www.dynamicpapers.com

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/42**

Paper 4 Extended Theory **May/June 2017**

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 will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2017 series for most Cambridge IGCSE®, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

® IGCSE is a registered trademark.

© UCLES 2017

www.dynamicpapers.com

Question	Answer	Marks
1(a)	three lines from 'Enzymes' to are biological catalysts ; work best in a narrow pH range ; are made from amino acids ;	**3**
1(b)	(correct) 46 °C is optimum temperature / rate decreases **above and below** 46 °C ; correct reference to **denaturation** ;	**2**
1(c)(i)	glucose / sugar / simple sugar ;	**1**
1(c)(ii)	glycogen ;	**1**
1(c)(iii)	nitrogen ;	**1**

Question	Answer	Marks
2(a)(i)	**A** potassium / K **B** lithium / Li **C** sodium / Na 1 or 2 correct, 1 mark all 3 correct, 2 marks	**2**
2(a)(ii)	exothermic ; chemical (potential) ; two from thermal (allow heat) / light / sound / kinetic ;	**3**
2(a)(iii)	in the range 1 to 14 (seconds) inclusive ;	**1**
2(b)	(too) dangerous / (risk of) explosion ;	**1**
2(c)(i)	resists corrosion / does not rust ;	**1**
2(c)(ii)	stronger / more difficult to damage ;	**1**

© UCLES 2017

www.dynamicpapers.com

Question	Answer	Marks
3(a)(i)	**C** **B**	**1**
3(a)(ii)	(**D** is 500 000 N) the idea that height remains constant / forces (**B** and **D**) are balanced / equal **and opposite** / the resultant force in the vertical direction is zero ;	**1**
3(a)(iii)	(decreases) the weight decreases ;	**1**
3(b)(i)	acceleration = increase in speed ÷ time / (160 – 100) ÷ 30 ; = 2 m / s^2 ;	**2**
3(b)(ii)	potential energy change = mgh or mgΔh / 50 000 $\times$ 10 $\times$ 2000 ; = 1 $\times$ 10^9 (J) ;	**2**

www.dynamicpapers.com

Question	Answer	Marks
4(a)(i)	valve **A** closes and valve **B** opens ;	**1**
4(a)(ii)	high(er) pressure required to send blood around the body / travel a long distance / ora ; high(er) pressure in aorta and low(er) pressure in pulmonary artery ; low pressure in pulmonary artery prevents damaging capillaries in lungs ;	**Max 2**
4(b)(i)	reduces blood flow in <u>coronary artery</u> / <u>arteries</u> ; by presence of cholesterol / fatty deposits / plaque ;	**2**
4(b)(ii)	less fatty diet / reduced stress / reduced smoking / more exercise ;	**1**
4(c)(i)	any valid fight or flight situation described ;	**1**
4(c)(ii)	**destroyed** by the <u>liver</u> ;	**1**
4(d)	reference to <u>auxins</u> ; greater concentration on dark side (of stem) ; cause greater (cell) elongation /growth (on that side) ;	**3**

Question	Answer	Marks
5(a)(i)	<u>fractional distillation</u> ;	**1**
5(a)(ii)	larger molecules / hydrocarbons have larger inter-molecular forces / ora ;	**1**
5(a)(iii)	larger inter-molecular forces means higher boiling point / ora ;	**1**
5(b)(i)	(**D**) alkane / saturated ; (**E**) alkene / unsaturated ;	**2**
5(b)(ii)	<u>bromine</u> (water / solution) ; (**D**) no change ***and*** (**E**) decolourises ;	**2**
5(b)(iii)	<u>cracking</u> ;	**1**
5(c)	(C_7H_{16}) + …**11**…(O_2) ➔ …**7**…(CO_2) + …**8**…(H_2O) ;;	**2**

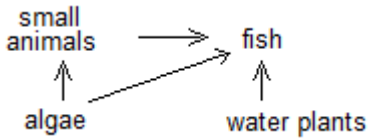
© UCLES 2017

www.dynamicpapers.com

Question	Answer	Marks
6(a)(i)	conduction ;	**1**
6(a)(ii)	(kinetic) energy of air molecules inside transferred to molecules in aircraft wall (fuselage) ; (kinetic) energy transferred between molecules in aircraft wall (fuselage) ; (kinetic) energy transferred from aircraft wall (fuselage) to air molecules outside ; the idea that energy is transferred via vibrating/colliding molecules/particles ;	**Max 2**
6(b)(i)	(Z) molecules shown not touching / apart ;	**1**
6(b)(ii)	molecules in jet engine moving faster ; because they are at a higher temperature / have greater kinetic energy ; **or** molecules in water moving more slowly ; because they are at a lower temperature / have smaller kinetic energy ; **or** the idea that molecules from the jet exhaust are able to move more freely ; because they are separated / far apart ; **or** the idea that molecules in water have more restricted movement ; because molecules are close together / touching ;	**2**
6(c)(i)	total distance = speed $\times$ time / $3 \times 10^5 \times 0.0002$; = 60 (km) ; so distance aircraft to transmitter = ½ $\times$ 60 / 30 (km) ;	**3**
6(c)(ii)	(long wavelength end) it is in the microwave part of spectrum / it is a microwave / it is at the low frequency end ; lower frequency waves have longer wavelength / ref. to inverse proportionality / reference to the formula $v = f \times \lambda$;	**2**

© UCLES 2017

www.dynamicpapers.com

Question	Answer	Marks
7(a)	an area where the organisms interact with each other ; and (interact with) their environment ;	2
7(b)	 all organisms written only once ; feeding relationships shown using arrows ;	2
7(c)(i)	no light ; for photosynthesis ;	2
7(c)(ii)	bacteria take in / use the oxygen ; for their respiration ;	2

Question	Answer	Marks
8(a)(i)	6 ;	1
8(a)(ii)	non-metal together with one from electrical / thermal insulator / low melting / boiling point ovp ;	1
8(b)(i)	(2), 8, 7 ;	1
8(b)(ii)	**one** shared pair and six non-bonding electrons on each C*l* ;	1
8(c)(i)	ionic ;	1
8(c)(ii)	sodium loses one (electron) ; chlorine gains one (electron) ;	2

© UCLES 2017

www.dynamicpapers.com

Question	Answer	Marks
8(d)	reference to full outer shell ;	**1**

Question	Answer	Marks
9(a)(i)	correct symbols for ammeter and lamp ; only the shown components connected in series ;	**2**
9(a)(ii)	voltmeter connected in parallel with lamp ; correct symbol for voltmeter ;	**2**
9(b)	$P = V \times I = 1.5 \times 0.6 = 0.9$ (W) ;	**1**
9(c)(i)	total resistance more, (so current decreases / so dimmer lamps) ;	**1**
9(c)(ii)	the idea that (compared to one bulb) the (total) potential difference (across two bulbs) is the same but the current is lower (V the same I lower) ; (if V is the same, but I is less) then less power (dissipated) / less total energy transformed per unit time ; **or** the relation $P = V \times I$ / $E = V \times I \times t$ therefore shows that the power / energy per unit time is lower (when two bulbs are used) ;	**2**

© UCLES 2017