



Cambridge IGCSE™

COMBINED SCIENCE**0653/42**

Paper 4 Theory (Extended)

May/June 2021**MARK SCHEME**Maximum Mark: 80

Published

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

Question	Answer	Marks
1(a)(i)	pollen ; stigma ;	2
1(a)(ii)	(anthers are) outside flower / (anthers are) on longer filaments ;	1
1(b)(i)	germination ;	1
1(b)(ii)	phototropism ;	1
1(c)	tip ; shaded / dark ; <u>elongation</u> ;	3
1(d)	add (crushed) seed to ethanol and pour into water ; white emulsion formed ;	2

Question	Answer	Marks
2(a)(i)	it loses (2) electrons ;	1
2(a)(ii)	chlorine atoms have seven electrons in the outer shell ; they gain an electron to, complete the outer shell / become stable ;	2
2(a)(iii)	calcium ions have +2 charge and need two chloride ions at –1 / each calcium atom loses 2 electrons / each chlorine atom gains 1 electron ;	1
2(b)(i)	(positive ion) represents a sodium ion AND (negative ion) represents a bromide ion ;	1
2(b)(ii)	contains positive and negative ions / contains oppositely charged ions ;	1
2(b)(iii)	there are two chloride ions to each calcium ion / ions are not in a 1 : 1 ratio ; each calcium ion has a +2 charge ;	2

Question	Answer	Marks
3(a)(i)	reference to kinetic energy (in wind) ; (KE) turns / moves, a turbine / generator ;	2
3(a)(ii)	solar / tidal / hydroelectric / geothermal / water ;	1
3(b)(i)	150 (s) ;	1
3(b)(ii)	use of area under graph / distance = speed $\times$ time ; ($\frac{1}{2} \times 25 \times 8$) or $100 / (75 \times 8)$ or 600 ; (($\frac{1}{2} \times 25 \times 8$) + (75 $\times$ 8) or (100 + 600)) = 700 (m) ;	3
3(b)(iii)	max. speed is 8 m / s ; = $0.008 \times 3600 = 28.8$ km/h (which does not break the speed limit of 30 km/h) ;	2

Question	Answer	Marks
4(a)(i)	60 ($^{\circ}$ C) ;	1
4(a)(ii)	correct reference to gain of energy ; increase in frequency of collisions / more effective collisions ;	2
4(b)(i)	break down proteins ; to form amino acids ;	2
4(b)(ii)	stomach, is acidic / has a low pH ; only enzyme A works, in acidic conditions / at low pH ;	2
4(c)	$6(\text{CO}_2) + 6\text{H}_2\text{O} \xrightarrow[\text{(chlorophyll)}]{\text{(light)}} \text{C}_6\text{H}_{12}\text{O}_6 + 6(\text{O}_2) \quad ;;$ <i>reactants correct = 1 mark</i> <i>products correct = 1 mark</i>	2

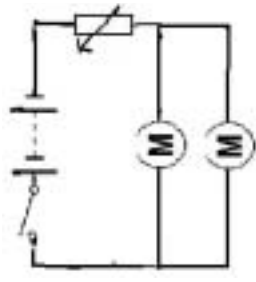
Question	Answer	Marks
5(a)(i)	place some acid on the paper OWTTE ; compare colours to a chart / colour indicates pH ;	2
5(a)(ii)	<i>acid</i> : in the range 4 to 1 ; <i>mixture</i> : 7 ;	2
5(b)	(highest) 4 AND (lowest) 1 ; faster reactions have more frequent collisions ; more concentrated acids have more particles (in the same volume) ; smaller pieces (of CaCO ₃) have a larger surface area (exposed to acid) ;	4

Question	Answer	Marks
6(a)(i)	conduction ;	1
6(a)(ii)	convection ;	1
6(b)(i)	thermometer / description of liquid expanding / rising to show temperature ;	1
6(b)(ii)	forces between gas molecules weaker OR distances between molecules in gas are greater ; so less energy needed to separate gas molecules ;	2
6(c)(i)	converging ;	1
6(c)(ii)	refraction ;	1
6(c)(iii)	lens closer to thermometer ; eye closer to lens ; (<i>in either order</i>)	2

Question	Answer	Marks
7(a)	unit containing all organisms and their environment ; interacting together ;	2
7(b)	pondweed → mayfly → trout → heron ; <i>one mark for organisms in correct order</i> <i>one mark for arrows</i>	2
7(c)(i)	light blocked so no photosynthesis / no light available for photosynthesis ;	1
7(c)(ii)	reference to decomposition / respiration / decomposers, uses up oxygen ;	1
7(c)(iii)	trout / fish, die ; heron has lost food source ;	2

Question	Answer	Marks
8(a)(i)	C_4H_8 $C_{15}H_{32}$ $C_{15}H_{30}$; <i>all three correct = 2</i> <i>one or two correct = 1</i>	2
8(a)(ii)	<i>any two from:</i> same general formula as each other ; similar <u>chemical</u> properties to each other ; all saturated / <u>only</u> single bonds ;	2
8(b)	(from) orange (to) colourless ;	1
8(c)(i)	H–H AND H ₂ ; ethene displayed formula ; C_2H_4 ;	3

Question	Answer	Marks
8(c)(ii)	high temperature ; catalyst / high pressure ;	2

Question	Answer	Marks
9(a)	 switch and variable resistor symbols correct ; variable resistor and switch in main circuit ; parallel connection for two motors ;	3
9(b)(i)	Power = $I \times V$ OR $I = P \div V = 24\,000 \div 96$; = 250 (A) ;	2
9(b)(ii)	the idea that the current in the main circuit = sum of currents in branches ;	1
9(c)	$Q = It / 30 \times 14\,400$; = 432 000 ; coulombs / C ;	3