



Cambridge IGCSE™

COMBINED SCIENCE

0653/42

Paper 4 Theory (Extended)

May/June 2022

MARK SCHEME

Maximum Mark: 80

Published

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This document consists of **12** printed pages.

Question	Answer	Marks
1(a)(i)	label to aorta on healthy heart ;	1
1(a)(ii)	blood flowing, backwards / into (left) atrium ;	1
1(a)(iii)	<i>any two from:</i> stress ; smoking ; genetic predisposition ; age ; gender ; AVP ;	2
1(b)(i)	$\frac{80}{60} \times 100$; 133.33333 ; 133 ;	3
1(b)(ii)	<i>any three from:</i> heart rate decreases ; less energy required / less muscular contraction ; less oxygen needs to be transported to muscles ; (due to) decreased respiration (rate) ; AVP ;	3

Question	Answer	Marks
2(a)(i)	volumes of solid and liquid do not change and gas volume decreases / changes ; solid and liquid particles are close together and gas particles are (far) apart ; the idea that solid / liquid particles cannot be pushed closer together and gas particles can be pushed closer together ;	3
2(a)(ii)	(volume increases because) particles move / become further apart ; particles gain (kinetic) energy / particles move faster ;	2
2(b)(i)	36–39 (°C) (any value in this range) ;	1
2(b)(ii)	above 45 (°C) ;	1
2(c)	(chemical / burning) new chemicals are formed / (physical / state change / melting) same substances present / ORA ;	1

Question	Answer	Marks
3(a)	(S =) 340 (N) AND no vertical movement, (so forces must be equal and opposite) ;	1
3(b)(i)	kinetic ; kinetic ;	2
3(b)(ii)	$W = F \times d$ (in any form) / = 225×0.30 ; 67.5 (J) ;	2
3(b)(iii)	power = work done ÷ time OR change in energy ÷ time OR = $67.5 \div 1.2$; 56 (W) ;	2

Question	Answer	Marks												
4(a)	<table border="1"> <thead> <tr> <th>letter</th><th>name of part</th><th>function</th></tr> </thead> <tbody> <tr> <td>(A)</td><td>anther / stamen</td><td>produce, pollen / male gamete</td></tr> <tr> <td>(D)</td><td>ovary</td><td>(produce ovules)</td></tr> <tr> <td>C</td><td>(stigma)</td><td>receives pollen / AW</td></tr> </tbody> </table>	letter	name of part	function	(A)	anther / stamen	produce, pollen / male gamete	(D)	ovary	(produce ovules)	C	(stigma)	receives pollen / AW	3
letter	name of part	function												
(A)	anther / stamen	produce, pollen / male gamete												
(D)	ovary	(produce ovules)												
C	(stigma)	receives pollen / AW												
4(b)	similarity – fusion of nuclei ; difference – pollen used instead of sperm / takes place in ovary not oviduct ;	2												
4(c)	acts as a barrier against, toxins / poisons ; <i>then any two from:</i> provides nutrients ; provides oxygen ; removes waste products ;	3												

Question	Answer	Marks
5(a)	<i>any two from:</i> brass is, stronger ; brass is, harder / more hardwearing ; brass does not corrode (as easily) ; ORA	2
5(b)(i)	percentage of copper (56) plus zinc (37), is 93 / is less than 100 / 7% unaccounted for ;	1
5(b)(ii)	atoms of zinc should be larger than copper ; too many Cu atoms / too few Zn atoms / percentage of zinc needs to be higher ;	2
5(c)(i)	because copper forms on the rod ;	1
5(c)(ii)	because copper ions are used up / less copper ions left ;	1
5(c)(iii)	orange rod and colourless solution ; no reaction ; because zinc is more reactive (than copper) ;	3

Question	Answer					Marks
6(a)	(gamma radiation)		ultraviolet ;	(visible light)	micro-waves ; (radio waves)	2
6(b)	burns / DNA damage / (skin) cancer ;					1
6(c)	satellite television / (mobile) telephones ;					1
6(d)	transverse ; equal to ;					2
6(e)(i)	$v = f\lambda$ (in any form) / ($f =$) $3 \times 10^8 \div 3.5 \times 10^{-7}$; $= 8.6 \times 10^{14}$; Hz ;					3
6(e)(ii)	$P = VI$ or $I = P \div V$ OR $450 \div 230$; and either: current in each lamp = $150 \div 230 / 0.652(174)$; (total current = $3 \times 0.652(174)$) = $1.96 / 2.0$ (A) ; OR (total power supply needed = 3×150) 450 (W) ; (total current = $450 / 230 =$) $1.96 / 2.0$ (A) ;					3

Question	Answer	Marks
7(a)(i)	mouse ;	1
7(a)(ii)	<i>any two from:</i> energy lost between trophic levels ; named example of energy loss ; so not enough energy to sustain more levels ;	2
7(b)(i)	palisade mesophyll cells – photosynthesis ; spongy mesophyll cells – gas exchange ;	2
7(b)(ii)	magnesium needed to synthesise chlorophyll / (less Mg means) plant becomes pale / yellow or less growth ; chlorophyll is needed for photosynthesis ;	2
7(c)	kill bacteria ; provide (acidic) pH for enzymes ;	2

Question	Answer	Marks															
8(a)(i)	(activation energy of) reaction 2 is higher because the difference in energy of reactants and energy of the peak is greater / OR A ;	1															
8(a)(ii)	more collisions have the activation energy / frequency of successful collisions increases ;	1															
8(b)	reaction 1 AND because it is exothermic / energy is given out ;	1															
8(c)	<table><tr><td></td><td>bonds are being broken</td><td>bonds are being formed</td><td>energy is being taken in</td><td>energy is being given out</td></tr><tr><td>arrow A</td><td>✓</td><td></td><td>✓</td><td></td></tr><tr><td>arrow B</td><td></td><td>✓</td><td></td><td>✓</td></tr></table>		bonds are being broken	bonds are being formed	energy is being taken in	energy is being given out	arrow A	✓		✓		arrow B		✓		✓	2
	bonds are being broken	bonds are being formed	energy is being taken in	energy is being given out													
arrow A	✓		✓														
arrow B		✓		✓													
8(d)(i)	4 ;	1															
8(d)(ii)	Any two from: contains (only) carbon and hydrogen ; all single bonds / saturated ; has the same general formula ;	2															

Question	Answer	Marks
9(a)	A AND C ;	1
9(b)(i)	 ;	1
9(b)(ii)	$E = IVt$ (in any form) or 300 (s) ; $5 \times 12 \times 5 \times 60 / 18\,000$ (J) ; 18 (kJ) ;	3
9(b)(iii)	8 (V) ;	1
9(b)(iv)	(to) thermal energy ; due to resistance (in the circuit) ;	2