



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE**0653/43**

Paper 4 Extended Theory

October/November 2018

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 October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **9** printed pages.



Cambridge Assessment
International Education

Question	Answer	Marks
1(a)	(B) cilia ; removes mucus from airway ; (C) cytoplasm ; place where chemical reactions / respiration takes place ;	4
1(b)(i)	feathery / large surface area ; for collecting pollen ;	2
1(b)(ii)	no need to attract insects ; because they are not needed for pollination / pollination is by wind / not by insects ;	2

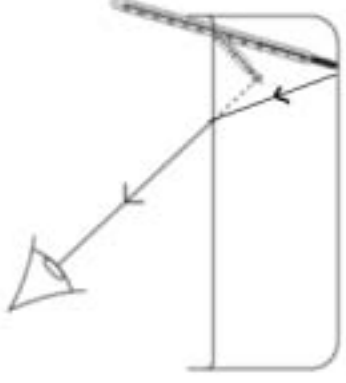
Question	Answer	Marks
2(a)(i)	 Two bonding pairs between C atom and each O atom ; correct non-bonding electrons on each O atom ;	2
2(a)(ii)	covalent ;	1
2(a)(iii)	(test) (step 1) add acid and (step 2) reference to use of limewater ; (observations) (limewater turns) milky / cloudy / white ppt. / solid ;	2
2(a)(iv)	the idea that thermal (energy) / heat (changes) to chemical (energy) ;	1
2(b)(i)	2, 8, 8, 2 shown as crosses or clear dots ;	1
2(b)(ii)	loss of electrons ; (reference to loss of) two electrons ;	2

Question	Answer	Marks
3(a)(i)	C at any point on graph line between 5.7 and 10 s ;	1
3(a)(ii)	average speed = total distance / total time = 20 / 30 ; = 0.67 (m / s) ;	2
3(b)(i)	Z ;	1
3(b)(ii)	X and Z equal / same (20–25) s ; X > Z for (25–30) s ;	2
3(c)	$KE = \frac{1}{2} mv^2 / \frac{1}{2} \times 20 \times 0.8^2$; = 6.4 J ;	2
3(d)	efficiency = [energy out / energy in] ($\times 100\%$) or energy in = energy out / 0.2 or 2400 / 0.2 / energy in = 2400 $\times 100 / 20$; = 12 000 (J) ;	2

Question	Answer	Marks
4(a)	produces irritation / cough / more mucus production ;	1
4(b)(i)	thin layer of carbon reduces the amount of light (energy) reaching leaves / chlorophyll ; (chlorophyll) traps less light (energy) ; less conversion to chemical energy ; reduces rate of photosynthesis ; Max 3	3
4(b)(ii)	oxygen used during combustion (of wood) ; oxygen not produced by plants ;	2
4(c)	methane ; infra-red ; global warming ;	3

Question	Answer	Marks
5(a)(i)	(most) A C B (least) D ;	1
5(a)(ii)	(effect) increase ; (explanation) two out of (particles) move faster / gain more kinetic energy ; (particles) collide more often / frequently ; (particles) collide with more energy ; Max 3	3
5(b)(i)	air ; allow oxygen coke ; allow carbon	2
5(b)(ii)	loss / removal of oxygen / O ;	1
5(c)(i)	(aluminium is) too reactive / more reactive than carbon ;	1
5(c)(ii)	electrolysis ;	1

Question	Answer	Marks
6(a)	any three of distances between molecules greater / molecules further apart in gases molecules are closer together in liquids ; forces between molecules of gases are weaker / forces between molecules of a liquid are stronger ; molecules can move freely in gas / molecules rolling / sliding over each other in liquids ; gas volume greater for same mass / liquid volume is smaller for the same mass ; Max 3	3
6(b)(i)	faster / more energetic molecules escape (from surface) ; average speed of remaining molecules less / water has less energy (leading to cooling) ;	2

Question	Answer	Marks
6(b)(ii)	less / slower cooling and less / slower mass loss ; less surface area for evaporation ;	2
6(c)(i)	refraction ;	1
6(c)(ii)	 ray from thermometer bulb to meet ray to eye at water surface;	1

Question	Answer	Marks
7(a)(i)	to supply the heart muscle / tissue ; with oxygen / glucose / oxygenated blood ; for respiration ;	2
7(a)(ii)	fatty deposits ;	1
7(a)(iii)	<i>any two of</i> take plenty of exercise ; eat a diet with little (saturated) fat ; try to reduce stress ; stop / do not smoke ; Max 2	2
7(b)(i)	$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$ formulae ; balanced ;	2

Question	Answer	Marks
7(b)(ii)	<u>contraction</u> ;	1
7(b)(iii)	to transport more glucose / oxygen (to muscles) ; to transport more carbon dioxide / distribute heat ;	2

Question	Answer	Marks
8(a)(i)	(A) ethene ; (B) methane ;	2
8(a)(ii)	(A) decolourises ; (B) no (visible) change ;	2
8(a)(iii)	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ species ; balanced ;	2
8(b)(i)	cracking ;	1
8(b)(ii)	(difference) <i>[(b.pt of) Q is greater]</i> NOTE: no mark for difference, but must be correct for explanation marks to be awarded (explanation) Q has larger / heavier molecules ; molecules of Q have greater intermolecular attractive forces ;	2

Question	Answer	Marks
9(a)(i)	 correct symbol for lamp ; parallel circuit with motor in one branch, lamp in other branch and no short circuit and no additional components ; switch in series with lamp only ;	3
9(a)(ii)	mains supply / (a.c.) power supply ;	1
9(b)	use of $P = IV / I = P / V$; (total) $P = 40 + 300 = 340 \text{ W}$; $I = 340 / 240 = 1.42 / 1.4 \text{ (A)}$; or use of $P = IV / I = P / V$; $40 / 240 + 300 / 240$; $= (0.17 + 1.25) = 1.42 \text{ (A)} / 1.4 \text{ (A)}$;	3



Cambridge International General Certificate of Secondary Education

Paper 4 Theory (Extended)

MARK SCHEME

Maximum Mark: 80



This document consists of printed pages.



1(a)	<table><tr><td>cuticle</td><td>waterproofs the leaf ;</td></tr><tr><td>stoma</td><td>allows gaseous exchange with surroundings ;</td></tr><tr><td>palisade cell</td><td>produces glucose ;</td></tr><tr><td>phloem tissue</td><td>transports sucrose out of the leaf ;</td></tr><tr><td>spongy mesophyll</td><td>allows diffusion of gases within the leaf ;</td></tr></table>	cuticle	waterproofs the leaf ;	stoma	allows gaseous exchange with surroundings ;	palisade cell	produces glucose ;	phloem tissue	transports sucrose out of the leaf ;	spongy mesophyll	allows diffusion of gases within the leaf ;			award: 5 correct = 4 marks 3 or 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 marks	
cuticle	waterproofs the leaf ;														
stoma	allows gaseous exchange with surroundings ;														
palisade cell	produces glucose ;														
phloem tissue	transports sucrose out of the leaf ;														
spongy mesophyll	allows diffusion of gases within the leaf ;														
1(b)	transport of minerals/ions /named mineral or ion (into the leaf) ; providing support (to leaf) ;			not: nitrogen											
1(c)	starch ;														
1(d)	<u>evaporation</u> of water from the surfaces of mesophyll cells ; (followed by) loss /diffusion of <u>water vapour</u> out of stomata /stoma ;														
2(a)	7 ; number of outer electrons = Group number ;														
2(b)(i)	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ formulae ; balancing ;														
2(b)(ii)	provides <u>activation</u> energy /provides minimum energy for reaction (to occur) ;														
2(b)(iii)	4 electrons shared between two O atoms ; non-bonding electrons on O correct ;														
3(a)	$W = m g$ or 0.40×10 ; 4.0 N ;			note: Correct numerical answer unit											
3(b)(i)	use of area under the graph /average speed $\times$ time / $\frac{1}{2} \times 31 \times 3.1$; 48.1 (m) ;			allow: $\frac{1}{2}$ base $\times$ height											

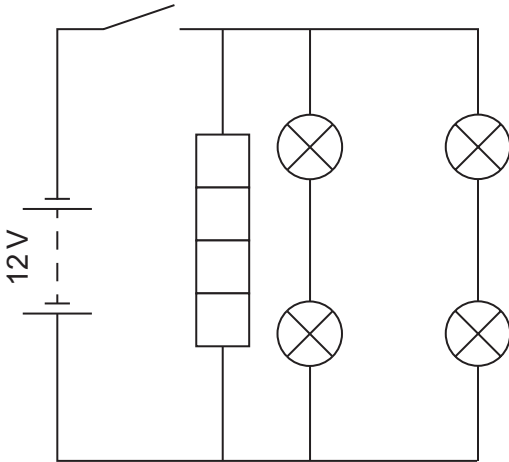
3(b)(ii)	$E_k = \frac{1}{2} m v^2$; $= \frac{1}{2} \times 0.40 \times 31^2$; $= 192 \text{ (J)}$;			award first and second mark allow: 190 or 192.2
3(b)(iii)	kinetic energy converted to thermal energy / (work is done against) friction (as the ball falls) ;			

4(a)	transports oxygen ;			
4(b)	Any one from: more space for haemoglobin ; more flexible shape (to move through capillaries) ;			max 1 allow: more space for oxygen
4(c)(i)	(red blood cells) are normal shape / biconcave ; (red blood cells) have shrunk / crenation / owtte ;			
4(c)(ii)	Any three from: ref to osmosis ; net movement of water molecules into cells ; cell membrane is fragile / cannot withstand water pressure ; down a water potential gradient / from high water potential to low water potential ;			max 3
4(c)(iii)	cell wall present in plant cells ; gives cell strength to resist / prevent bursting ;			allow: correct reference to cell wall in plants

5(a)	cobalt(II) carbonate CoCO_3 ; cobalt(II) chloride Cl^- ;			
5(b)	filter / centrifuge / decant ; (partially) evaporate / heat / boil ; allow to crystallise / cool / let crystals form ; dry crystals / dry between filter paper / leave in a warm place to dry ;			

5(c)	more (acid) particles ; per unit volume ; more frequent collisions ;			
6(a)(i)	vibration is perpendicular to direction of travel of wave ;			owtte
6(a)(ii)	sound waves ;			allow: seismic/mass oscillating on a spring
6(b)	changes – speed/wavelength ; same – frequency/amplitude ;			
6(c)(i)	frequency less than lower limit of hearing ;			
6(c)(ii)	by vibrations of <u>air particles</u> ; forming compressions and rarefactions ;			allow: for max 1 mark: vibrations of the air forming longitudinal waves
6(d)	$(v =) f\lambda$; $v = 30 \times 0.80 = 24$;			
6(e)	3.0×10^8 (m/s) ;			allow: correct value in any format
7(a)(i)	(no mark) smaller molecule than ;			
7(a)(ii)	it has an active site ; complementary in shape to substrate ;			not: same shape
7(b)(i)	molecules have less kinetic energy/moving more slowly ; fewer collisions per unit time/less frequent collisions ;			
7(b)(ii)	enzyme is (becoming) denatured ; substrate no longer fits active site / 3-d structure of enzyme destroyed ;			
7(c)	protease ; <u>amino acids</u> ;			allow: any named protease e.g. pepsin

8(a)	refinery gas ; road surfaces ; naphtha ;			
8(b)	different boiling points /viscosity /flammability ; refinery gas has lowest boiling point /viscosity /highest flammability /identifies correct trend down the fractions ; correctly relates property to size of molecules in fractions larger molecules have higher boiling points /viscosity /lower flammability ;			
8(c)	contains 2 carbon atoms and 6 hydrogen atoms ; idea that $2n + 2$ gives $(2 \times 2 + 2) = 6$;			
8(d)	only contains single (carbon-carbon) bonds ; molecules contain hydrogen and carbon only ;			
9(a)	(6 V) potential difference /voltage ; maximum voltage /safe voltage /working voltage (to allow lamp to work) ; (120 W) power /energy transferred per second ; 120 (watts) is the power at working voltage /owtte ;			

9(b)	 sidelamps remain in series with each other and each pair in parallel with the battery ; heater, sidelamps, headlamps all in parallel ;	9(c)	$(Q =) It / 12.5 \times 2 \times 60 ;$ $= 1500 \text{ (C)} ;$
9(d)	convection ;		