



Cambridge IGCSE™

COMBINED SCIENCE

0653/43

Paper 4 Theory (Extended)

October/November 2021

MARK SCHEME

Maximum Mark: 80

Published

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This document consists of **10** printed pages.

Question	Answer	Marks															
1(a)(i)	cervix ;	1															
1(a)(ii)	encloses fetus / holds or produces amniotic fluid ;	1															
1(a)(iii)	<i>any three from:</i> via umbilical cord ; to the placenta ; passes into mother's blood ; correct reference to diffusion ;	3															
1(b)	<i>any two from:</i> contraction ; of ventricles / muscle ; AVP ;	2															
1(c)	<table border="1"> <tr> <td></td><td>male gametes</td><td>female gametes</td></tr> <tr> <td>name</td><td>sperm(s) ;</td><td>(eggs)</td></tr> <tr> <td>where they are made</td><td>testes ;</td><td>(ovaries)</td></tr> <tr> <td>number released at any one time</td><td>(over 40 million)</td><td>one ;</td></tr> <tr> <td>adaptive feature</td><td>flagellum / enzymes ;</td><td>(jelly coating)</td></tr> </table>		male gametes	female gametes	name	sperm(s) ;	(eggs)	where they are made	testes ;	(ovaries)	number released at any one time	(over 40 million)	one ;	adaptive feature	flagellum / enzymes ;	(jelly coating)	4
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name	sperm(s) ;	(eggs)															
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adaptive feature	flagellum / enzymes ;	(jelly coating)															

Question	Answer	Marks
2(a)	ammonium nitrate AND sodium chloride ; an upwards arrow shows, energy change is positive / energy of the products is greater than the energy of the reactants ;	2
2(b)(i)	thermometer / temperature probe ; stop-watch;	2
2(b)(ii)	increases then decreases ; (increases because) energy given out / exothermic reaction ; (decreases because) reaction is finished (and so it cools) ;	3
2(b)(iii)	(34.5 – 22.0 =) 12.5 (°C) ;	1

Question	Answer					Marks						
3(a)(i)	<table><tr><td>(gamma radiation)</td><td></td><td></td><td>visible light ;</td><td>infrared ;</td><td>(microwaves)</td></tr></table>					(gamma radiation)			visible light ;	infrared ;	(microwaves)	2
(gamma radiation)			visible light ;	infrared ;	(microwaves)							
3(a)(ii)	3×10^8 (m / s) AND all <u>electromagnetic</u> waves travel with same speed ;					1						
3(b)	$v = f\lambda$ in any form / $3 \times 10^8 \div 635 \times 10^{-9}$; 4.72×10^{14} ; Hz ;					3						
3(c)(i)	thermal ;					1						
3(c)(ii)	dull black surfaces are good absorbers (of radiation) ;					1						
3(d)	molecular vibration ; transfer by electrons ;					2						

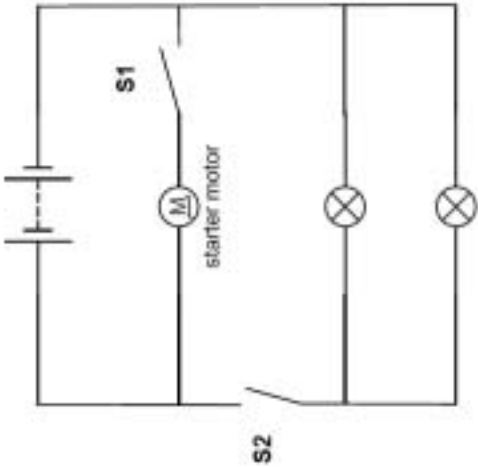
Question	Answer	Marks
4(a)(i)	arrow drawn pointing from grasshopper to eagle ;	1
4(a)(ii)	grasshopper / squirrel ;	1
4(a)(iii)	<i>any two from:</i> energy is lost between trophic levels ; named example of energy loss ; the longer the chain the less energy is available ;	2
4(b)	soil has a higher water potential / water moves from area of high water potential to low water potential ; reference to osmosis ; across a partially permeable membrane ;	3

Question	Answer	Marks
5(a)	<i>iron:</i> $\leq 2500^{\circ}\text{C}$ AND <i>aluminium oxide:</i> $> 2500^{\circ}\text{C}$; at 2500°C , iron is a liquid and aluminium oxide is a solid ;	2
5(b)	aluminium displaces iron / aluminium removes oxygen from iron ; because aluminium is more reactive than iron ;	2
5(c)	iron(III) oxide / Fe^{3+} ; causes aluminium to gain oxygen ;	2
5(d)	charge on, iron(II) is $2+$ AND iron(III) is $3+$; total positive charge needs to match total negative charge ;	2

Question	Answer	Marks
6(a)	(total surface area = $2 \times 0.28 =$) 0.56 (m ²) ; pressure = force ÷ area <i>in any form</i> / $8000 \times 10 \div 0.56$; 1.4 x 10 ⁵ (Pa) ;	3
6(b)(i)	acceleration = change in speed ÷ time / $4 \div 8$; 0.5 (m / s ²) ;	2
6(b)(ii)	deceleration ; not constant ;	2
6(b)(iii)	maximum speed identified as 4 m / s ; $KE = \frac{1}{2}mv^2$ <i>in any form</i> / $\frac{1}{2} \times 8000 \times 4^2$; 64 000 (J) ;	3

Question	Answer	Marks
7(a)(i)	as temperature increases so does the rate ; rate decreases above 35 °C ;	2
7(a)(ii)	enzymes denature / shape of active site changes ; substrate no longer fits into active site ;	2
7(b)(i)	any palisade cell labelled ;	1
7(b)(ii)	gas exchange ;	1
7(b)(iii)	<i>any three from:</i> magnesium ions needed to make chlorophyll ; (deficiency means) less chlorophyll will be made ; (less chlorophyll means) less light energy transferred to chemical energy ; idea that the chemical energy is in the form of carbohydrates (so less are made) ;	3

Question	Answer	Marks
8(a)(i)	<i>bromine:</i> (dark) orange / brown ; <i>iodine:</i> solid ;	2
8(a)(ii)	all contain the same number of electrons (seven electrons) in the outer shell ;	1
8(b)(i)	single bond between atoms shown as two shared electrons ; (dependent mark) rest of molecule correct ;	2
8(b)(ii)	molecules have only two atoms ; of the same type ;	2
8(c)(i)	rubidium ; outer electron (is furthest from nucleus and so) more easily lost / rubidium is further down Group I ;	2
8(c)(ii)	KCl ;	1

Question	Answer	Marks
9(a)	if one (head)lamp breaks, the other still works / still a complete circuit ;	1
9(b)	correct time conversion / $5 \times 60 \times 60 / 18\,000$; $Q = It$ in any form / $5 \times 18\,000 / 5 \times 5 \times 60 \times 60$; 90 000 (C) ;	3
9(c)	 switch S1 for starter motor in correct position ; switch S2 for headlamps in correct position ; switch symbols correct AND no short circuits, open circuits or additional components ;	3