



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

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**CO-ORDINATED SCIENCES**

**0654/33**

Paper 3 Theory (Core)

**October/November 2019**

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.

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 **16** 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.

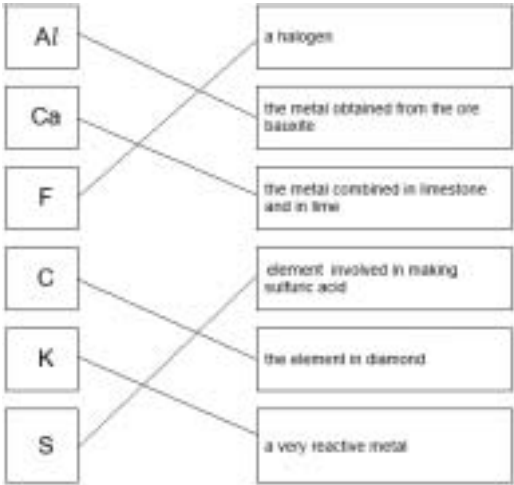
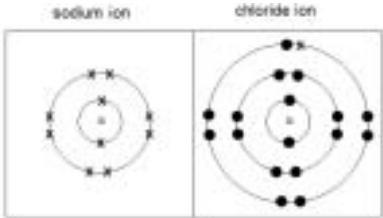
**GENERIC MARKING PRINCIPLE 5:**

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)	septum ;	1										
1(a)(ii)	valve;	1										
1(a)(iii)	arrow pointing into the heart from the pulmonary vein ; (furthest right blood vessel)	1										
1(b)	<table border="1"> <thead> <tr> <th data-bbox="344 403 669 469">component of blood</th> <th data-bbox="669 403 1234 469">function</th> </tr> </thead> <tbody> <tr> <td data-bbox="344 469 669 534">white blood cell ;</td> <td data-bbox="669 469 1234 534">antibody production and phagocytosis</td> </tr> <tr> <td data-bbox="344 534 669 600">platelets ;</td> <td data-bbox="669 534 1234 600">promotes blood clotting</td> </tr> <tr> <td data-bbox="344 600 669 665">plasma ;</td> <td data-bbox="669 600 1234 665">transport of dissolved nutrients</td> </tr> <tr> <td data-bbox="344 665 669 730">red blood cell ;</td> <td data-bbox="669 665 1234 730">transport of oxygen</td> </tr> </tbody> </table>	component of blood	function	white blood cell ;	antibody production and phagocytosis	platelets ;	promotes blood clotting	plasma ;	transport of dissolved nutrients	red blood cell ;	transport of oxygen	4
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white blood cell ;	antibody production and phagocytosis											
platelets ;	promotes blood clotting											
plasma ;	transport of dissolved nutrients											
red blood cell ;	transport of oxygen											
1(c)	xylem ; phloem ;	2										
1(d)	evaporation ; diffusion ; stomata ;	3										

Question	Answer	Marks						
2(a)	 <p>1 correct ;                  3 correct ;;                  5 correct ;;;</p>	3						
2(b)	<table style="margin-left: 40px;"> <tr> <td>n</td> <td>e</td> </tr> <tr> <td>Be</td> <td>5 4</td> </tr> <tr> <td>B</td> <td>6 5</td> </tr> </table> <p>;;</p>	n	e	Be	5 4	B	6 5	2
n	e							
Be	5 4							
B	6 5							
2(c)	 <p>sodium ion correct ;                  chloride ion correct ;</p>	2						
2(d)(i)	burette ;	1						

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(d)(ii)	sodium hydroxide ; hydrochloric (acid) ;	<b>2</b>
2(d)(iii)	>7 up to 14 ;	<b>1</b>

Question	Answer	Marks
3(a)(i)	gravitational potential <b>and</b> kinetic ; constant ; friction ;	<b>3</b>
3(a)(ii)	$s = d / t$ or $30 / 1.7$ ; 18 (m / s) ;	<b>2</b>
3(a)(iii)	Earth ;	<b>1</b>
3(b)(i)	it slows it down / causes it to decelerate ;	<b>1</b>
3(b)(ii)	148 (J) ;	<b>1</b>
3(c)(i)	water stored behind the dam flows through turbines / water used to provide KE to turbines / GPE to kinetic energy ; turbines turn generators to produce electricity ;	<b>2</b>
3(c)(ii)	they contract, get shorter ;	<b>1</b>
3(c)(iii)	zero, none ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)(i)	A – too cold / AW; B – not enough water / AW ;	<b>2</b>
4(a)(ii)	light is not needed for germination ;	<b>1</b>
4(b)	glucose + oxygen → carbon dioxide + water ;;	<b>2</b>
4(c)	protein synthesis, cell division, growth ticked ;; 1 or 2 correct = 1 mark, 3 correct = 2 marks	<b>2</b>
4(d)	sensitivity ; movement ;	<b>2</b>



Question	Answer	Marks
5(a)(i)	alloy ;	1
5(a)(ii)	<b>two</b> from: malleable ; ductile ; good electrical conductors ; good thermal conductors ; high m.pt / b.pt. ; high density ;  <b>max 2</b>	2
5(a)(iii)	transition elements / metals ;	1
5(b)	calcium and magnesium more reactive than carbon (so no reaction) ; carbon more reactive than copper and lead (so reaction observed) ;	2
5(c)	<b>zinc oxide</b> has lost oxygen and so is reduced ; carbon has gained oxygen and so is oxidised ;	2

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(a)(i)	bring the known pole of the magnet towards the unknown pole of the other magnet; if it attracts it is the opposite pole OR if it repels it is the like pole;	<b>2</b>
6(a)(ii)	complete field lines drawn (at least two to top, two to bottom); incomplete field lines drawn; arrows showing direction N to S;	<b>3</b>
6(b)	amplitude – increases; frequency – decreases;	<b>2</b>
6(c)	20 Hz to 20 000 Hz;	<b>1</b>

Question	Answer	Marks
7(a)	test 1 ✓, test 2–4 X ;	1
7(b)	iodine solution ; blue-black ;	2
7(c)	ref to diffusion ; higher concentration of oxygen inside the cell / ORA ; oxygen moves down a concentration gradient / from high to low concentration ; across the <u>cell</u> membrane / <u>cell</u> wall ;  <b>max 3</b>	3
7(d)(i)	D ;	1
7(d)(ii)	chloroplast ;	1
7(d)(iii)	cell membrane ; nucleus ; cytoplasm ;  <b>max 2</b>	2

Question	Answer	Marks
8(a)(i)	nitrogen 78% + oxygen 21% = 99% / or equivalent ; so other gases = 100 – 99 = 1% ;	2
8(a)(ii)	any noble gas ;	1
8(a)(iii)	reference to full outer shell ;	1
8(a)(iv)	sulfur dioxide / SO <sub>2</sub> ; carbon monoxide / CO ; nitrogen oxides (named oxide) / NO <sub>x</sub> ;  <b>max 2</b>	2
8(b)(i)	electrolyte ;	1
8(b)(ii)	hydrogen ;	1
8(c)(i)	→ calcium chloride ; + carbon dioxide + water ;	2
8(c)(ii)	80 ÷ 50 = 1.6 (cm <sup>3</sup> / s) ;	1
8(c)(iii)	decrease temperature / decrease acid concentration / decrease surface area of calcium carbonate ;	1

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
9(a)(i)	alpha, $\alpha$ ;	<b>1</b>
9(a)(ii)	background radiation ;	<b>1</b>
9(b)	working seen on graph, evidence of halving the activity ; 1 hour ;	<b>2</b>
9(c)(i)	symbol for voltmeter ; in parallel with lamp ;	<b>2</b>
9(c)(ii)	current is increased ;	<b>1</b>
9(c)(iii)	electrons ;	<b>1</b>

Question	Answer	Marks			
10(a)(i)	area of land cleared / deforestation, increase then decreases ; data quote / peak in 2004 / peak at 27 000;	<b>2</b>			
10(a)(ii)	$(12000 - 7000) = 5000$ ; $(5000 / 12000 \times 100) = 42\%$ ;	<b>2</b>			
10(b)	combustion of fuels ;	<b>1</b>			
10(c)(i)	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>pollutant</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">chemical waste</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">fertiliser</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">rubbish (solid waste)</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">untreated sewage</div> <p>⋮</p> </td> <td style="width: 10%; text-align: center; vertical-align: middle;"> <p>source</p> </td> <td style="width: 40%; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">crop plant agriculture</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">domestic / household waste</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">human and animal waste</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">industries</div> </td> </tr> </table>	<p>pollutant</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">chemical waste</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">fertiliser</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">rubbish (solid waste)</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">untreated sewage</div> <p>⋮</p>	<p>source</p>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">crop plant agriculture</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">domestic / household waste</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">human and animal waste</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">industries</div>	<b>3</b>
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10(c)(ii)	spread of disease / reduction of dissolved oxygen / algal bloom / bacterial growth ;	<b>1</b>			

Question	Answer	Marks
11(a)	(ethanol) hydrocarbons contain only carbon and hydrogen / do not contain oxygen / (ethanol) contains oxygen ;	1
11(b)(i)	<b>L</b> and <b>P</b> ;	1
11(b)(ii)	reaction with (aqueous) bromine ; alkanes – no reaction / remains orange / coloured and alkenes – orange to colourless / bromine decolourised ;	2
11(c)(i)	steam / H <sub>2</sub> O ;	1
11(c)(ii)	increases reaction rate ;	1
11(d)(i)	fermentation ;	1
11(d)(ii)	carbon dioxide ;	1
11(d)(iii)	<u>distillation</u> ;	1

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Question	Answer	Marks
12(a)(i)	vibrate faster;	1
12(a)(ii)	a metal rod would cause a short circuit / it is an electrical conductor; <b>or</b> ceramic rod would prevent short circuit / as it is an insulator ; <b>max 1</b>	1
12(a)(iii)	convection; radiation;	2
12(b)(i)	damaged cable / insulation (on cable to electric heater); overloaded socket / overheating of cables / overheating of plug (to mains socket);	2
12(b)(ii)	13;	1
12(b)(iii)	to protect the electrical circuit, to provide electrical safety to the user;	1
12(c)(i)	visible in middle box; infrared in 5th box;	2
12(c)(ii)	number of waves (passing a point) per unit time;	1
12(d)	12 ( $\Omega$ );	1