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**COMBINED SCIENCE**

**0653/42**

Paper 4 Extended 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 **12** 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.

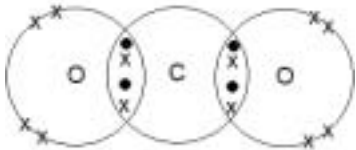
**GENERIC MARKING PRINCIPLE 5:**

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.

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)(i)	$(1.5 - 0.6 =) 0.9 \text{ (dm}^3\text{)}$ ;	<b>1</b>
1(a)(ii)	(increase in breaths) = 2 breaths (over 12 seconds) ; $\times 60 / 12 = 10$ ;	<b>2</b>
1(b)	increase ; (aerobic) <u>respiration</u> increases during exercise ;	<b>2</b>
1(c)	combines with haemoglobin / reduces the amount of oxygen able to combine with haemoglobin ; reduces amount of oxygen being transported (by blood / red cells) ;	<b>2</b>
1(d)	lung cancer / COPD / emphysema / bronchitis ;	<b>1</b>

Question	Answer	Marks
2(a)(i)	molecules contain carbon and hydrogen (only) / are hydrocarbons / are covalent ;	1
2(a)(ii)	fraction A molecules are smaller / have fewer carbon atoms / have lower intermolecular forces ;	1
2(b)(i)	family of compounds with the same general formula ; similar chemical properties ;	2
2(b)(ii)	<pre>       H   H   H                 H — C — C — C — H                       H   H   H           </pre> 3 carbon atoms in chain ; all else correct ;	2
2(c)(i)	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ ; correct formulae ; correctly balanced ;	2
2(c)(ii)	global warming / climate change / consequence of climate change / <u>enhanced</u> greenhouse effect ;	1
2(c)(iii)	 two shared pairs of electrons between oxygen and carbon ; all else correct ;	2

Question	Answer	Marks
3(a)(i)	The extension (of an elastic object) is (directly) proportional to the force (applied to it) ;	<b>1</b>
3(a)(ii)	correct calculation of extension $x = 0.04$ <b>or</b> spring constant $k = 50$ ; $(F = kx = 50 \times 0.06) = 3.0$ (N) ;	<b>2</b>
3(a)(iii)	use of work done = force $\times$ distance ; $(W = Fx = 0.75 \times 0.015) = 0.011$ (J) ;	<b>2</b>
3(b)(i)	use of conservation of energy ( $mgh = KE = 2$ ) ; $0.125 \times 10 \times h = 2$ ; $= 1.6$ (m) ;	<b>3</b>
3(b)(ii)	friction / air resistance ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)(i)	nucleus correctly labelled ; cell membrane correctly labelled ;	<b>2</b>
4(a)(ii)	large surface area ; increases <u>rate</u> of water uptake ;	<b>2</b>
4(b)(i)	needed to make amino acids ;	<b>1</b>
4(b)(ii)	across root cortex ; up stem ; in xylem ;	<b>Max. 2</b>
4(c)(i)	rickets / soft (and deformed) bones ;	<b>1</b>
4(c)(ii)	butter / margarine / egg (yolks) / milk ;	<b>1</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(a)(i)	bauxite ;	<b>1</b>
5(a)(ii)	$Al_3^+$ ;	<b>1</b>
5(a)(iii)	(positive) aluminium ions move to / are attracted to (negative) cathode ; and gain (three) electrons ;	<b>2</b>
5(a)(iv)	aluminium is too reactive / aluminium above carbon in reactivity series / aluminium is more reactive than carbon ;	<b>1</b>
5(b)	(alloys are) stronger / more resistant to corrosion ;	<b>1</b>



Question	Answer	Marks
6(a)	Use of $P = IV$ ; (750 / 240 =) $I = 3.1$ (25) (A) ; 5 A fuse just higher than required operating current so appropriate / 3 A fuse too low and would blow under normal working conditions / 13 A fuse too high and would not blow until much higher than operating current ;	<b>3</b>
6(b)	(when the switch is down) additional resistor (in motor branch of circuit) ; potential difference across motor decreases (because some p.d. across resistor) ; current (in motor) decreases (so motor speed is slow) ; <b>ora</b>	<b>3</b>
6(c)	hairdryer blows evaporated water molecules away so they cannot fall back onto the hair again ; hairdryer heats the water molecules on the hair so they have increased KE and can evaporate faster ;	<b>2</b>

Question	Answer	Marks
7(a)(i)	(lipase) breaks down fats (in the milk) ; to produce fatty acids ;	<b>1</b>
7(a)(ii)	the breakdown of large insoluble molecules ; into small soluble molecules that can be absorbed ;	<b>2</b>
7(a)(iii)	pancreas / small intestine ;	<b>1</b>
7(b)	enzyme is <u>denatured</u> ;  enzyme (molecule) has changed shape / destroyed substrate no longer fits active site <b>or</b> active site shape has changed ; substrate no longer fits enzyme (molecule) ;	<b>3</b>
7(c)	food is broken down into smaller pieces ; without chemical change / without action of enzymes / it is a physical change ;	<b>2</b>

Question	Answer	Marks
8(a)(i)	85 ;	1
8(a)(ii)	7 ; group VII element / halogen ;	2
8(a)(iii)	KAt ;	1
8(b)(i)	thermal energy released / temperature increased / chemical energy converted to thermal energy ; more energy released during bond formation than energy required for bond breaking ;	2
8(b)(ii)	alternating Cl <sup>-</sup> and Na <sup>+</sup> ions ;	1
8(b)(iii)	(NaCl) ionic so attractive forces between ions are strong more thermal energy (heat) needed to separate ions <b>or</b> (chlorine) covalent so attractive forces between molecules are weak ; less thermal energy (heat) needed to separate molecules ;	2

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
9(a)	visible light in correct position ; ultraviolet in correct position ;	<b>2</b>
9(b)	use of distance = speed $\times$ time ; (330 $\times$ 10) = 3300 m ;	<b>2</b>
9(c)	use of $Q = I t$ ; (30 000 $\times$ 0.00005) = 1.5 ; coulombs / C ;	<b>3</b>
9(d)(i)	electron(s) ;	<b>1</b>
9(d)(ii)	hair becomes (electrostatically) charged (due to transfer of electrons) ; like charges repel (causing hair to stand on end) ;	<b>2</b>