Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/42**

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.

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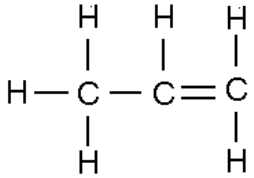
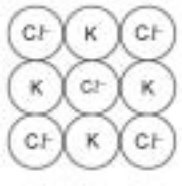
Question	Answer	Marks
1(a)(i)	**A** (untreated so the) enzyme caused the brown substance to be produced (in air) ; **C** (the boiling water) denatured the enzymes ;	**2**
1(a)(ii)	active site / enzyme damaged / destroyed / shape changed ; substrate will no longer fit into it ;	**2**
1(b)(i)	kills bacteria / pathogens / (harmful) microorganisms ; gives an acid pH for enzymes / owtte ;	**2**
1(b)(ii)	hydrochloric acid is a strong acid ; hydrochloric acid can damage mouth, etc. when swallowed ;	**max 1**
1(c)(i)	glycogen ;	**1**
1(c)(ii)	amino acids ;	**1**
1(c)(iii)	carbon, hydrogen, oxygen, nitrogen	**1**

Question	Answer	Marks
2(a)	molecule / compound containing carbon and hydrogen atoms only ;	**1**
2(b)(i)	high temperature / high pressure ;	**1**
2(b)(ii)	thermal energy is changed into chemical energy ; so thermal energy is absorbed / removed from surroundings / temperature (of surroundings) decreases ;	**2**
2(b)(iii)	aqueous bromine remains orange / not decolourised by saturated hydrocarbons ; aqueous bromine is decolourised by unsaturated hydrocarbons ;	**2**

Question	Answer	Marks
2(c)(i)	 3 carbon atoms in chain ; only one carbon-carbon double bond ; all else correct ;	3
2(c)(ii)	$2C_3H_6 + 9O_2 \rightarrow 6CO_2 + 6H_2O$ all formulae correct ; balancing (dependent on correct formulae) ;	2

Question	Answer	Marks
3(a)	**P** ;	1
3(b)	weight of box = $500 \times 10 = 5000$ (N) ; work done = force × distance moved / $F \times d$; $= 5000 \times 3 = 15\,000$ (J) ;	3
3(c)(i)	decelerating / slowing down to a stop ; deceleration changing / not constant ;	2
3(c)(ii)	distance = area under graph **or** $0.5 \times 20 \times 5 + (50 - 20) \times 5\ (+ 40)$ **or** $(0.5 \times (50 + (50 - 20)) \times 5)(+ 40)$; = 240 (m) ;	2
3(c)(iii)	KE = $\frac{1}{2}mv^2$ **or** KE = $0.5 \times 1500 \times 5^2$; = 18 750 J	2

Question	Answer	Marks
4(a)(i)	combustion / burning ;	1
4(a)(ii)	death / excretion / egestion ;	1
4(a)(iii)	(increases) less photosynthesis / fewer trees to photosynthesise ; so CO_2 not taken in / fewer trees to take in carbon dioxide ;	2
4(b)	growth ; increased ; death ; decomposers ;	4

Question	Answer	Marks
5(a)(i)	any suggestion in the range 50–75°C (inclusive) ;	1
5(a)(ii)	rubidium is more reactive than potassium;	1
5(a)(iii)	hydrogen;	1
5(a)(iv)	the idea that attractive forces between particles have to be broken down / decreased / atoms gain speed / KE so they move further apart / owtte ;	1
5(b)(i)	outer shell / one electron lost from K atom; outer shell of chlorine gains one electron / outer shell of chlorine atom is filled / completed ;	2
5(b)(ii)	 alternating K^+ and Cl^- ions ;	1
5(b)(iii)	opposite / unlike charges (attract) ;	1

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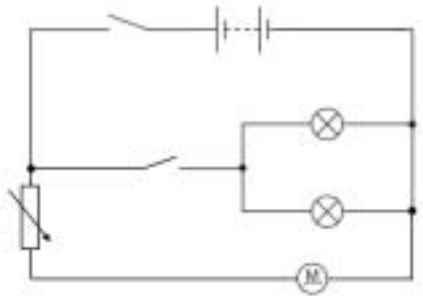
Question	Answer	Marks
6(a)	hot gases less dense (than cooler gases) / owtte ; less dense / hotter gases rise (and cooler gases fall) / owtte ;	**2**
6(b)(i)	$(\text{time} =)\frac{\text{distance}}{\text{speed}}$; $= \frac{150\,000\,000\,000}{300\,000\,000} (= 500)\,\text{s}$; $= \frac{500}{60} = 8.3\,\text{min}$;	**3**
6(b)(ii)	$v = f\lambda$ **or** $f = \frac{v}{\lambda}$ **or** $f = 3.0 \times 10^8 / 7.4 \times 10^{-7}$; $= 4.1 \times 10^{14}\,(\text{Hz})$;	**2**
6(c)	remote control / movement detector / intruder alarm / heat lamps / other correct use ;	**1**

Question	Answer	Marks
7(a)	<u>phototropism</u> ;	**1**
7(b)	auxin produced at tip ; more auxin in cells in dark side ; auxin causes (cell) **elongation** ; (cell) elongation greater on dark side ;	**max 3**
7(c)	any example of a fight or flight situation described ;	**1**
7(d)	(breathing rate) enables more oxygen to enter blood / be taken in (at lungs) ; (heart rate) increases rate of delivery of oxygen / glucose to cells ;	**2**

Question	Answer	Marks
7(e)	*any two from* muscle contraction protein synthesis growth maintenance of body temperature ;;	**2**

Question	Answer	Marks
8(a)(i)	nickel ions and copper ions ;	**1**
8(a)(ii)	$(7 - 2) \div (10 - 2)$ **or** $5 \div 8$; $= 0.6(25)$;	**2**
8(b)	transition metals / elements ;	**1**
8(c)(i)	chloride / Cl^- ; copper / Cu^{2+} ;	**2**
8(c)(ii)	$CuCl_2$;	**1**

Question	Answer	Marks
9(a)(i)	variable resistor ;	**1**
9(a)(ii)	 at least three symbols correct ; variable resistor and motor in series in same branch ; lamps in parallel with motor and each other ; only two switches and both correctly located ;	**4**
9(b)(i)	$P = V \times I$ / 36×7.0 ; = 252 / 250 ; watt(s) / W ;	**3**
9(b)(ii)	time / t ;	**1**