www.dynamicpapers.com

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/41**

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.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

© UCLES 2019

www.dynamicpapers.com

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.

© UCLES 2019

www.dynamicpapers.com

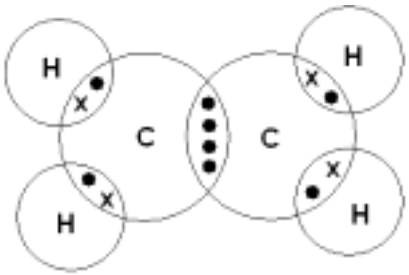
GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

© UCLES 2019

www.dynamicpapers.com

Question	Answer	Marks
1(a)(i)	27.3–25.6 = 1.7 ; (1.7) / 25.6 × 100 = 6.64(%) ;	**2**
1(a)(ii)	high water potential outside and low water potential inside bag / higher water potential outside bag / water moves from high to low water potential ; *and one of* water moves in by osmosis ; use of the term diffusion ; water moves so as to try to equalise water potential ;	**2**
1(b)	protein ;	**1**
1(c)(i)	**6**H_2O + **6**$\mathbf{CO_2}$ → $C_6H_{12}O_6$ + **6**$\mathbf{O_2}$ 1 mark for formulae ; 1 mark for balancing dependent on formulae ;	**2**
1(c)(ii)	*any two of* (used) in respiration / release energy ; stored as starch ; avp ;	**max 2**

www.dynamicpapers.com

Question	Answer	Marks
2(a)	**high** temperature / **high** pressure / catalyst ;	**1**
2(b)(i)	**A**, **B** and **E** ;	**1**
2(b)(ii)	**A**, **B** and **E** ;	**1**
2(b)(iii)	**A**, **B, C, D** and **E** / all of them ;	**1**
2(c)	 two bonding pairs between carbon atoms ; all else correct ;	**2**
2(d)	family of compounds with a general formula ; similar chemical properties ;	**2**

Question	Answer	Marks
3(a)(i)	14 000 (N) ;	**1**
3(a)(ii)	1400 (kg) ;	**1**
3(b)(i)	(speed =) distance / time **or** 5400 / 3600 ; = 1.5 (m/s) ;	**2**

© UCLES 2019

www.dynamicpapers.com

Question	Answer	Marks
3(b)(ii)	(work done =) force × distance / W = F × d = 500 × 2000 ; = 1 000 000 (J) ;	**2**
3(b)(iii)	(KE =) ½ mv^2 ; = ½ × 1400 × $(1.5)^2$ = 1575 (J) ;	**2**
3(c)(i)	speed of sound in liquid / water faster than in gas / air ;	**1**
3(c)(ii)	range of human hearing = 20 to 20 000Hz ; so beluga can produce sound that lies within the range of human **hearing** ; beluga sounds very high-pitched (to humans) ;	**max 2**

Question	Answer	Marks
4(a)	**A** – enzymes ; **B** – flagellum ;	**2**
4(b)(i)	oviduct ;	**1**
4(b)(ii)	jelly coating changes form after fertilisation (to prevent further entry of sperm) ;	**1**
4(c)(i)	**A** umbilical cord ; **B** amniotic sac / amnion ;	**2**
4(c)(ii)	glucose ; amino acids ;	**2**

© UCLES 2019

www.dynamicpapers.com

Question	Answer	Marks
5(a)(i)	sodium atom loses one electron ; oxygen atom gains two electrons / oxygen atom achieves filled outer shell by gaining electrons ;	2
5(a)(ii)	Na_2O ; explanation in terms of balanced charges / implication that charges need to balance ;	2
5(b)	opposite / unlike charges (attract) ;	1
5(c)	$NaOH\ (aq) + HCl\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$ all formulae correct ; balanced and at least three correct state symbols ;	2
5(d)(i)	in the range 25 °C to 55 °C (inclusive) ;	1
5(d)(ii)	melting point decreases down Group 1 ;	1
5(d)(iii)	metals are above carbon in reactivity series ;	1

Question	Answer	Marks
6(a)(i)	$(E =) IVt = 0.5 \times 2000 \times 0.1$; $= 100$ (J) ;	2
6(a)(ii)	$(Q =) It = 0.5 \times 0.1$; $= 0.05$; coulomb(s) / C ;	3
6(b)	$v = f\lambda$ **or** $f = v/\lambda$ **or** $f = 3.0 \times 10^8 / 184 \times 10^{-9}$; $= 1.6(3) \times 10^{15}$ (Hz) ;	2

© UCLES 2019

www.dynamicpapers.com

Question	Answer	Marks
6(c)	to protect humans from touching the high voltage wires / owtte ;	**1**

Question	Answer	Marks
7(a)(i)	haemoglobin ;	**1**
7(a)(ii)	any two of not enough red blood cells / haemoglobin ; not enough oxygen taken to body / cells / muscles ; less (energy released by) **respiration** ;	**max 2**
7(b)(i)	fruit / vegetable / named example ; to add vitamins / minerals / fibre ;	**2**
7(b)(ii)	energy taken in by body exceeds energy needed by body ; excess (energy) is stored as fat ;	**2**
7(c)(i)	**coronary** arteries ; become blocked / narrowed ;	**2**
7(c)(ii)	too much fat (contained in the food) ;	**1**

© UCLES 2019

www.dynamicpapers.com

Question	Answer	Marks
8(a)	20 electrons ; 2,8,8,2 ;	**2**
8(b)(i)	(carbon dioxide) gas released from the apparatus ;	**1**
8(b)(ii)	particles have more energy/kinetic energy / move faster ; more successful collisions / collisions with enough energy ; greater frequency of collisions ;	**max 2**
8(b)(iii)	curved portion steeper ; horizontal line at same mass ;	**2**
8(c)	calcium oxide / calcium hydroxide / calcium hydrogencarbonate / calcium ;	**1**

Question	Answer	Marks
9(a)	100 °C ;	**1**
9(b)	fuse symbol ; switch symbol + completed circuit ;	**2**
9(c)(i)	transfer from powder to metal tube by molecular vibrations ; transfer through metal by mobile electrons ; transfer of molecular vibrations from metal tube to vibration / movement of water molecules ; reference to the transfer of energy through the water for example by particle collisions / or by convection ;	**max 2**

© UCLES 2019

www.dynamicpapers.com

Question	Answer	Marks
9(c)(ii)	magnesium oxide or aluminium oxide ; the idea that these materials are poor electrical conductors and good thermal conductors / owtte ;	**2**
9(c)(iii)	(less) resistance inversely proportional (to cross-sectional area) / the greater the cross section the lower the resistance ;	**1**

© UCLES 2019