

Cambridge IGCSE™

COMBINED SCIENCE**0653/42**

Paper 4 Theory (Extended)

October/November 2023**MARK SCHEME**Maximum Mark: 80

Published

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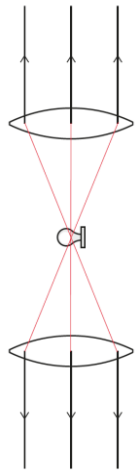
Question	Answer	Marks
1(a)(i)	<u>stigma(s)</u> ; <u>wind</u> ;	2
1(a)(ii)	idea that air sacs, increase the time in the air / increase air resistance / increase surface area / provide a sail effect / reduce density ;	1
1(b)	<i>any two from:</i> sexual reproduction ORA, (usually) requires two parents (not one) ; requires, fertilisation / fusion, of (nuclei) of gametes ; produces offspring that are not genetically identical ; leads to a zygote forming ;	2
1(c)(i)	<u>sperm duct</u> ; <u>cervix</u> ;	2
1(c)(ii)	<i>any two from:</i> have a flagellum ; contain enzymes ; AVP;	2

Question	Answer	Marks
2(a)(i)	hydrochloric (acid) ;	1
2(a)(ii)	water ;	1
2(a)(iii)	add excess MgO / add MgO until no more dissolves ; filter (to remove excess MgO) ; evaporate (some) water / heat to remove (some) water / heat to saturation point / heat to crystallisation point ;	3
2(b)(i)	temperature greater than 0 °C and below 20 °C ;	1
2(b)(ii)	because, heat / (thermal) energy, is released ;	1
2(b)(iii)	idea that Mg and K are in different groups OR have different numbers of electrons in their outer shells OR different valences OR they form ions with different charges ;	1

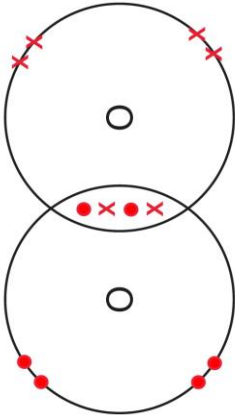
Question	Answer	Marks
3(a)(i)	50 (s) ;	1
3(a)(ii)	X anywhere on the horizontal line of the graph ;	1
3(a)(iii)	evidence of, use of area under graph / $\frac{1}{2} \times 100 \times 12$; 600 (m) ;	2
3(b)(i)	evidence of, $W = mg / 2500 \times 10$ OR 25 000 ; any value greater than 25 000 (N) ; a resultant force is needed ;	3
3(b)(ii)	evidence of, change in GPE = $mg\Delta h / 2500 \times 10 \times 0.95$; 24 000 (J) ;	2
3(c)	(the truck needs the) energy in fuel / energy transfer from fuel ; work done against friction OR energy is transferred to thermal energy (of surroundings) ;	2

Question	Answer					Marks																									
4(a)(i)	<table><tr><td>organism</td><td>carnivore</td><td>primary consumer</td><td colspan="2">occupies trophic level 3</td></tr><tr><td>blackbird</td><td>✓</td><td></td><td colspan="2">✓</td></tr><tr><td>caterpillar</td><td></td><td>✓</td><td colspan="2"></td></tr><tr><td>hawk</td><td>✓</td><td></td><td colspan="2"></td></tr><tr><td>thrush</td><td>✓</td><td></td><td colspan="2">✓</td></tr></table> carnivore column ; primary consumer column ; trophic level 3 column ;					organism	carnivore	primary consumer	occupies trophic level 3		blackbird	✓		✓		caterpillar		✓			hawk	✓				thrush	✓		✓		3
organism	carnivore	primary consumer	occupies trophic level 3																												
blackbird	✓		✓																												
caterpillar		✓																													
hawk	✓																														
thrush	✓		✓																												
4(a)(ii)	any three from: hawk is trophic level 4 / idea that next level is trophic level 5 ; not enough energy (to support another level) ; energy lost between each trophic level OR only a percentage of energy is transferred between trophic levels ; example of energy loss ;					3																									
4(b)(i)	greater number of trees in the young forest area ;					1																									
4(b)(ii)	red oak ;					1																									
4(c)	glucose converted to starch / glucose is stored as starch ; plus any three from: (light energy is) transferred to chemical energy ; by chlorophyll ; (takes place in) chloroplasts ; used in photosynthesis ; used to synthesise carbohydrates / glucose ; AVP ;					4																									

Question	Answer	Marks
5(a)(i)	magnesium AND it is the most reactive or atoms lose electrons most readily ;	1
5(a)(ii)	copper AND copper does not displace hydrogen (from the acid) ;	1
5(a)(iii)	any value greater than 0 AND less than 30 ; reactivity of iron is between copper and zinc ;	2
5(b)(i)	(volume of gas produced) increases ; more frequent collisions more successful collisions OR particles move faster / particles have more kinetic energy ; more particles (have more than minimum) with activation energy ;	3
5(b)(ii)	<i>pH at start: 1–3 AND pH at end: 7 ;</i> (acid is fully neutralised) because magnesium is in excess OR the acid is used up;	2

Question	Answer	Marks						
6(a)(i)	 all six emerging rays correctly linked back to principal focus at lamp ;	1						
6(a)(ii)	0.6 (m) ;	1						
6(b)(i)	unit conversion cm to m ; evidence of, $v = f \lambda / 330 \div 0.75$; 440 (Hz) ;	3						
6(b)(ii)	(loud means) large amplitude ; requires a lot of energy (from a powerful diesel engine) ;	2						
6(c)	<table border="1"><tr><td></td><td></td><td>(visible light)</td><td>(infrared)</td><td></td><td>radio waves ;</td></tr></table>			(visible light)	(infrared)		radio waves ;	1
		(visible light)	(infrared)		radio waves ;			

Question	Answer	Marks
7(a)	thick (muscular) wall ; to withstand pressure ; OR small lumen ; to maintain pressure ; OR elastic fibres ; to allow stretch and recoil ;	2
7(b)(i)	less blood passes through ; reference to transport of oxygen in blood ;	2
7(b)(ii)	<i>any two from:</i> smoking ; genetic predisposition ; age ; gender / sex ; diet ; stress ; AVP ;	2

Question	Answer	Marks
8(a)(i)	$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$;	1
8(a)(ii)	<i>reducing agent</i> carbon monoxide ; <i>reason</i> it takes oxygen from iron (oxide) OR it reduces iron oxide (to iron) ;	2
8(b)(i)	<i>any two from:</i> oil acts as a barrier ; stops contact of iron with, air / oxygen ; stops contact of iron with water ;	2
8(b)(ii)	painting / coating / AVP ;	1
8(c)(i)	Group VI AND has 6 electrons in the outer shell / same number of electrons in outer shell as the group number ;	1
8(c)(ii)	 bonding electrons correct ; non-bonding electrons correct ;	2

Question	Answer	Marks
9(a)	evidence of, $P = IV / 18 \times 240$; 4300 ; W / watt(s) ;	3
9(b)(i)	parallel ; different currents so two separate branches / series circuit must have same current everywhere / 18 A is split into 12 A and 6 A ;	2
9(b)(ii)	cables to floodlight G are twice as long ; R is proportional to length / R increases with length / R (of the cables / in the branch) is doubled ; idea that R is inversely proportional to I / use of $V = IR$ (in any form) (so the current is halved) ;	3