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**COMBINED SCIENCE**

**0653/42**

Paper 4 Extended Theory

**March 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 March 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 **9** 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:**

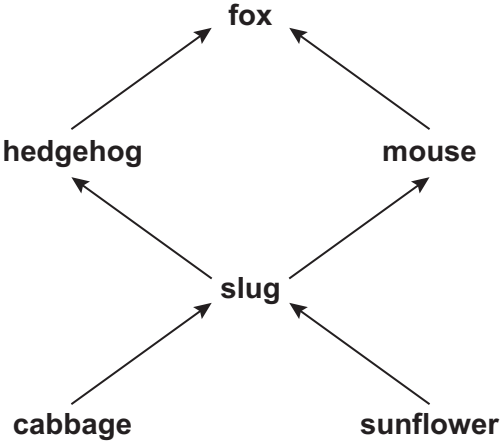
Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**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)	trophic levels in boxes in the order producer, primary consumer, secondary consumer, tertiary consumer ;	<b>1</b>
1(a)(ii)	<p><i>food web drawn as follows</i></p>  <pre> graph BT     cabbage --&gt; slug     sunflower --&gt; slug     slug --&gt; hedgehog     slug --&gt; mouse     hedgehog --&gt; fox     mouse --&gt; fox   </pre> <p>all organisms correct ; arrows pointing in the correct direction ;</p>	<b>2</b>
1(a)(iii)	any two from respiration / heat ; not all (prey) eaten ; not all (prey) digested / ref. to egestion (of faeces) ; excretion of waste products / urine ;	<b>max 2</b>
1(b)(i)	carbohydrates, proteins ;	<b>1</b>
1(b)(ii)	prevents constipation / owtte ;	<b>1</b>
1(b)(iii)	apple ;	<b>1</b>
1(c)	<b>lack of</b> vitamin C ;	<b>1</b>

Question	Answer	Marks
1(d)(i)	(person <b>B</b> ) reference to a more active occupation ;	<b>1</b>
1(d)(ii)	(person <b>C</b> ) males need more energy than females ;	<b>1</b>

Question	Answer	Marks
2(a)(i)	fraction <b>O</b> molecules are larger / have more carbon atoms; fraction <b>O</b> has higher bp / is liquid not gas; fraction <b>O</b> is more viscous; fraction <b>O</b> molecules have stronger intermolecular attractive forces; fraction <b>O</b> is less flammable ; fraction <b>O</b> has higher density ;	<b>max 2</b>
2(a)(ii)	heat / high temperature / temp of 450 °C etc. <b>or</b> high pressure / 200 atm <b>or</b> catalyst;	<b>1</b>
2(b)	x = 3; y = 6;	<b>2</b>
2(c)	four hydrogen atoms used two attached to each carbon; two bonding pairs between carbon atoms; single bonding pair between each carbon and hydrogen;	<b>3</b>
2(d)	(family of compounds with) the same general formula ; similar (chemical) properties ;	<b>2</b>

Question	Answer	Marks
3(a)	X at point where curve touches x axis the first time ;	1
3(b)(i)	weight of ball = force downwards = $0.12 \times 10 = 1.2 \text{ N}$ ; resultant force = $8.4 - 1.2 = 7.2 \text{ N}$ ;	2
3(b)(ii)	gain in height by ball = $4.1 - 1.4 = 2.7 \text{ m}$ ; gain in PE = $mgh = 0.12 \times 10 \times 2.7$ ; = $3.24 \text{ (J)}$ ;	3
3(c)(i)	$\frac{1}{2} mv^2$ ;	1
3(c)(ii)	$(\frac{1}{2} mv^2) = \frac{1}{2} \times 0.12 \times 8^2$ ;  = $3.84 \text{ (J)}$ ;	2

Question	Answer	Marks
4(a)	prevents backflow of blood ; from ventricle to atrium ;	2
4(b)(i)	produced by respiration / in body cells ; the idea that blood has come from the body (to heart) ;	2
4(b)(ii)	oxygen collected at the lungs / the idea that oxygenated blood comes from the lungs (to the left hand side) ;	1
4(c)(i)	blockage / narrowing of artery ; reference to coronary (arteries) ;	2
4(c)(ii)	avoid smoking ; reduce stress ; reduce fat in diet ; reference to exercise ;	max 1

Question	Answer	Marks
5(a)(i)	transition metals / elements ;	1
5(a)(ii)	electrons = 26 ;	1
5(b)	stronger more resistant to corrosion ;	1
5(c)(i)	coke / carbon ;	1
5(c)(ii)	Fe <sub>2</sub> O <sub>3</sub> ;	1
5(c)(iii)	iron oxide / Fe <sup>3+</sup> reduced ; carbon monoxide oxidised ;	2
5(c)(iv)	aluminium is <b>too</b> reactive / aluminium is above carbon in reactivity series ;	1
5(c)(v)	(increases) global warming / climate change / consequence of climate change described ;	1
5(d)	iron and sulfuric acid ; <b>or</b> iron oxide / iron (III) oxide and (dilute) sulfuric acid ;	1

Question	Answer	Marks
6(a)	8 (A) ; 4 A in each identical heater in parallel adds to 8 A ;	2
6(b)(i)	(warmer) molecules vibrate faster / gain kinetic energy ; the idea that energy is passed from molecule to molecule ;	2
6(b)(ii)	molecules in air gain (kinetic) energy (from collisions with wood) ; (faster) molecules transfer energy to more molecules by collision ; (faster) molecules move further apart ; so (warmer) air has lower density ;	max 3
6(c)	gap opens again / re-appears ; solids contract on cooling / as temperature falls ;	2

Question	Answer	Marks
7(a)	hangs outside (of flower) ; so wind can reach it ;	2
7(b)	<b>F</b> wind-pollinated – grain is smooth so it travels through the air easily / with less friction ;	1
7(c)	pollination – transfer of pollen (from anther to stigma) ; fertilisation – fusion of <b>nuclei</b> ;	2
7(d)(i)	<u>palisade</u> (cells) ;	1
7(d)(ii)	contain chloroplasts / chlorophyll ;	1
7(d)(iii)	in the <u>phloem</u> ;	1

Question	Answer	Marks
8(a)(i)	<b>X</b> anywhere on horizontal part of graph ;	1
8(a)(ii)	curved portion steeper and horizontal line at same volume ;	1
8(a)(iii)	rate of reaction faster (so steeper curve) ; same final volume of gas (so horizontal line at same height (volume)) ;	2
8(b)	456 (g) ;	1
8(c)	chlorine ;	1



Question	Answer	Marks
9(a)	$E = V \times I \times t$ ; time in seconds = $60 \times 60 \times 12 / 43200$ ; $E = 240 \times 0.5 \times 8 \times 60 \times 60 \times 12 = 41\,472\,000 \text{ J} / 41(.5) \text{ MJ}$ ;	<b>3</b>
9(b)(i)	$3.0 \times 10^8 \text{ m/s}$ ;	<b>1</b>
9(b)(ii)	$v = f\lambda$ ; $f (= v/\lambda) = 3 \times 10^8 / 589 \times 10^{-9} = 5.09 \times 10^{14} \text{ (Hz)}$ ;	<b>2</b>
9(c)	transverse wave vibrations at right angles to direction of travel, longitudinal in same direction as direction of travel ;	<b>1</b>
9(d)(i)	(ultraviolet) shorter wavelength than violet / visible ;	<b>1</b>
9(d)(ii)	<b>skin</b> cancer / burning of <b>skin</b> / other known hazard ;	<b>1</b>