



**Cambridge Assessment International Education**  
Cambridge International General Certificate of Secondary Education

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**COMBINED SCIENCE**

**0653/31**

Paper 3 Core Theory

**October/November 2019**

MARK SCHEME

Maximum Mark: 80

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**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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This document consists of **10** 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.

Question	Answer	Marks
1(a)(i)	B and C ;	1
1(a)(ii)	any two from: vacuoles ; cell walls ; chloroplasts ;	2
1(a)(iii)	white blood cell ; phagocytosis / description of phagocytosis ;	2
1(b)(i)	plasma ;	1
1(b)(ii)	glucose underlined ; oxygen underlined ;	2
1(b)(iii)	respiration ; lungs / alveoli ;	2

Question	Answer	Marks
2(a)(i)	A and it is on left of the Periodic Table ;	1
2(a)(ii)	C and B ;	1
2(b)	(element D) noble gases / Group VIII / Group 0 ; (element E) transition metals / transition elements ;	2
2(c)(i)	 reactants ; products ;	2
2(c)(ii)	to make sure all the acid is used up ;	1

Question	Answer	Marks
2(c)(iii)	(bond) ionic ; (explanation) (electron) transfer / loss <b>and</b> gain ;	2

Question	Answer	Marks
3(a)	gravitational kinetic kinetic electrical  1 or 2 correct = 1 mark 3 correct = 2 marks All correct = 3 marks	3
3(b)(i)	radio waves / microwaves ;	1
3(b)(ii)	visible light ;	1
3(c)(i)	<b>C and</b> because more waves in same time / higher frequency ;	1
3(c)(ii)	<b>A and</b> because waves have largest amplitude ;	1
3(c)(iii)	any value below 20 (Hz) ; Hz / hertz ;	2
3(c)(iv)	below the (normal) lower limit / frequency of human hearing ;	1

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)(i)	<i>any two from:</i> for photosynthesis ; transport in plants ; as a solvent ;	<b>2</b>
4(a)(ii)	cortex ; xylem ; mesophyll ;	<b>3</b>
4(b)	gravitropism ;	<b>1</b>
4(c)(i)	root continued and bending downwards ;	<b>1</b>
4(c)(ii)	roots respond to gravity;	<b>1</b>
4(d)	no light for photosynthesis ;	<b>1</b>

Question	Answer	Marks
5(a)(i)	hydrogen / H <sub>2</sub> ;	1
5(a)(ii)	increases ;	1
5(a)(iii)	increases ;	1
5(a)(iv)	increases ;	1
5(b)(i)	loses oxygen ;	1
5(b)(ii)	thermal (heat) energy absorbed/taken in ;	1
5(c)	<p style="text-align: center;"> <span style="margin-right: 100px;"><b>gas</b></span> <span><b>test</b></span> </p> <p style="margin-top: 20px;"> <span style="margin-right: 100px;">ammonia</span> <span>use damp red litmus paper</span> </p> <p style="margin-top: 20px;"> <span style="margin-right: 100px;">carbon dioxide</span> <span>use a glowing splint</span> </p> <p style="margin-top: 20px;"> <span style="margin-right: 100px;">oxygen</span> <span>use limewater</span> </p> <p style="margin-top: 20px;">           three correct lines = 2 marks            one or two lines correct = 1 mark         </p>	2

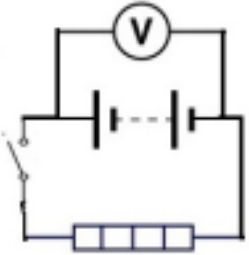
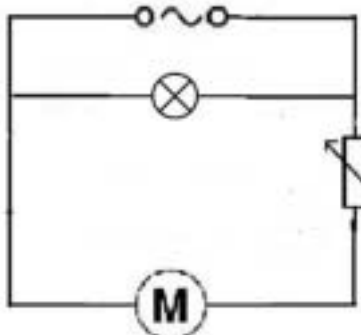
Question	Answer	Marks
6(a)(i)	Earth (only) ;	1

Question	Answer	Marks
6(a)(ii)	<i>(data selected from the table to show) any two from:</i> temperature on surface of Earth is above melting point of water ; temperature on surface of Earth is below boiling point of water ; temperature on Venus higher than boiling point of water (at 100 °C) ; temperature on Mars lower than melting point of water (at 0 °C) ;	2
6(b)(i)	(infrared) radiation ;	1
6(b)(ii)	(conduction and convection) need a medium to travel through / no medium in space ;	1
6(c)	time in hours = 365 x 24 ; speed = distance / time <b>or</b> $940 \times 10^6 / 365 \times 24$ ; = 107 306 / 107 000 (km/h) ;	3
6(d)	two converging rays ; coming to a focus at the burning grass;	2

Question	Answer	Marks
7(a)(i)	grass → cricket → frog → owl  organisms in correct order ; arrows in correct direction ;	2
7(a)(ii)	(an organism that) makes its own (organic) nutrients/food ; using energy from (sun)light / photosynthesis ;	2
7(b)	<i>any two from:</i> the breakdown of large, insoluble food molecules ; into small water-soluble molecules ; so (small molecules) can be absorbed ;	2
7(c)(i)	loss of shelter / loss of habitat / loss of food / reduction in population of part of food chain ;	1
7(c)(ii)	loss of soil / flooding / increase of carbon dioxide in the atmosphere ;	1



Question	Answer	Marks
8(a)(i)	fractional distillation ;	<b>1</b>
8(a)(ii)	compound/molecule that contains carbon and hydrogen ; only ;	<b>2</b>
8(a)(iii)	(raw material) to make chemicals ;	<b>1</b>
8(b)(i)	(test) copper((II)) sulfate <b>or</b> cobalt((II)) chloride ; (result) (white) turns blue (blue) turns pink ;	<b>2</b>
8(b)(ii)	toxic / poisonous (to humans/animals) / breathing difficulties / combines with haemoglobin in place of oxygen / reduces oxygen carrying capacity of the blood ;	<b>1</b>
8(b)(iii)	(percentage) $\leq 1\%$ ;	<b>1</b>
8(b)(iv)	nitrogen = 78% and oxygen = 21% <b>or</b> nitrogen + oxygen = 99% ;	<b>1</b>

Question	Answer	Marks
9(a)	 <p>correct choice of meter with symbol ; connection in parallel with cells ;</p>	2
9(b)	13 A ;	1
9(c)	arrow(s) from heater going upwards ;	1
9(d)	 <p>lamp in parallel with motor (above or below) ; variable resistor symbol ; variable resistor in series with motor only ;</p>	3