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Paper 4 Extended Theory

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MARK SCHEME

Maximum Mark: 80

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

Question	Answer	Marks
1(a)(i)	$(1.5 - 0.6 =) 0.9 \text{ (dm}^3\text{)} ;$	1
1(a)(ii)	(increase in breaths) = 2 breaths (over 12 seconds) ; $\times 60 / 12 = 10 ;$	2
1(b)	increase ; (aerobic) <u>respiration</u> increases during exercise ;	2
1(c)	combines with haemoglobin / reduces the amount of oxygen able to combine with haemoglobin ; reduces amount of oxygen being transported (by blood / red cells) ;	2
1(d)	lung cancer / COPD / emphysema / bronchitis ;	1

Question	Answer	Marks
2(a)(i)	molecules contain carbon and hydrogen (only) / are hydrocarbons / are covalent ;	1
2(a)(ii)	fraction A molecules are smaller / have fewer carbon atoms / have lower intermolecular forces ;	1
2(b)(i)	family of compounds with the same general formula ; similar chemical properties ;	2
2(b)(ii)	$ \begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H} - \text{C} - & \text{C} - & \text{C} - \text{H} \\ & & \\ & \text{H} & \text{H} & \text{H} \end{array} $ 3 carbon atoms in chain ; all else correct ;	2
2(c)(i)	$\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$; correct formulae ; correctly balanced ;	2
2(c)(ii)	global warming / climate change / consequence of climate change / <u>enhanced</u> greenhouse effect ;	1
2(c)(iii)	 two shared pairs of electrons between oxygen and carbon ; all else correct ;	2

Question	Answer	Marks
3(a)(i)	The extension (of an elastic object) is (directly) proportional to the force (applied to it) ;	1
3(a)(ii)	correct calculation of extension $x = 0.04$ or spring constant $k = 50$; ($F = kx = 50 \times 0.06 = 3.0$ (N) ;	2
3(a)(iii)	use of work done = force $\times$ distance ; ($W = Fx = 0.75 \times 0.015 = 0.011$ (J) ;	2
3(b)(i)	use of conservation of energy ($mgh = KE = 2$) ; $0.125 \times 10 \times h = 2$; $= 1.6$ (m) ;	3
3(b)(ii)	friction / air resistance ;	1

Question	Answer	Marks
4(a)(i)	nucleus correctly labelled ; cell membrane correctly labelled ;	2
4(a)(ii)	large surface area ; increases <u>rate</u> of water uptake ;	2
4(b)(i)	needed to make amino acids ;	1
4(b)(ii)	across root cortex ; up stem ; in xylem ;	Max. 2
4(c)(i)	rickets / soft (and deformed) bones ;	1
4(c)(ii)	butter / margarine / egg (yolks) / milk ;	1

Question	Answer	Marks
5(a)(i)	bauxite ;	1
5(a)(ii)	Al_3^{+} ;	1
5(a)(iii)	(positive) aluminium ions move to / are attracted to (negative) cathode ; and gain (three) electrons ;	2
5(a)(iv)	aluminium is too reactive / aluminium above carbon in reactivity series / aluminium is more reactive than carbon ;	1
5(b)	(alloys are) stronger / more resistant to corrosion ;	1

Question	Answer	Marks
6(a)	Use of $P = IV$; ($750 / 240 =$) $I = 3.1$ (25) (A) ; 5 A fuse just higher than required operating current so appropriate / 3 A fuse too low and would blow under normal working conditions / 13 A fuse too high and would not blow until much higher than operating current ;	3
6(b)	(when the switch is down) additional resistor (in motor branch of circuit) ; potential difference across motor decreases (because some p.d. across resistor) ; current (in motor) decreases (so motor speed is slow) ; ora	3
6(c)	hairdryer blows evaporated water molecules away so they cannot fall back onto the hair again ; hairdryer heats the water molecules on the hair so they have increased KE and can evaporate faster ;	2

Question	Answer	Marks
7(a)(i)	(lipase) breaks down fats (in the milk) ; to produce fatty acids ;	1
7(a)(ii)	the breakdown of large insoluble molecules ; into small soluble molecules that can be absorbed ;	2
7(a)(iii)	pancreas / small intestine ;	1
7(b)	enzyme is <u>denatured</u> ; enzyme (molecule) has changed shape / destroyed substrate no longer fits active site or active site shape has changed ; substrate no longer fits enzyme (molecule) ;	3
7(c)	food is broken down into smaller pieces ; without chemical change / without action of enzymes / it is a physical change ;	2

Question	Answer	Marks
8(a)(i)	85 ;	1
8(a)(ii)	7 ; group VII element / halogen ;	2
8(a)(iii)	KAt ;	1
8(b)(i)	thermal energy released / temperature increased / chemical energy converted to thermal energy ; more energy released during bond formation than energy required for bond breaking ;	2
8(b)(ii)	alternating Cl^- and Na^+ ions ;	1
8(b)(iii)	(NaCl) ionic so attractive forces between ions are strong more thermal energy (heat) needed to separate ions or (chlorine) covalent so attractive forces between molecules are weak ; less thermal energy (heat) needed to separate molecules ;	2

Question	Answer	Marks
9(a)	visible light in correct position ; ultraviolet in correct position ;	2
9(b)	use of distance = speed $\times$ time ; (330×10) = 3300 m ;	2
9(c)	use of $Q = I t$; ($30\,000 \times 0.00005$) = 1.5 ; coulombs / C ;	3
9(d)(i)	electron(s) ;	1
9(d)(ii)	hair becomes (electrostatically) charged (due to transfer of electrons) ; like charges repel (causing hair to stand on end) ;	2