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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/43**

Paper 4 Extended Theory **May/June 2019**

MARK SCHEME

Maximum Mark: 80

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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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.

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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.

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Question	Answer	Marks
1(a)	gas **X** oxygen (no mark) reduces in expired air (so oxygen used in respiration) ; gas **Y** carbon dioxide (no mark) increases in expired air (so carbon dioxide released in respiration) ;	**2**
1(b)	any two of large surface area ; thin walls ; good blood supply ; good ventilation with air ;	**max 2**
1(c)	goblet cells secrete mucus ; mucus traps pathogens and particles ; cilia sweep mucus out of the trachea ;	**3**
1(d)	chronic obstructive pulmonary disease / COPD ; lung cancer ; coronary heart disease ;	**max 2**

Question	Answer	Marks
2(a)(i)	arrow from reactant energy level to the top of the curve ;	**1**
2(a)(ii)	reactants have less chemical energy than products ;	**1**
2(a)(iii)	**high** temperature / **high** pressure / catalyst ;	**1**
2(b)	family of compounds with a general formula ; similar chemical properties ;	**2**

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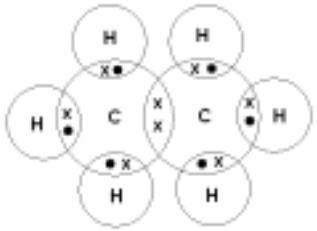
Question	Answer	Marks
2(c)	 six hydrogen atoms, three attached to each carbon ; one bonding pair between carbon atoms ; single bonding pairs between each carbon and hydrogen ;	3
2(d)	global warming / enhanced greenhouse effect / climate change / named consequence of climate change ;	1
2(e)	$C^2H^4 + 3O^2 \rightarrow 2CO^2 + 2H^2O$ all formulae correct ; balanced (dependent on correct formulae) ;	2

Question	Answer	Marks
3(a)(i)	arrow pointing from right to left ;	1
3(a)(ii)	has to be an (equal and) opposite upward force / owtte ;	1
3(b)(i)	acceleration ; constant ;	2
3(b)(ii)	water friction / resistance (much higher than air resistance) ;	1
3(b)(iii)	working mark from one or more of : speed at 20 s = 0.88 m/s (KE =) ½ mv^2 (KE =) ½ x 60 × 0.88^2 ; = 23.2(3) (J) ;	2

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Question	Answer	Marks
3(b)(iv)	(average speed =) distance ÷ time **or** 25 ÷ 30 ; = 0.83 (m/s) ;	**2**

Question	Answer	Marks
4(a)(i)	to make <u>chlorophyll</u> ;	**1**
4(a)(ii)	leaves turn yellow ;	**1**
4(b)	growth ; producers ; increase ; decrease ;	**4**
4(c)(i)	faster rate of transpiration / water loss from lower surface / cell surfaces ; more stomata on lower surface ;	**2**
4(c)(ii)	transpiration rate increases / increased evaporation from stomata / mesophyll cell surfaces ; water molecules have more kinetic energy due to higher temperature ; correct reference to diffusion of water molecules / vapour from air spaces in the leaf ;	**max 2**

Question	Answer	Marks
5(a)(i)	number of protons = 12 and number of neutrons = 12 ;	**1**
5(a)(ii)	12 electrons shown ; 2,8,2 configuration shown ;	**2**
5(b)(i)	(thermal) energy absorbed which decreases inter-particle forces / allows particles to separate / move around freely ;	**1**
5(b)(ii)	<u>cathode</u> ;	**1**
5(b)(iii)	gain electrons ; (gain) two (electrons) ;	**2**

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Question	Answer	Marks
5(c)(i)	magnesium chloride ;	**1**
5(c)(ii)	limewater ; goes cloudy / milky ;	**2**

Question	Answer	Marks
6(a)(i)	forces decrease ; distances increase ;	**2**
6(a)(ii)	(average) speed (of molecules) decreases ;	**1**
6(b)	the higher the wind speed the higher the rate of evaporation / drying ; increased wind speed increases the rate at which molecules move away from suit / decreases the chances that escaped molecules return / owtte ; the higher the temperature the higher the rate of evaporation / drying ; increased temperature increases the energy / speed of molecules so they leave the surface at a higher rate / owtte ;	**max 3**
6(c)(i)	1 (m)	**1**
6(c)(ii)	f = (1 ÷ time between waves = 1 ÷ 5) = 0.2 (Hz) ;	**1**
6(c)(iii)	$v = f\lambda$ or $\lambda = v / f$ or $\lambda = 3 / 0.2$; = 15 (m) ;	**2**

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Question	Answer	Marks
7(a)	C ; shape of C is complementary to the active site ;	2
7(b)(i)	40 °C ;	1
7(b)(ii)	enzyme is denatured ; shape of active site changes ; substrate no longer fits the enzyme ;	3
7(c)	the breakdown of large / insoluble molecules ; into small / soluble molecules ;	2

Question	Answer	Marks
8(a)	electrons ; charges ;	2
8(b)(i)	1 hour = 3600 s / (E =) 50 × 24 × 3600 ; 4 320 000 (J) ;	2
8(b)(ii)	(Q=) I × t **or** (Q =) 25 × 60 ; = 1500 ; coulombs / C ;	3
8(c)	motor symbol with switch connected in parallel with lamps ;	1
9(a)(i)	in range 21 °C to 38 °C ;	1
9(a)(ii)	increases as group is descended ;	1
9(b)	metals are too reactive / more reactive than carbon ;	1
9(c)(i)	The group number is equal to the number of outer shell electrons ;	1
9(c)(ii)	metallic character decreases going from left to right ;	1

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