



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

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**CO-ORDINATED SCIENCES**

**0654/32**

Paper 3 Theory (Core)

**May/June 2018**

MARK SCHEME

Maximum Mark: 120

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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.

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**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.

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)(i)	<b>A</b> trachea ; <b>B</b> bronchi / bronchus ;	<b>2</b>
1(a)(ii)	label line to heart ;	<b>1</b>
1(b)	more oxygen ; less carbon dioxide ; less water vapour ;	<b>max 2</b>
1(c)	increased frequency / faster ; increased depth / deeper ;	<b>2</b>
1(d)	Any <b>two</b> of the following: nutrition ; excretion ; sensitivity ; reproduction ; growth ;	<b>max 2</b>

Question	Answer	Marks
2(a)(i)	temperature (reading) increases ; magnesium is lost ; gas released / bubbling ;	max 2
2(a)(ii)	magnesium chloride ;	1
2(b)(i)	(carbon dioxide) + magnesium → magnesium oxide + carbon ;	1
2(b)(ii)	carbon dioxide ; because carbon dioxide loses oxygen ;	2
2(c)(i)	$100 - (2.0 + 91.5 + 0.4 + 0.1) = 6 \text{ (g)}$ ;	1
2(c)(ii)	alloy is stronger / more resistant to corrosion ;	1
2(d)(i)	(horizontal) row of elements ;	1
2(d)(ii)	high density ; reference to coloured compounds ; reference to catalysis ;	max 2

Question	Answer	Marks
3(a)	(nucleus) splits ;	1
3(b)	stored in water tanks / encased in glass / deep burial ;	1
3(c)(i)	(resistance is) reduced ;	1
3(c)(ii)	change metal or change length ;	1
3(d)(i)	liquid – irregular arrangement and most touching ; gas – irregular arrangement and widely spaced ;	2
3(d)(ii)	<u>temperature</u> at which a liquid turns into a gas ;	1

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)(i)	cuticle <b>D</b> ;	<b>1</b>
4(a)(ii)	palisade mesophyll layer <b>G</b> ;	<b>1</b>
4(a)(iii)	label line and label <b>V</b> to vascular bundle ;	<b>1</b>
4(b)(i)	sugars / glucose, oxygen ;	<b>1</b>
4(b)(ii)	sunlight / light ;	<b>1</b>
4(b)(iii)	contain chloroplasts ; tightly packed ;	<b>max 1</b>
4(c)	stomata / stoma ; cell membrane / cytoplasm ;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(a)(i)	10 ;	<b>1</b>
5(a)(ii)	40 ;	<b>1</b>
5(a)(iii)	<b>B and C and</b> same atomic number / number of protons ;	<b>1</b>
5(a)(iv)	<b>E and</b> greatest number of protons / numbers of protons and electrons are equal ;	<b>1</b>
5(b)(i)	reference to increasing rate of reaction ; and remaining (chemically) unchanged ;	<b>2</b>
5(b)(ii)	ammonia is a compound / Periodic Table contains only elements / owtte ;	<b>1</b>
5(b)(iii)	covalent ; two non-metals ;	<b>2</b>
5(c)	8 ;	<b>1</b>

Question	Answer	Marks
6(a)(i)	<b>R</b> ;	<b>1</b>
6(a)(ii)	tractor is moving at constant speed ;	<b>1</b>
6(a)(iii)	(speed) = distance / time ; 1100 or $12 \times 60$ ; 1.53 m / s ;	<b>3</b>
6(b)	area of tyres greater for tractor ; (greater area means) smaller pressure for tractor ;	<b>2</b>
6(c)	refracted ray bends towards normal ; correct angle of incidence ; correct angle of refraction ;	<b>3</b>
6(d)	water molecules are moving / have a range of kinetic energies ; more energetic molecules escape ; break bonds / break forces of attraction between molecules ; ref to increased energy on a hot day ;	<b>max 3</b>



<b>Question</b>	<b>Answer</b>	<b>Marks</b>
7(a)(i)	2004 ;	<b>1</b>
7(a)(ii)	12911 – 7008 = 5903; (5903 / 12911) × 100 = 46(%) ;	<b>2</b>
7(b)	habitats / shelter / breeding areas destroyed ; loss of food source ; AVP;	<b>max 2</b>
7(c)	<u>natural selection</u> ;	<b>1</b>

Question	Answer	Marks
8(a)(i)	untreated water contains (harmful) microorganisms that cause illness / disease ; chlorine sterilises the water / kills microorganisms ;	<b>2</b>
8(a)(ii)	brown solution / brown or black ppt ; iodine displaced / chlorine more reactive than iodine ;	<b>2</b>
8(a)(iii)	no reaction <b>and</b> because argon is unreactive / inert / a noble gas ;	<b>1</b>
8(b)(i)	negative <b>and</b> chlorine is a non-metal / non-metals gain electrons ;	<b>1</b>
8(b)(ii)	add sodium hydroxide (solution) ; blue precipitate ;	<b>2</b>

Question	Answer	Marks
9(a)(i)	kilowatt ;	<b>1</b>
9(a)(ii)	1.16 (kW) ;	<b>1</b>
9(a)(iii)	any value between 10 and 12 ;	<b>1</b>
9(b)	lower pitch ;	<b>1</b>
9(c)(i)	solar / geothermal / tidal / HEP / waves ;	<b>1</b>
9(c)(ii)	goes upwards / rises ;	<b>1</b>
9(c)(iii)	radiation ;	<b>1</b>
9(c)(iv)	infra-red ;	<b>1</b>

Question	Answer			Marks															
10(a)	<table border="1" data-bbox="322 217 1330 572"> <thead> <tr> <th data-bbox="322 217 658 268">name of part</th> <th data-bbox="658 217 983 268">letter on Fig. 4.1</th> <th data-bbox="983 217 1330 268">function</th> </tr> </thead> <tbody> <tr> <td data-bbox="322 268 658 352">oviduct</td> <td data-bbox="658 268 983 352">A</td> <td data-bbox="983 268 1330 352"><i>where fertilisation occurs</i></td> </tr> <tr> <td data-bbox="322 352 658 403">ovary</td> <td data-bbox="658 352 983 403"><b>F</b></td> <td data-bbox="983 352 1330 403">releases egg</td> </tr> <tr> <td data-bbox="322 403 658 488">uterus lining / wall</td> <td data-bbox="658 403 983 488">E</td> <td data-bbox="983 403 1330 488"><i>where implantation occurs</i></td> </tr> <tr> <td data-bbox="322 488 658 572"><i>vagina</i></td> <td data-bbox="658 488 983 572">C</td> <td data-bbox="983 488 1330 572"><i>receives penis during intercourse</i></td> </tr> </tbody> </table> <p data-bbox="322 608 757 643">one mark for each correct row ;;;;</p>			name of part	letter on Fig. 4.1	function	oviduct	A	<i>where fertilisation occurs</i>	ovary	<b>F</b>	releases egg	uterus lining / wall	E	<i>where implantation occurs</i>	<i>vagina</i>	C	<i>receives penis during intercourse</i>	<b>4</b>
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10(b)(i)	nuclei ;			<b>1</b>															
10(b)(ii)	number of cells increases / forms ball of cells ; moves into uterus :			<b>2</b>															
10(c)	requires two parents ; produces, genetically different offspring / variation ; involves gametes ;			<b>max 2</b>															

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
11(a)(i)	petroleum / crude oil ;	<b>1</b>
11(a)(ii)	<u>fractional distillation</u> ;	<b>1</b>
11(a)(iii)	alkane ; saturated ; single ;	<b>3</b>
11(b)(i)	nitrogen 78 ; oxygen 21 ;	<b>2</b>
11(b)(ii)	(products of) combustion ; (combustion of) hydrocarbon / fuel ;	<b>2</b>
11(b)(iii)	carbon monoxide ; nitrogen oxides / or specific / or NO <sub>x</sub> ; sulfur dioxide ;	<b>max 2</b>

Question	Answer	Marks
12(a)	electrical kinetic thermal energy sound  one, two or three correct ; all four correct ;	2
12(b)(i)	13 A ; must be greater than maximum theoretical current / 9A ;	2
12(b)(ii)	protects device if too much current / prevents too much current ;	1
12(c)	$R = V / I$ or $230 / 4.5$ ; $= 51.1$ ; ohms / $\Omega$ ;	3
12(d)(i)	steel magnetises more slowly / loses magnetism more slowly / iron magnetises more quickly / loses magnetism quicker ;	1
12(d)(ii)	(volume) = $13 \times 13 \times 13 = 2197 \text{ (cm}^3\text{)}$ ;	1
12(d)(iii)	mass = density $\times$ volume or $7.80 \times 2197$ ; $= 17136.6 \text{ (g)}$ ;	2

Question	Answer	Marks
13(a)	<p><i>from 0–10 minutes</i> increases rapidly / increases until 190 mg / 100 cm<sup>3</sup> ;</p> <p><i>from 10–30 minutes</i> decreases rapidly / decreases until 100 mg / 100 cm<sup>3</sup> ;</p> <p><i>from 30–60 minutes</i> increases and levels off / stabilises ;</p>	<b>3</b>
13(b)	<p>glucose + oxygen → carbon dioxide + water</p> <p>left-hand side correct ; right-hand side correct ;</p>	<b>2</b>
13(c)	adrenaline ;	<b>1</b>
13(d)	<p>travels in the blood ; to target organ ; travels to the liver (to be destroyed) ;</p>	<b>max 2</b>