



Cambridge IGCSE™

COMBINED SCIENCE

0653/32

Paper 3 Theory (Core)

March 2020

MARK SCHEME

Maximum Mark: 80

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 March 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **12** printed pages.

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(a)(i)	coronary ;	1
1(a)(ii)	vena cava ;	1
1(a)(iii)	valves ;	1
1(a)(iv)	Q ; <i>and any one from:</i> has a large lumen ; has a thin (muscle) wall ;	2
1(b)	<i>(similarity) any one from:</i> pulse rates increase during exercise ; pulse rates decrease after exercise ; pulse rates return, to normal / to rate before exercise ; <i>(differences) any two from:</i> Student A has higher pulse rate (before or during or after exercise) / ora ; Student A has higher increase in pulse rate (during exercise) / ora ; Student A has longer recovery time / ora ;	3

Question	Answer	Marks
2(a)(i)	<i>Group I</i> Y <i>Group VII</i> X <i>transition element</i> Z ;; <i>one or two correct = 1 mark</i>	2
2(a)(ii)	decrease ;	1

Question	Answer	Marks
2(b)(i)	<i>calcium</i> S <i>magnesium</i> P <i>iron</i> Q <i>copper</i> R ;; <i>magnesium correct = 1 mark</i>	2
2(b)(ii)	<i>any two from:</i> increase concentration ; increase temperature ; (use a) catalyst ; Increase surface area of metal / (use) powder / smaller pieces (of metal) ;	max 2
2(b)(iii)	hydrogen / H ₂ ;	1
2(b)(iv)	exothermic ;	1

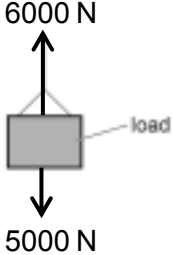
Question	Answer	Marks
3(a)(i)	(volume = 100 × 20 × 6.0 =) 12 000 (cm ³) ;	1
3(a)(ii)	94 000 (g) ;	1
3(a)(iii)	$\text{density} = \frac{\text{mass}}{\text{volume}} = \frac{94\,000}{12\,000} ;$ $= 7.8 \text{ (g / m}^3\text{)} ;$	2
3(b)	solid iron: more closely packed / liquid iron: further apart ; OR solid iron: regular arrangement / liquid iron: random arrangement ;	1
3(c)	fast moving atoms in molten iron slow down as it cools ; atoms slow down again as solid iron cools ;	2

Question	Answer	Marks
3(d)	glass would melt or break / mercury or liquid would boil ;	1

Question	Answer	Marks										
4(a)(i)	(top) xylem ; (bottom) guard cell ;	2										
4(a)(ii)	photosynthesis ;	1										
4(a)(iii)	transport sugars / transport sucrose ;	1										
4(b)(i)	starch / glycogen ;	1										
4(b)(ii)	permanent ;	1										
4(b)(iii)	carbon AND hydrogen AND oxygen ;	1										
4(c)	<table border="1"> <tbody> <tr> <td>lost through the stomata as water vapour</td> <td>5</td> </tr> <tr> <td>enters mesophyll cells of leaf</td> <td>4</td> </tr> <tr> <td>passes through root cortex cells</td> <td>2</td> </tr> <tr> <td>passes into xylem</td> <td>(3)</td> </tr> <tr> <td>taken in by root hair cells</td> <td>1</td> </tr> </tbody> </table> <i>all correct = 2 marks</i> <i>any two correct = 1 mark</i>	lost through the stomata as water vapour	5	enters mesophyll cells of leaf	4	passes through root cortex cells	2	passes into xylem	(3)	taken in by root hair cells	1	2
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taken in by root hair cells	1											

Question	Answer	Marks
5(a)	heating / cooking ;	1
5(b)(i)	hydrocarbon ;	1
5(b)(ii)	carbon dioxide ;	1
5(b)(iii)	<i>reagent</i> copper sulfate OR cobalt chloride ; <i>result</i> (white to) blue OR (blue to) pink ; result must match the reagent	2
5(c)(i)	covalent ;	1
5(c)(ii)	shared (pair) ;	1
5(d)(i)	alkenes double (bonds) and alkanes (only) single (bonds) ;	1
5(d)(ii)	poly(ethene) ;	1

Question	Answer	Marks
6(a)(i)	(electrical energy) ↓ kinetic (energy) ; ↓ gravitational ; (potential energy)	2
6(a)(ii)	(lost as / transformed into) thermal energy ;	1

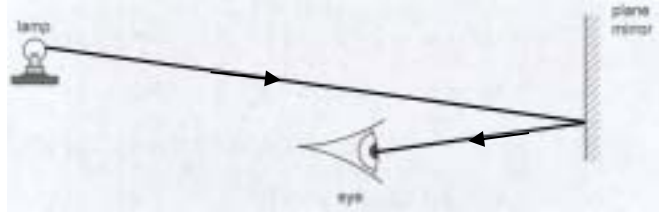
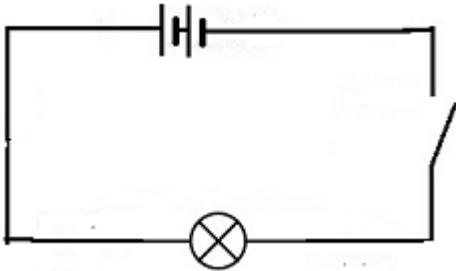
Question	Answer	Marks
6(b)(i)	 <p>both arrows in correct directions ; both arrows correctly labelled ;</p>	2
6(b)(ii)	$(6000 - 5000 =) 1000 \text{ (N)} ;$	1
6(b)(iii)	accelerating / changing speed ;	1
6(c)	$\text{time} = \frac{\text{distance}}{\text{speed}} = \frac{30}{330} ;$ $= 0.09(1) \text{ s} ;$	2

Question	Answer	Marks
7(a)(i)	gall bladder ;	1
7(a)(ii)	the pancreas secretes, pancreatic juice / enzymes (for digestion) ; (therefore) less digestion can take place ;	2

Question	Answer	Marks										
7(a)(iii)	<table border="1" data-bbox="647 217 1476 635"> <tr> <td data-bbox="647 217 1326 300">alter the activity of organs</td> <td data-bbox="1326 217 1476 300">✓</td> </tr> <tr> <td data-bbox="647 300 1326 383">breakdown large insoluble molecules</td> <td data-bbox="1326 300 1476 383"></td> </tr> <tr> <td data-bbox="647 383 1326 466">chemical substances</td> <td data-bbox="1326 383 1476 466">✓</td> </tr> <tr> <td data-bbox="647 466 1326 549">produced by target organs</td> <td data-bbox="1326 466 1476 549"></td> </tr> <tr> <td data-bbox="647 549 1326 632">transported in red blood cells</td> <td data-bbox="1326 549 1476 632">;;</td> </tr> </table> <p data-bbox="320 671 734 802"><i>all correct = 2 mark two ticks one correct = 1 mark three ticks two correct = 1 mark more than 3 ticks = 0 marks ;;</i></p>	alter the activity of organs	✓	breakdown large insoluble molecules		chemical substances	✓	produced by target organs		transported in red blood cells	;;	2
alter the activity of organs	✓											
breakdown large insoluble molecules												
chemical substances	✓											
produced by target organs												
transported in red blood cells	;;											
7(b)(i)	squirrel / deer ;	1										
7(b)(ii)	(The fox is a primary consumer when) eats berries ; (The fox is a secondary consumer when) eats squirrel ;	2										
7(b)(iii)	<i>any two from:</i> water ; oxygen ; suitable temperature ;	max 2										

Question	Answer	Marks
8(a)	evaporate ; <i>allow distil / crystallise / boil</i>	1
8(b)	<i>drawn:</i> Na ⁺ 2, 8 ; Cl ⁻ 2, 8, 8 ;	2
8(c)	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 100px;">concentrated aqueous sodium chloride</div> <div style="margin: 0 10px;">→</div> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 100px;">sodium hydroxide</div> <div style="margin: 0 10px;">+</div> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 100px;">hydrogen ;</div> <div style="margin: 0 10px;">+</div> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 100px;">chlorine ;</div> <div style="margin-left: 20px;"><i>(either order)</i></div> </div>	2
8(d)	<i>pH</i> > 7 to 14 ; <i>colour</i> blue-green / blue / purple ;	2
8(e)	(blue / purple to) white / bleached ;	1

Question	Answer	Marks							
9(a)(i)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 20%;">gamma radiation</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 20%;">(visible) light ;</td> <td style="width: 20%;"></td> <td style="width: 20%;">micro- waves</td> <td style="width: 20%;">radio waves ;</td> </tr> </table>	gamma radiation			(visible) light ;		micro- waves	radio waves ;	2
gamma radiation			(visible) light ;		micro- waves	radio waves ;			
9(a)(ii)	number of, vibrations / waves / oscillations per second ;	1							
9(b)	$R = V/I$ or $I = V/R = 12/1.5 ;$ $= 8 ;$ (unit =) A ;	3							

Question	Answer	Marks
9(c)	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>ray from lamp to mirror to eye ;</p> <p>angle of incidence and angle of reflection at mirror judged by eye to be equal (normal not required) ;</p> </div> </div>	2
9(d)	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>correct symbols for lamp and switch ;</p> <p>complete series circuit with no additional components ;</p> </div> </div>	2