



Cambridge IGCSE™

COMBINED SCIENCE**0653/41**

Paper 4 Theory (Extended)

October/November 2021**MARK SCHEME**Maximum Mark: 80

Published

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This document consists of **11** printed pages.

Question	Answer	Marks
1(a)	ciliated cell — movement of mucus palisade mesophyll cell — photosynthesis sperm cell — reproduction one correct line ; three lines correct ;	2
1(b)(i)	vacuole / cell wall ;	1
1(b)(ii)	root hair (cell) ;	1
1(b)(iii)	water moves by osmosis ; from high water potential to a low water potential / down a water potential gradient / (because) cell X has a lower water potential than cell Y OR A ; through a partially permeable membrane ;	3
1(c)	evaporation from (surface of) mesophyll cells ; diffusion (of water vapour) through stomata ;	2
1(d)	(magnesium deficiency causes) leaves (to) turn yellow ; (because magnesium) needed to make chlorophyll ;	2

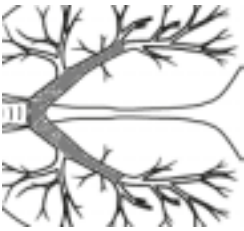
Question	Answer	Marks
2(a)	A melting ; B condensation ; C freezing ;	3
2(b)	<i>energy</i> : particles have more (kinetic) energy at 120 °C ; <i>arrangement</i> : particles close / regular / lattice at –10 °C but random / spread out at 120 °C ; <i>movement</i> : particles (vibrate) in fixed positions at –10 °C but move around freely at 120 °C ;	3
2(c)	<i>any three from</i> : more (thermal) energy needed to break bonds (in sodium chloride) ; sodium chloride, contains ionic bonds / is ionic ; the bonds between ions are stronger than between (water) molecules ; attraction between ions is high due to opposite electrical charges / strong electrostatic attraction between ions ;	3

Question	Answer	Marks
3(a)	chemical (potential) ; thermal / heat ;	2
3(b)(i)	acceleration = change in speed ÷ time <i>in any form</i> / $17 \div 3.5$; $4.9 \text{ (m / s}^2\text{)}$;	2
3(b)(ii)	use of area under graph / $\frac{1}{2} \times 3.5 \times 17$; 30 (m) ;	2
3(b)(iii)	$KE = \frac{1}{2} m v^2$ <i>in any form</i> / $\frac{1}{2} \times 32 \times 17 \times 17$; 4600 (J) ;	2
3(b)(iv)	$P = E \div t$ <i>in any form</i> / $4600 \div 3.5$; 1300 ; watt(s) / W ;	3

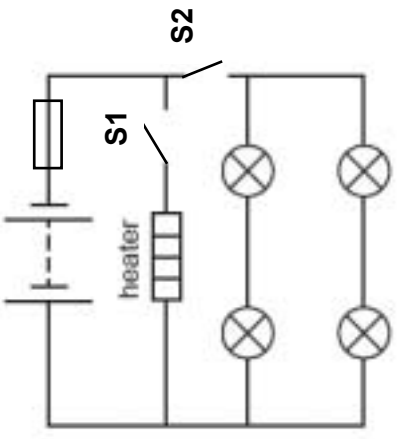
Question	Answer	Marks
4(a)	environment ; area ;	2
4(b)(i)	fish / blue whale ;	1
4(b)(ii)	transferred to fish when fish feeds on zooplankton ; transferred to bird when bird feeds on fish ;	2
4(c)	<i>(increased availability of nitrate ions causes) (increased) growth of producers ; (increased aerobic respiration by) decomposers / bacteria ; (death of fish due to) lack of oxygen ;</i>	3

Question	Answer	Marks
5(a)	iron(III) oxide ; CuO ;	2
5(b)	carbon ; removes oxygen from the lead(II) oxide / reducing agents remove oxygen from another substance / it reduces lead(II) oxide / reduces lead <u>ions</u> ;	2
5(c)(i)	iron (<i>most</i>) lead copper (<i>least</i>) in correct order; the more reactive metal displaces the less reactive / AW ;	2
5(c)(ii)	(yes, because) zinc is more reactive (than iron) ;	1
5(d)	solution goes colourless / blue colour fades / decolourises ; lead has a brown / orange coating / dark brown / orange solid appears ;	2

Question	Answer	Marks
6(a)(i)	arrow showing one complete wavelength ;	1
6(a)(ii)	molecules clos(er) together in compressions / molecules further / (far) apart in rarefactions ;	1
6(b)(i)	<i>any two from:</i> bat / dog / horse ;	1
6(b)(ii)	bat AND canary bird ;	1
6(c)	$v = f\lambda$ in <i>any form</i> / $340 \div 170$; ($\lambda =$) 2 m ; (distance = $2 \times 60 =$) 120 (m) ;	3
6(d)	adaptation stated, e.g. large surface area ; correctly matched to method of energy transfer, e.g. radiation ;	2

Question	Answer	Marks
7(a)(i)	 bronchus labelled anywhere in shaded area ;	1
7(a)(ii)	<i>any two from:</i> large surface area ; good blood supply ; thin <u>walls</u> ; good ventilation ; AVP ;	2
7(b)(i)	person 1 has a higher increase in breathing rate ORA ;	1
7(b)(ii)	70 AND 130 AND 60 ; 86 ;	2
7(c)	<i>any two from:</i> increased respiration ; cause increase in carbon dioxide levels (in the blood) ; removes more carbon dioxide (from the blood) / removes carbon dioxide faster ; AVP ;	2

Question	Answer	Marks
8(a)	<i>any two from:</i> (sea) water / solutions, pass through filter ; insoluble materials / plastic / solids, do not pass through filter ; description of, filter / filter paper, as being, porous / having (small) holes ;	2
8(b)	distillation ; heat / boil / evaporate, (sea) water ; salt is left behind ; condense / cool, steam / water vapour (to obtain pure water);	4
8(c)	chlorine ; kills any bacteria in the water ;	2

Question	Answer	Marks
9(a)	total current = sum of branches / $8.5 + 1.5 + 1.5$; 11.5 (A) ;	2
9(b)	ammeter ;	1
9(c)	 correct symbols for fuse AND switch ; switch S1 in correct place for heater ; switch S2 in correct place for lamps ; fuse in correct place AND no short circuits, open circuits or additional components ;	4