



Cambridge O Level

COMBINED SCIENCE

5129/22

Paper 2 Theory

May/June 2021

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.

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This document consists of **14** 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.

Examples of how to apply the list ruleState **three** reasons.... [3]

A	1. Correct	✓	2
	2. Correct	✓	
	3. Wrong	✗	

B (4 responses)	1. Correct, Correct	✓, ✓	3
	2. Correct	✓	
	3. Wrong	ignore	

C (4 responses)	1. Correct	✓	2
	2. Correct, Wrong	✓, ✗	
	3. Correct	ignore	

D (4 responses)	1. Correct	✓	2
	2. Correct, CON (of 2.)	✗, (discount 2)	
	3. Correct	✓	

E (4 responses)	1. Correct	✓	3
	2. Correct	✓	
	3. Correct, Wrong	✓	

F (4 responses)	1. Correct	✓	2
	2. Correct	✓	
	3. Correct CON (of 3.)	✗ (discount 3)	

G (5 responses)	1. Correct	✓	3
	2. Correct	✓	
	3. Correct Correct CON (of 4.)	✓ ignore ignore	

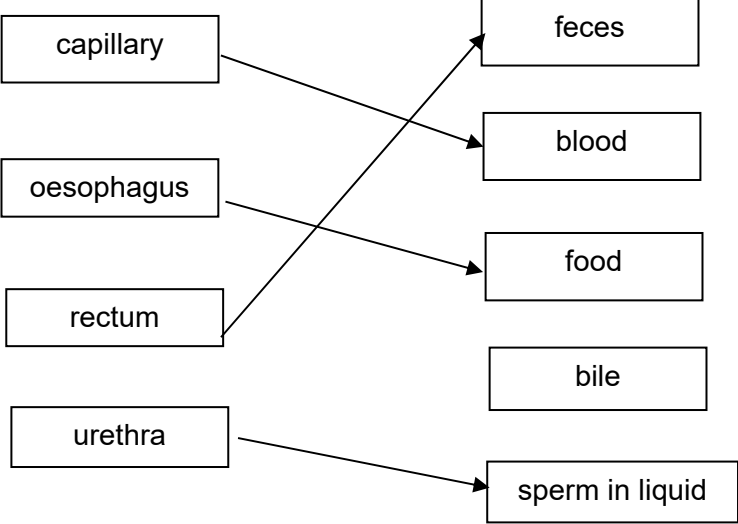
H (4 responses)	1. Correct	✓	2
	2. Correct	✗	
	3. CON (of 2.) Correct	(discount 2) ✓	

I (4 responses)	1. Correct	✓	2
	2. Correct	✗	
	3. Correct CON (of 2.)	✓ (discount 2)	

Question	Answer	Marks
1(a)(i)	<i>herbivores: 115 and carnivores: 10 ;</i>	1
1(a)(ii)	producer/s ;	1
1(b)(i)	a herbivore eats plants (only) or a carnivore eats animals (only) ;	1
1(b)(ii)	any two from <ul style="list-style-type: none"> • more energy available for herbivores ; • some parts (of herbivores are) not eaten ; • some parts (of herbivores are) not digestible ; • (in garden habitat) herbivores smaller in size than carnivores ; • energy lost between one trophic level and the next ; • energy is lost in activities such as movement / respiration, etc. ; 	2
1(b)(iii)	broken down ; by decomposers / detritivores ;	2

Question	Answer	Marks
2(a)(i)	incomplete combustion ;	1
2(a)(ii)	poisonous / toxic ;	1
2(b)(i)	2 2 ;	1
2(b)(ii)	limewater ; milky ;	2
2(c)(i)	hematite ;	1
2(c)(ii)	removes the oxygen (from the iron ore) ;	1

Question	Answer	Marks
3	straight line from (0,0) to (5,10) ; downward sloping curve ending at (9,4) ; upward sloping straight line ending at (12,7) ; horizontal line after 12 s ;	4

Question	Answer	Marks
4	 <pre> graph LR A[capillary] --> F[feces] B[oesophagus] --> C[blood] D[rectum] --> E[food] G[urethra] --> H[sperm in liquid] I[bile] </pre>	4

Question	Answer	Marks
5(a)(i)	94 ;	1
5(a)(ii)	16 94 ;; 4.7 ;	3
5(b)(i)	hydroxide ;	1
5(b)(ii)	12–14 ;	

Question	Answer	Marks
6(a)	arc from ramp to floor ; bounce height from floor less than apex of arc ;	2
6(b)	$F = m \times a$ or $a = F \div m$ or $60 / 2$; $30 \text{ (m / s}^2\text{)} ;$	2

Question	Answer	Marks
7(a)	(cardiac) muscle ;	1
7(b)	arrow on (lumen of) A leaving the heart / going upwards ; arrow on (lumen of) B leaving the heart / going upwards ;	2
7(c)(i)	label line V ending on one of the flaps of an A-V valve ;	1

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Question	Answer	Marks
7(c)(ii)	any three from : <ul style="list-style-type: none"> • when atrium contracts ; • (blood pushes flaps aside so) valve opens ; • when ventricle contracts; • (blood forces valves flaps to meet so) valve closes ; • to prevent backflow of blood ; • flap inversion prevented by cords ; 	3

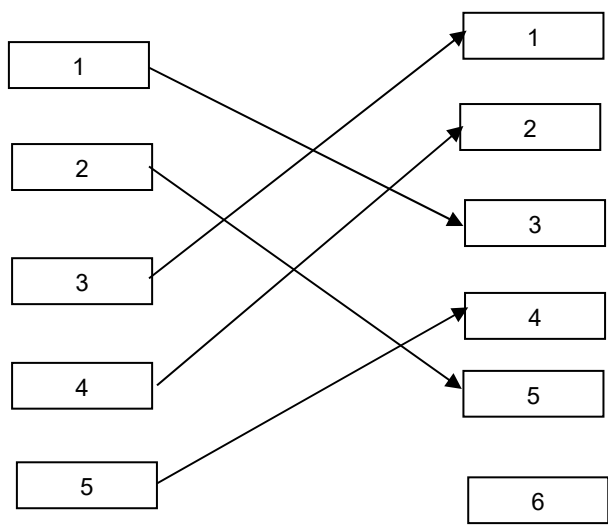
Question	Answer	Marks
8(a)	one bonding pair ; 3 lone pairs on each chlorine ;	2
8(b)(i)	7 electrons in outer shell ;	1
8(b)(ii)	reactivity – decreases ; colour – darkens ;	2
8(c)	(s) (g) (s) ;	1
8(d)	kills bacteria ;	1

Question	Answer	Marks
9(a)	use a ruler / scale ; any two from : <ul style="list-style-type: none"> • align zero end (of ruler) with start of coiled part ; • take reading (from ruler) where the coiled part ends ; • mm divisions / mm scale ; • placed the scale close to the spring ; • place the scale close to the spring to avoid parallax error ; 	3

Question	Answer	Marks
9(b)	measure (original) length ; add weight / mass then remove weight / mass ; spring returns to original / same length (when weight removed) ;	3

Question	Answer	Marks								
10(a)	they are poisonous / toxic ;	1								
10(b)	<table border="1" data-bbox="331 507 916 839"> <thead> <tr> <th data-bbox="331 507 622 643">substance excreted</th> <th data-bbox="622 507 916 643">number of the organ responsible for excretion</th> </tr> </thead> <tbody> <tr> <td data-bbox="331 643 622 707">carbon dioxide</td> <td data-bbox="622 643 916 707">2</td> </tr> <tr> <td data-bbox="331 707 622 770">urea</td> <td data-bbox="622 707 916 770">3</td> </tr> <tr> <td data-bbox="331 770 622 839">water</td> <td data-bbox="622 770 916 839">3</td> </tr> </tbody> </table>	substance excreted	number of the organ responsible for excretion	carbon dioxide	2	urea	3	water	3	3
substance excreted	number of the organ responsible for excretion									
carbon dioxide	2									
urea	3									
water	3									

Question	Answer	Marks
11(a)	K = fractional distillation ; L = cracking ; M = alkene ; N = water ;	4
11(b)	y = 7 ; z = 16 ;	2

Question	Answer	Marks
12	 <pre> graph LR L1[1] --> R1[1] L2[2] --> R2[2] L3[3] --> R4[4] L4[4] --> R5[5] L5[5] R6[6] </pre>	5

Question	Answer	Marks
13(a)(i)	too little dietary fibre (roughage) ;	1
13(a)(ii)	diet contains too much fat / carbohydrates / high calorie food ;	1
13(b)(i)	any two from : <ul style="list-style-type: none"> • too little / no water / rain ; • crop plants don't grow ; • livestock dies ; • no food for humans to eat ; 	2
13(b)(ii)	any two from : <ul style="list-style-type: none"> • too many people ; • temperature too high ; • lack of money ; • lack of fertiliser / mineral ions / vitamins ; • lack of distribution facilities ; • animal / plant diseases ; • food eaten by competing species ; • war / civil disruption ; • natural disaster ; 	2

Question	Answer	Marks
14	zinc ; <u>stainless</u> steel ; aluminium ; iron ;	4

Question	Answer	Marks
15(a)(i)	Z ;	1
15(a)(ii)	$R = V/I$ or $1.2/0.24$ 5 ; ohms / Ω ;	3
15(b)(i)	0.48 ;	1
15(b)(ii)	0.48 ;	1
15(b)(iii)	$(P =) V \times I$ or 2.4×0.48 1.152 ;	2

Question	Answer	Marks
16	gland ; blood ; liver ; liver ; carbohydrates ;	5

Question	Answer	Marks
17(a)(i)	B ;	1
17(a)(ii)	A ;	1
17(a)(iii)	C ;	1
17(b)	sample is impure ;	1

Question	Answer				Marks
18(a)					3
	α			✓	
	β				
	γ	✓	✓		
18(b)(i)	He <u>nucleus</u> ;				1
18(b)(ii)	electron ;				1
18(b)(iii)	high frequency / energy wave ;				1