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**CO-ORDINATED SCIENCES**

**0654/32**

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.

**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)	white blood cell labelled ;	<b>1</b>
1(a)(ii)	red blood cell ;	<b>1</b>
1(b)(i)	12 ;	<b>1</b>
1(b)(ii)	pathogen was destroyed ;	<b>1</b>
1(c)	line decreasing / flat from 15–20 days ; line shown increasing (and decreasing) ;	<b>2</b>
1(d)	blood clotting ;	<b>1</b>

Question	Answer	Marks
2(a)(i)	electrons have (virtually) zero mass ;	<b>1</b>
2(a)(ii)	argon / Ar ;  <i>and then one from</i> there are 18 electrons / (and so) 18 protons (in the atom) ; so the proton number / atomic number = 18 (and so is argon) ; eight outer electrons so Group VIII and three shells so third period ;	<b>2</b>
2(a)(iii)	outer (electron) shell is full / no need to lose or gain electrons for stability / owtte ;	<b>1</b>
2(b)(i)	mass of oxygen is added to the mass of calcium / owtte ;	<b>1</b>
2(b)(ii)	mixture pH is >7 to 14 ; mixture is alkaline / mixture contains calcium hydroxide / it is a metal oxide / it is a basic oxide ;	<b>2</b>

Question	Answer	Marks
3(a)	stopwatch ;	1
3(b)(i)	X anywhere on horizontal section ;	1
3(b)(ii)	at $t = 0$ s or $t = 110$ s ;	1
3(b)(iii)	as the gradient is steeper / changed speed in a shorter period of time ;	1
3(b)(iv)	use of area under graph or $0.5 \cdot 15 \cdot 4$ ; $= 30$ (m) ;	2
3(c)(i)	correct symbols for cell and switch ; all connected in series ;	2
3(c)(ii)	$V = IR$ , $I = V / R$ , $6 / 2$ ; 3 (A) ;	2
3(c)(iii)	20 (Hz) to 20 000 (Hz) ;	1

Question	Answer	Marks
4(a)	cells ; molecules ; energy ;	<b>3</b>
4(b)(i)	B and C ;	<b>1</b>
4(b)(ii)	line drawn between carbon in plants and carbon dioxide in the atmosphere ; arrowhead pointing towards carbon in plants ;	<b>2</b>
4(c)	loss of shelter / habitat ; extinction ; loss of food source ; avp ;  <b>max 2</b>	<b>2</b>

Question	Answer	Marks
5(a)(i)	sulfur dioxide ;	<b>1</b>
5(a)(ii)	causes acid rain ; effect of acid rain ; causes respiratory problems (in humans) ;  <b>max 2</b>	<b>2</b>
5(a)(iii)	carbon monoxide ; oxides of nitrogen / NO <sub>x</sub> / named oxide of nitrogen ;	<b>2</b>
5(b)(i)	chromatography ;	<b>1</b>
5(b)(ii)	water moves up the paper ; dyes carried along with the water / dyes dissolve in the water ; different dyes move at different speeds / move to different heights ;	<b>3</b>
5(b)(iii)	three spots vertically in a line above the letter <b>P</b> ; shape, shading and heights of the spots all a reasonable attempt to reproduce the individual spots for <b>Q R</b> and <b>S</b> ;	<b>2</b>
5(b)(iv)	the impurities may be poisonous / impurities affect the colour ;	<b>1</b>



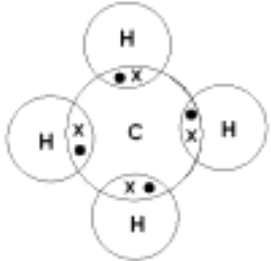
Question	Answer	Marks
6(a)(i)	$\rho = m / v$ or $200 / 250$ ; $0.8 \text{ (g / cm}^3\text{)}$ ;	<b>2</b>
6(a)(ii)	$W = mg$ , $0.200 \cdot 10$ ; $2 \text{ (N)}$ ;	<b>2</b>
6(b)(i)	the position of the COM in A is not through the centre of the tower base / COM is not directly above the base ; it is unstable, (or opposite for B) ;	<b>2</b>
6(b)(ii)	it is lifted up through the furthest distance compared to the other blocks ;	<b>1</b>
6(b)(iii)	gravitational potential ;	<b>1</b>
6(c)	$s = d / t$ ; $(39 + 39) / 0.25$ ; $310 \text{ m / s}$ ;	<b>3</b>

Question	Answer	Marks
7(a)(i)	<i>part A</i> blue-black ; <i>part B</i> orange / yellow / brown ;	<b>2</b>
7(a)(ii)	light ;	<b>1</b>
7(b)	(magnesium ions are) needed for production of chlorophyll ; chlorophyll is necessary for photosynthesis ;	<b>2</b>
7(c)(i)	(water enters) through the <u>root hair cell</u> ; by osmosis ;	<b>2</b>
7(c)(ii)	ref. to transpiration ; evaporation of water (from mesophyll cells) ; diffusion (of water vapour) ; through the stomata ;  <b>max 3</b>	<b>3</b>

Question	Answer	Marks
8(a)(i)	electrolysis ;	1
8(a)(ii)	electrolyte labelled anywhere ; negative electrode labelled ;	2
8(a)(iii)	chlorine / hydrogen ;	1
8(b)(i)	sodium oxide / hydroxide / carbonate ;	1
8(b)(ii)	alkanes (relatively) unreactive / alkanes do not react with sodium ;	1
8(c)(i)	pH 7 ; <u>green</u> ;	2
8(c)(ii)	squeaky pop ; hydrogen ;	2
8(d)(i)	ionic / electrovalent ;	1
8(d)(ii)	$2 \text{ Na} + \text{Br}_2 \rightarrow 2 \text{ NaBr}$ ;	1

Question	Answer	Marks
9(a)(i)	proton <b>and</b> neutron ;	<b>1</b>
9(a)(ii)	nucleon number / mass number ; atomic number / proton number ;	<b>2</b>
9(a)(iii)	atomic number / proton number is the same ;	<b>1</b>
9(b)(i)	visible light in the centre box ;	<b>1</b>
9(b)(ii)	Volts, V ;	<b>1</b>
9(c)	solid then gas then liquid 1 mark for 1 correct ; 2 marks for all 3 correct ;	<b>2</b>

Question	Answer	Marks								
10(a)(i)	<table border="1" data-bbox="286 252 887 533"> <tr> <td data-bbox="286 252 600 320">sensory neurone cut</td> <td data-bbox="600 252 887 320">motor neurone cut</td> </tr> <tr> <td data-bbox="286 320 600 395">✓</td> <td data-bbox="600 320 887 395"></td> </tr> <tr> <td data-bbox="286 395 600 464"></td> <td data-bbox="600 395 887 464"></td> </tr> <tr> <td data-bbox="286 464 600 533"></td> <td data-bbox="600 464 887 533">✓</td> </tr> </table> <p data-bbox="286 571 315 603">;;</p>	sensory neurone cut	motor neurone cut	✓					✓	<b>2</b>
sensory neurone cut	motor neurone cut									
✓										
	✓									
10(a)(ii)	automatic circled ; rapid circled ;	<b>2</b>								
10(b)	in the form of an electrical signal ;	<b>1</b>								
10(c)	brain ; spinal cord ;	<b>2</b>								
10(d)	gland ;	<b>1</b>								

Question	Answer	Marks
11(a)(i)	<u>fractional distillation</u> ;	<b>1</b>
11(a)(ii)	(physical) no new substances produced / only changes of state involved ;	<b>1</b>
11(a)(iii)	refinery gas heating / cooking / other correct ; bitumen surfacing roads / water-proofing / other correct ;	<b>2</b>
11(b)	the idea that single substances (hexane) have a single boiling point but mixtures (gasoline) boil over a temperature range ;	<b>1</b>
11(c)(i)	 <p>1 mark symbols correct ; 1 mark bonding pairs correct ;</p>	<b>2</b>
11(c)(ii)	only single bonds ;	<b>1</b>
11(c)(iii)	ethene ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
12(a)	evaporation ;	<b>1</b>
12(b)(i)	due to a change of speed ;	<b>1</b>
12(b)(ii)	angle drawn between the normal and the ray from the object <b>and</b> labelled with the letter 'i' ;	<b>1</b>
12(c)	frequency ; amplitude ; wavelength ;	<b>3</b>
12(d)(i)	slows down ;	<b>1</b>
12(d)(ii)	constant ;	<b>1</b>
12(e)	molecules gain KE / move apart ; liquid expands ;	<b>2</b>

Question	Answer			Marks															
13(a)	<table border="1" data-bbox="286 252 1216 582"> <thead> <tr> <th data-bbox="286 252 577 322">part</th> <th data-bbox="577 252 824 322">letter in Fig. 5.1</th> <th data-bbox="824 252 1216 322">function</th> </tr> </thead> <tbody> <tr> <td data-bbox="286 322 577 386">sepal</td> <td data-bbox="577 322 824 386">E</td> <td data-bbox="824 322 1216 386">protects flower when in bud</td> </tr> <tr> <td data-bbox="286 386 577 450">anther</td> <td data-bbox="577 386 824 450">C</td> <td data-bbox="824 386 1216 450">produces pollen</td> </tr> <tr> <td data-bbox="286 450 577 513">petal</td> <td data-bbox="577 450 824 513">A</td> <td data-bbox="824 450 1216 513">attracts insects</td> </tr> <tr> <td data-bbox="286 513 577 582">ovary</td> <td data-bbox="577 513 824 582">D</td> <td data-bbox="824 513 1216 582">produces ovules</td> </tr> </tbody> </table> <p data-bbox="286 625 315 651">...</p>			part	letter in Fig. 5.1	function	sepal	E	protects flower when in bud	anther	C	produces pollen	petal	A	attracts insects	ovary	D	produces ovules	<b>3</b>
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ovary	D	produces ovules																	
13(b)	ref to pollen and ovule ; fusion of nuclei ;			<b>2</b>															
13(c)	zygote ;			<b>1</b>															
13(d)	<b>1 and 2 ;</b>			<b>1</b>															