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Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

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Paper 4 Extended Theory

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MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	$6\text{CO}_2 + 6\text{H}_2\text{O} \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$;;	2
1(a)(ii)	makes the leaf float ; good light absorption ;	2
1(b)(i)	more plants produced in B than A / greater increase in B than A ; use of supporting data e.g. increase of 5 in A and 19 in B ;	2
1(b)(ii)	nitrate ions causes population to increase more rapidly ;	1
1(c)(i)	becomes covered with duckweed / algae / plants ;	1
1(c)(ii)	(bacteria) decompose the dead plants ; bacteria use up oxygen / oxygen concentration in pond decreases ; due to <u>respiration</u> of the bacteria ; fish die / suffocate due to lack of oxygen ;	max 3

Question	Answer	Marks
2(a)(i)	(metal ion) any moving towards negative electrode and (non-metal ion) any moving towards positive electrode ; (electrolyte) solution ; (anode) positive electrode ;	3
2(a)(ii)	the idea that electron transfer occurs between ions and electrodes ; positive ions gain electrons and negative ion lose electrons ;	2
2(b)	electrolysis ; molten (sodium chloride) ; relevant additional detail e.g. high temperature needed / inert electrodes used ;	max 2
2(c)(i)	carbon / coke ;	1
2(c)(ii)	carbon monoxide / CO / carbon / C ;	1
3(a)(i)	upward vertical force arrow acting on the drone at any point ;	1

Question	Answer	Marks
3(a)(ii)	falls to ground ; accelerates ;	2
3(a)(iii)	(moves / accelerates due to) unbalanced forces / weight / gravitational force ;	1
3(b)(i)	PE gained = $mgh = 5 \times 10 \times 50$; = 2500 ; joules / J ;	3
3(b)(ii)	chemical > electrical > kinetic > (grav PE) ; ; all 3 correct for 2 marks; any 2 correct for 1	2
3(c)(i)	electromagnetic waves ;	1
3(c)(ii)	$v = f \lambda$ OR rearranged / $\lambda = 3.0 \times 10^8 / 35 \times 10^6$; = 8.6 m ;	2

Question	Answer	Marks
4(a)	A stigma ; feathery structure / large area to trap pollen ; B anther ; hangs outside the flower to (allow the wind) disperse pollen ;	4
4(b)	no need to attract insects ;	1
4(c)	haploid nuclei fuse / join ; to form a diploid zygote ; genetically dissimilar offspring ;	max 2

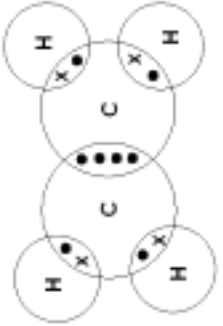
Question	Answer	Marks
5(a)(i)	(13) 13 electrons so 13 protons / same no. electrons and protons ;	1
5(a)(ii)	aluminium ;	1
5(b)(i)	(mass no.) 37 ; (neutron no.) 20 ;	2
5(b)(ii)	2, 8, 8 shown on a diagram with concentric shells ;	1
5(b)(iii)	(chlorine is an element but) sodium chloride is a compound / not an element ;	1
5(c)	(test) silver nitrate / aqueous/solution (acidic conditions) ; (result) white precipitate ;	2

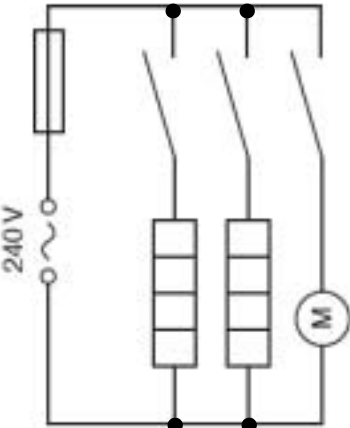
Question	Answer	Marks
6(a)	line starts from -5° ; line rises to meet cooling line ; curves meet at or after 200 seconds ; line matches cooling line and follows it as temp rises again at end ;	Max 3
6(b)(i)	convection ;	1
6(b)(ii)	cold water denser than warm (so sinks to bottom, displacing warmer water back to top) ;	1

Question	Answer	Marks
7(a)(i)	larynx correctly labelled ;	1
7(a)(ii)	<i>any bronchiole correctly labelled ;</i>	1
7(b)(i)	thin wall / short diffusion distance ; good blood supply ;	2

Question	Answer	Marks
7(b)(ii)	down concentration gradient osmosis ;	1
7(c)	<i>mucus</i> traps pathogens / dust ; <i>cilia</i> (beat upwards to) remove the mucus ;	2
7(d)	(blood leaving left ventricle) has to go all round the body ; blood leaving right ventricle only has to go to lungs / high pressure in lung capillaries would damage them ;	2

Question	Answer	Marks
8(a)(i)	coal and natural gas ;	1
8(a)(ii)	<u>fractional distillation</u> ;	1
8(b)(i)	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ all formulae correct ; correct balancing (dependant on correct formulae) ;	2
8(b)(ii)	C_6H_{14} ;	1
8(b)(iii)	(B) / C_6H_{14} / hexane (B) larger molecule / surface area ; (B) greater intermolecular (attractive) forces / more energy needed to separate molecules ;	2
8(c)(i)	cracking ;	1

Question	Answer	Marks
8(c)(ii)	 (circles not essential) double bond between carbon atoms ; four H atoms drawn with single pair between each and a C atom ;	2

Question	Answer	Marks
9(a)	 fuse in main circuit ; heating elements in parallel with each other and supply ; motor in parallel with heating elements (and supply) ; switches in series with both heaters and motor ;	4
9(b)	total power supply required = $1200 \times 2 + 100 = 2500 \text{ W}$; use of $P = I \times V$ e.g. current through one heater = 5 A / total current = $2500 \div 240$; = 10.4 A (which is above fuse rating) ;	3

Question	Answer	Marks
9(c)	value within range 10–15 kHz ; top end of normal range is 20 kHz / older residents can hear up to 15 kHz ;	2