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COMBINED SCIENCE

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Paper 4 Extended Theory

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MARK SCHEME

Maximum Mark: 80

Published

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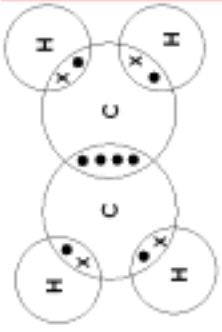
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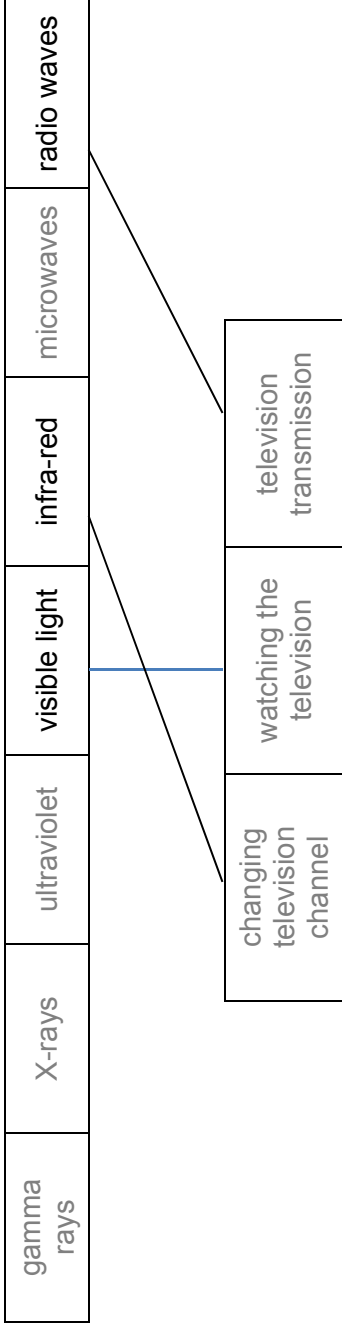
Question	Answer	Marks																													
1(a)	<table><tr><th rowspan="2">substance in food</th><th colspan="4">element</th></tr><tr><th>carbon</th><th>hydrogen</th><th>nitrogen</th><th>oxygen</th></tr><tr><td>carbohydrate</td><td>✓</td><td>✓</td><td></td><td>✓</td></tr><tr><td>fat</td><td>✓</td><td>✓</td><td></td><td>✓</td></tr><tr><td>protein</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>water</td><td></td><td>✓</td><td></td><td>✓</td></tr></table> one mark for each correct row , , , , ,	substance in food	element				carbon	hydrogen	nitrogen	oxygen	carbohydrate	✓	✓		✓	fat	✓	✓		✓	protein	✓	✓	✓	✓	water		✓		✓	4
substance in food	element																														
	carbon	hydrogen	nitrogen	oxygen																											
carbohydrate	✓	✓		✓																											
fat	✓	✓		✓																											
protein	✓	✓	✓	✓																											
water		✓		✓																											
1(b)	include more fibre / roughage / fruit / vegetables ; (fibre) helps to move food through digestive system ;	2																													
1(c)	fatty ; (first space) smoking ; stress ;	3																													
1(d)(i)	(increases blood flow) (because the artery is) wider / the idea of more space (for blood to pass through) ;	1																													
1(d)(ii)	increases supply of glucose / oxygen (reaching the heart muscle) ; for respiration (in heart muscle cells) / to release energy (in muscle cells) / for contraction / action (of heart muscle) ;	2																													

Question	Answer	Marks
2(a)(i)	No reaction expected / will take place / experiment has to compare different metals ;	1
2(a)(ii)	aluminium / Al zinc / Zn tin / Sn lead / Pb ;; aluminium and lead correctly located = 1 all correct = 2	2
2(b)(i)	magnesium chloride ;	1
2(b)(ii)	$\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$ all formulae and balanced (dependent on formulae) ; 3 or 4 correct state symbols (dependent on correct species) ;	2
2(b)(iii)	feasible method of collection ; timing device listed or shown in diagram ;	2
2(c)(i)	(Number of) protons + neutrons (in an atom) ;	1
2(c)(ii)	13 electrons shown ; arranged 2, 8, 3 ;	2

Question	Answer	Marks
3(a)(i)	arrow vertically upwards acting from the load ;	1
3(a)(ii)	(moving at) constant speed ;	1
3(b)(i)	constant acceleration constant speed changing acceleration ;	1
3(b)(ii)	Distance (= area under graph) = $\frac{1}{2} \times 4 \times 25 + 4 \times (65 - 25)$; = 210 (m) ;	2
3(c)	volume of cube = $2.0 \times 2.0 \times 2.0 = 8.0 \text{ m}^3$; density = mass / volume or $d = m / V$ or $m = V \times d = 8.0 \times 7000$; = 56 000 (kg) ;	3

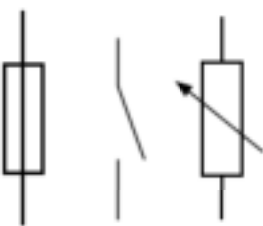
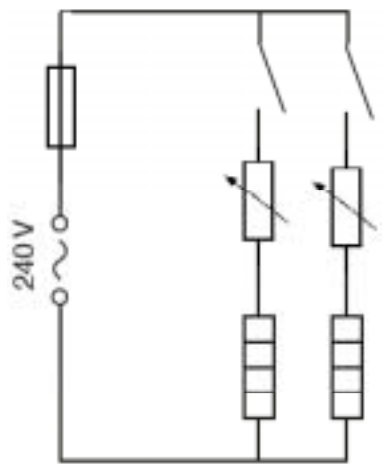
Question	Answer	Marks
4(a)(i)	(leaf P) it contains most chlorophyll ;	1
4(a)(ii)	converted to chemical energy ; used to make glucose / carbohydrate ;	2
4(b)(i)	$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$ correct formulae ; correctly balanced depending on correct formulae ;	2
4(b)(ii)	from leaves ; (transport) through the phloem ;	2

Question	Answer	Marks
5(a)(i)	(compound / substance) containing hydrogen and carbon (atoms) ; (carbon and hydrogen) only ;	2
5(a)(ii)	 (circles not essential) four electrons shown between carbon atoms ; four H atoms drawn with single pair of electrons between each and a C atom ;	2
5(a)(iii)	(test) (addition of) bromine ; (ethane) no change of color ; and (ethene) decolorises ;	2
5(b)(i)	global warming / any valid effect of global warming ;	1
5(b)(ii)	thermal / heat energy released (by chemical reaction) / (chemical reaction causes) temperature increase ; chemical energy converted (to thermal / heat energy) ;	2

Question	Answer						Marks
6(a)	 3 correctly named parts of the electromagnetic spectrum ; these named parts correctly located ; 2 correct links between action and part of the electromagnetic spectrum ;						3
6(b)(i)	convection ;						1
6(b)(ii)	the density of hot gases is lower (than air in balloon) ; hot gases / lower density gases rise / ora ;						2
6(b)(iii)	molecules move faster / have greater kinetic energy ; (attractive) forces become weaker / less significant ; the separation between molecules increases ;						3

Question	Answer	Marks
7(a)(i)	green plants → caterpillars → small birds → hawk or green plants → mice → cats → hawk correct organisms from the diagram in order ; arrows in correct sense ;	2
7(a)(ii)	cat ; hawk ;	2
7(b)(i)	(the hawk's) energy lost in respiration / heat / movement / growth ; (the hawk's) energy lost in waste products e.g. faeces, urine ; not all of the cat eaten by the hawk ;	max 2
7(b)(ii)	very little energy remains after 4 transfers / the idea that there is insufficient energy to sustain further levels ;	1

Question	Answer	Marks
8(a)(i)	melt / make it molten / convert it into a liquid form ;	1
8(a)(ii)	ions not mobile / the idea that ions need to (be able to) move ;	1
8(b)(i)	<u>blast furnace</u> ;	1
8(b)(ii)	carbon is more reactive than iron ; group II metals / calcium are more reactive than carbon ;	2
8(c)(i)	transition (elements / metals) ;	1
8(c)(ii)	noble (gases) / Group VIII ;	1

Question	Answer	Marks
9(a)(i)	 fuse switch variable resistor 3 correct for 2 marks Any 1 correct for 1 mark	2
9(a)(ii)	parallel ;	1
9(a)(iii)	 two hotplates connected in parallel ; each hotplate branch contains a variable resistor in series ; each hotplate branch contains a switch in series ; fuse in main circuit ;	4

Question	Answer	Marks
9(b)	$P = V \times I$; EITHER larger hotplate: $I = 1500 / 240 = 6.25 \text{ A}$ smaller hotplate: $I = 1000 / 240 = 4.17 \text{ A}$; total current = $10(.4 \text{ A})$, (safely less than 13 A) ; or total power = $1.5 \text{ (kW)} + 1.0 \text{ (kW)} = 2.5 \text{ (kW)}$; $P = V \times I$ or $I = P / V$ or total current = $2500 / 240$; = $10(.4 \text{ A})$ (safely less than 13 A) ;	3