Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/43**

Paper 4 Theory (Extended) **May/June 2021**

MARK SCHEME

Maximum Mark: 80

Published

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[Turn over

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)(i)</td><td>filament ;</td><td>1</td></tr>
<tr><td>1(a)(ii)</td><td>any two from:
smaller ;
lighter ;
smooth / not spiky ;</td><td>2</td></tr>
<tr><td>1(b)</td><td><table><tr><th>germinates yes / no</th></tr><tr><td>(yes)</td></tr><tr><td>no</td></tr><tr><td>no</td></tr><tr><td>no</td></tr><tr><td>yes</td></tr></table>;

all needed for 1 mark</td><td>1</td></tr>
<tr><td>1(c)</td><td><table><tr><th>feature</th><th>adaptation to function</th></tr><tr><td>stomata</td><td>(small pores used for gas exchange)</td></tr><tr><td>(spongy mesophyll layer)</td><td>air spaces for gas exchange</td></tr><tr><td>palisade (mesophyll cells)</td><td>(contain large numbers of chloroplasts for photosynthesis)</td></tr></table>;;;</td><td>3</td></tr>
</table>

Question	Answer	Marks
2(a)(i)	(l) (l) (g) ;	1
2(a)(ii)	(at the positive electrode) bromide ions ; lose electrons ; (at the negative electrode) lead ions gain electrons ; lead ions gain two electrons ;	4
2(b)	less than 373 (°C) ;	1
2(c)	inert ;	1
2(d)	the temperature is below the melting point of magnesium oxide / the apparatus is not hot enough to melt magnesium oxide / magnesium oxide remains a solid ; so the ions are fixed in position (cannot move) / so electricity cannot flow though the material / so electrolysis cannot occur / needs to be aqueous or molten to conduct ;	2

Question	Answer	Marks
3(a)(i)	ultraviolet ;	1
3(a)(ii)	reflected / absorbed (by sunscreen) ;	1
3(b)	$p = F / A$; $A = 2 \times 155$ (= 310) $cm^2 = 0.031\ m^2$; $F = mg = 75 \times 10 = 750$ N ; $p = 750 / 0.031 = 24\,194 / 24\,200$ (Pa) ;	4
3(c)(i)	height = area under graph = ½ × 0.60 × 5.4 ; = 1.6(2) (m) ;	2
3(c)(ii)	acceleration = change in speed / time = 5.4 / 0.60 ; = 9.0 (m/s^2) ;	2

Question	Answer	Marks
4(a)(i)	right ventricle labelled ;	**1**
4(a)(ii)	contracts ; to push / pump, blood out of heart ;	**2**
4(b)(i)	34 years and under ;	**1**
4(b)(ii)	coronary heart disease increases with age ; more men than women have coronary heart disease (in each age group) ;	**2**
4(c)(i)	*any two from:* genetic predisposition ; stress ; smoking ;	**2**
4(c)(ii)	high fat diet ; cause blockage of coronary artery ;	**2**

Question	Answer	Marks
5(a)	*the element in Group VII* **Z** ; *the* ***two*** *elements which form negative ions* **X** ; *and* **Z** ; (either order) *the metallic element* **Y** ; *the element with the highest proton number* **X** ;	**5**
5(b)(i)	**W** = carbon ; **Z** = fluorine ;	**2**
5(b)(ii)	two shared electrons in each of four bonds ; three lone pairs on each atom of **Z** ;	**2**

Question	Answer	Marks
6(a)(i)	ammonia ;	1
6(a)(ii)	ammonia ;	1
6(a)(iii)	(thermal conductivity greater due to) transfer by (delocalised) electrons ;	1
6(b)	$f = v / \lambda = 3 \times 10^8 / 546 \times 10^{-9}$; $= 5.49 \times 10^{14} / 5.5 \times 10^{14}$; Hz ;	3
6(c)(i)	thermal ;	1
6(c)(ii)	175 W = 175 J / s / energy = power × time ; 8 hrs = 8 × 3600 = 28 800 s ; (total energy =) 175 × 28 800 = 5 040 000 (J) ;	3

Question	Answer	Marks
7(a)(i)	40 (°C) ;	1
7(a)(ii)	both enzymes increase in activity with increase in temperature ; decrease in activity with increase in temperature over a certain point ; enzyme **B** is more active at higher temperatures ;	3
7(a)(iii)	enzymes denature / shape of active site changes ; substrate no longer fits into active site ;	2
7(b)	breaks down, fats / lipids / oils ; forms fatty acids and glycerol ;	2
7(c)	6 (O_2) + $C_6H_{12}O_6$ → 6 H_2O + 6 (CO_2) ;; *all five answers = 2 marks* *3 or 4 correct = 1 mark* *1 or 2 correct = 0 marks*	2

Question	Answer	Marks
8(a)(i)	contain hydrogen and carbon ; only ;	**2**
8(a)(ii)	unsaturated has (carbon to carbon) double bond ;	**1**
8(b)(i)	addition ;	**1**
8(b)(ii)	double bonds break (to form a polymer) ;	**1**
8(b)(iii)	ethane does not have a double bond ;	**1**
8(c)	$C_2H_4 + 3\ O_2 \rightarrow 2\ CO_2 + 2\ H_2O$ one mark for H_2O ; balanced dependent on correct formulae ;	**2**

Question	Answer	Marks
9(a)(i)	friction ;	**1**
9(a)(ii)	electrons ;	**1**
9(a)(iii)	tyres made of rubber ; (rubber is) an insulator ;	**2**
9(b)(i)	$Q = It = 0.015 \times 0.3 / 1000$; $= 0.000\,004\,5$ (C) ;	**2**
9(b)(ii)	$V = IR = 0.015 \times 40\,000$ (= 600 V) ;	**1**