



Cambridge IGCSE™

COMBINED SCIENCE**0653/42**

Paper 4 Theory (Extended)

March 2021**MARK SCHEME**Maximum Mark: 80

Published

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This document consists of **12** printed pages.

Question	Answer	Marks
1(a)(i)	liver ;	1
1(a)(ii)	kill bacteria ; provide <u>acidic</u> pH for enzymes ;	2
1(a)(iii)	chemical (digestion) AND mechanical (digestion) ;	1
1(b)(i)	carbon dioxide + (water) $\xrightarrow[\text{chlorophyll}]{\text{(light)}}$ (glucose) + oxygen <i>one mark for carbon dioxide and oxygen</i> <i>one mark for chlorophyll</i>	2
1(b)(ii)	iodine (solution) tests for <u>starch</u> / shows blue-black with <u>starch</u> ; glucose made in photosynthesis is converted to starch ;	2
1(c)	as light intensity increases so does (rate of) photosynthesis (then it levels off) ; idea that rate is higher, at 30°C than 20°C / at higher temperature ;	2

Question	Answer	Marks									
2(a)	<table border="1"> <tr> <th>number of neutrons</th><th>number of protons</th><th>number of electrons</th></tr> <tr> <td>6</td><td>6</td><td>6</td></tr> <tr> <td>8</td><td>8</td><td>8</td></tr> </table> <i>one mark neutrons correct</i> <i>second mark protons and electrons correct</i>	number of neutrons	number of protons	number of electrons	6	6	6	8	8	8	2
number of neutrons	number of protons	number of electrons									
6	6	6									
8	8	8									
2(b)	carbon has 4 outer shell electrons and oxygen has 6 ;	1									

Question	Answer	Marks
2(c)	four bonding electrons shown between carbon and each oxygen ; (dependent on MP1) rest of molecule correct ;	2
2(d)	gas ;	1
2(e)	<i>one point from:</i> CO ₂ is a greenhouse gas / causes enhanced greenhouse effect / causes atmosphere to heat up / traps excess heat in atmosphere / causes global warming ; <i>and one point from:</i> climate change ; extreme weather events / named example, e.g. hurricanes ; sea level rise / flooding (of coastal areas) ; polar ice caps melt ;	2

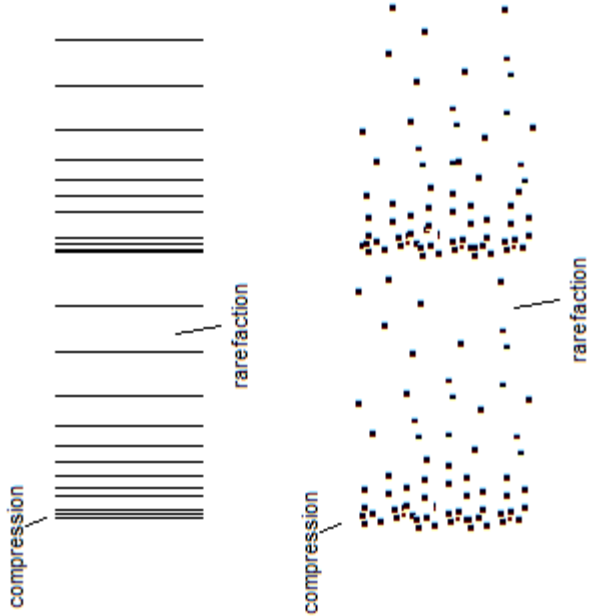
Question	Answer	Marks
3(a)	9 (m/s) ;	1
3(b)	use of gradient of line / use of $v = u + at$; $(9.0 - 5.5) \div (6.0 - 4.5) = 2.3(3)$; m/s ² ;	3
3(c)	use of area under graph / $5.5 \times (4.5 - 3.0) + \frac{1}{2} \times (10.0 - 5.5) \times (4.5 - 3.0)$; = 11.6(25) (m) ;	2
3(d)(i)	air resistance / friction / AVP, e.g. drag ;	1
3(d)(ii)	500 N / equal (and opposite so balanced) ; (because) speed is constant / there is no resultant force ;	2
3(d)(iii)	work done = force $\times$ distance / $W = F \times d / 500 \times 30$; = 15 000 (J) ;	2

Question	Answer	Marks
4(a)(i)	(green) plant ; slug / aphid ; fox / blackbird ;	3
4(a)(ii)	the position of an organism in a food chain or food web ;	1
4(a)(iii)	passes to slug when slug eats (green) plant passes to hedgehog when hedgehog eats slug passes to fox when fox eats hedgehog <i>all three = 2 marks one or two = 1 mark</i>	2
4(b)	concentration of carbon dioxide increases ; <i>because,</i> carbon dioxide is produced by burning (the forest) ; less carbon dioxide removed (from the air) by photosynthesis ;	3

Question	Answer	Marks
5(a)	iron(III) oxide ;	1
5(b)(i)	equation $1 / C + O_2 \rightarrow CO_2$;	1
5(b)(ii)	carbon monoxide ;	1
5(b)(iii)	carbon / C ; carbon dioxide / CO_2 ; CO / carbon monoxide (gap 1) and Fe_2O_3 / iron oxide (gap 2) ;	3
5(c)(i)	copper ; zinc ;	2

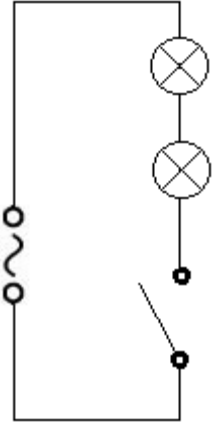
Question	Answer	Marks
5(c)(ii)	(aluminium/magnesium/sodium) AND because too reactive / very reactive / more reactive than carbon ;	1
5(c)(iii)	electrolysis ;	1

Question	Answer	Marks
6(a)(i)	<i>any two from:</i> random (arrangement) ; the idea of far apart ; moving, freely / around / quickly / randomly ;	2
6(a)(ii)	closer / not as far apart ;	1
6(a)(iii)	increase in temperature ;	1
6(b)(i)	amplitude correctly indicated on Fig. 6.2 ;	1
6(b)(ii)	$v = f \lambda / \lambda = v \div f / 330 \div 400$; $= 0.825 / 0.83$ (m) ;	2

Question	Answer	Marks
6(b)(iii)	(series of) compressions and rarefactions ; description of what these terms mean by reference to air pressure or distance between molecules / diagram such as one of those below, 	2

Question	Answer	Marks
7(a)(i)	less, blood / oxygen transported to heart (muscle) ; (heart) muscle unable to respire effectively ;	2
7(a)(ii)	<i>any two from:</i> gender / sex ; stress ; smoking ; age ; genetic predisposition ; AVP, e.g. obesity / lack of exercise ;	2
7(b)	<i>any one adaptation and explanation pairing for arteries from:</i> thick muscular wall ; to withstand high pressure ; OR elastic (muscle fibres in walls) ; to allow, contraction / relaxation / maintain blood flow rate ; OR narrow lumen ; to maintain, blood pressure / flow rate ; <i>adaptation and explanation for capillaries:</i> thin walls / walls only one cell thick ; to allow for exchange of materials / to allow substances to diffuse in and out ;	4

Question	Answer	Marks
8(a)	(thermal) energy / heat, is given out / reaction is exothermic ;	1
8(b)(i)	(fizzing occurs because) hydrogen / a gas, is made ; (Universal Indicator turns purple because) an alkali is made / pH > 7 / a basic solution is made ; (metal) hydroxide is made / named metal hydroxide ;	3
8(b)(ii)	potassium ; <i>and any one from:</i> quotes comparative observations from the table to show potassium reacts the most vigorously with water ; potassium is the most reactive metal (of the three) / is lower down Group 1 ;	2
8(c)(i)	rubidium hydroxide and hydrogen ;	1
8(c)(ii)	(rate of reaction is) faster AND (explanation) because rubidium is more reactive / because rubidium is lower down the group ;	1

Question	Answer	Marks
9(a)(i)	 correct symbol for a switch and a lamp ; one switch and two lamps in series and all else correct ;	2
9(a)(ii)	failed lamp means no circuit ;	1
9(b)(i)	1.2 (A) ;	1
9(b)(ii)	220 (V) ;	1
9(b)(iii)	$P = V \times I = 220 \times 0.4 ;$ $= 88 \text{ (W)} ;$	2