answer	Marks
14(a)	-1 ; 1 / 1840 ;	2
14(b)	X ; V or Z ; V ; W ;	4

Question	Answer	Marks
15(a)	0.2 (A) ;	1
15(b)(i)	$V = I R$ or 0.2×3 ; 0.6 (V) ;	2
15(b)(ii)	3 (Ω) ;	1

Question	Answer	Marks
16	any three from: <ul style="list-style-type: none"> • through unprotected sex / not using a condom or femidom ; • using non-sterile needles or syringes / share injection equipment ; • mother-to-child transmission during pregnancy ; • during birth ; • in breast milk ; • in contaminated blood ; 	3

Question	Answer	Marks
17(a)	magnesium sulfate ; hydrogen ;	2
17(b)	filter funnel (with paper) ;	1
17(c)	exothermic ;	1
17(d)	increase ;	1

Question	Answer	Marks
18(a)	magnetic fields have direction ; poles align with Earth's magnetic field ;	2
18(b)	any two from : <ul style="list-style-type: none"> • <u>(electromagnet)</u> can be switched off ; • <u>(electromagnet)</u> made of iron ; • <u>(electromagnet)</u> magnetised by an electric current ; • <u>(electromagnet)</u> has a coil ; • <u>(electromagnet)</u> can change poles ; 	2

Question	Answer	Marks
19	nuclide ; neutrons ; electrons / protons ;	3