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COMBINED SCIENCE

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Paper 4 Extended Theory

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MARK SCHEME

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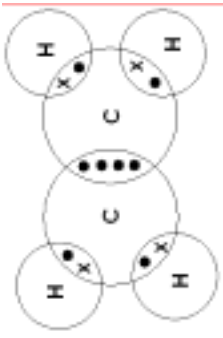
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Question	Answer	Marks
1(a)(i)	geotropism ;	1
1(a)(ii)	auxin moves to lower surface ; causes more elongation / growth ;	2
1(a)(iii)	causes retardation of elongation / growth (on lower surface) ;	1
1(b)(i)	has large projection / is long / large surface area ; the idea of increased rate of water uptake / of diffusion ;	2
1(b)(ii)	higher concentration of water / water potential in soil / ora / there is a concentration gradient between the soil water and the cell water ; water moves from high to low concentration (of water) / down the concentration gradient ;	2
1(c)	xylem ;	1

Question	Answer	Marks
2(a)(i)	anhydrous / blue cobalt chloride ; turns (blue to) pink ; OR anhydrous / white copper sulfate ; turns (white to) blue ;	2
2(a)(ii)	$\text{Ca(OH)}_2(\text{aq}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{g}) + \text{H}_2\text{O}(\text{l})$ correct species both sides ; 3 or 4 correct states ;	2

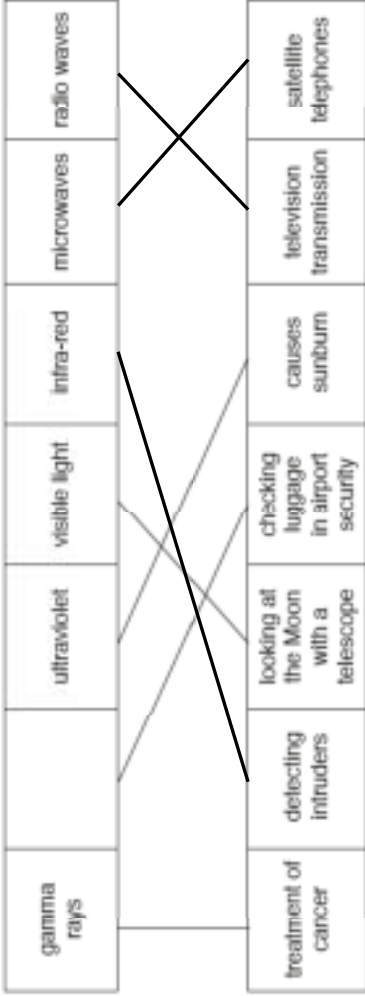
Question	Answer	Marks
2(b)(i)	 (circles not essential) 4 electrons between two C atoms ; 2 electrons between each of 4 pairs of C and H atoms ;	2
2(b)(ii)	covalent ;	1
2(c)	2, 4 ;	1

Question	Answer	Marks
3(a)	fuse ; (the idea that 240 V could produce a) high current ; one from (a high current could) cause damage / overheating ; (fuse) protects circuit / breaks circuit / melts ;	3
3(b)(i)	$(R = V/I) = 3 / 0.2 ;$ $= 15 (\Omega) ;$	2
3(b)(ii)	total power supply required = $100 + 20 = 120 \text{ W}$; $P = I \times V$ or total current = $120 / 240$; $= 0.5 \text{ A}$;	3

Question	Answer	Marks
3(c)	 reflected ray shown at approx. correct angle missing the eye ;	1

Question	Answer	Marks
4(a)	trachea, bronchus, bronchiole ;	1
4(b)	<i>effect on mucus</i> mucus production increases ; <i>effect on cilia</i> cilia become paralysed / damaged ; cannot remove mucus from airway / away from lungs ;	3
4(c)	(rate of gas exchange reduced) reduced area (for gas exchange in alveoli) ;	1
4(d)(i)	narrowing / blockage of <u>coronary arteries</u> ; due to fatty deposits / plaque ;	2
4(d)(ii)	high fat diet ; stress ;	2

Question	Answer	Marks
5(a)(i)	(decrease) gas produced / released (by the reaction) ; to the surroundings / substance leaves the flask / apparatus ;	2
5(a)(ii)	(increase) particles move faster / gain (kinetic) energy ; particles collide more often ; the idea that more of the collisions are successful ;	max 2
5(a)(iii)	increase ; calcium is more reactive (than magnesium) ;	2
5(b)(i)	cathode ;	1
5(b)(ii)	(each ion) loses (one) electron ;	1
5(b)(iii)	MgCl_2 ;	1
5(b)(iv)	reduction ;	1

Question	Answer	Marks
6(a)(i)	X-rays ;	1
6(a)(ii)	electromagnetic spectrum  uses all three correct ;	1
6(b)	electromagnetic / infra-red waves can travel through a vacuum / do not need a medium to travel through ;	1
6(c)(i)	glass is a bad / poor conductor (of thermal energy) ;	1
6(c)(ii)	air / gas expands / volume increases ; molecules move faster / gain kinetic energy ; separation / distance between molecules increases ;	3

Question	Answer	Marks
7(a)(i)	the Sun ;	1
7(a)(ii)	death / egestion / excretion ;	1
7(a)(iii)	1, 2, 4	1
7(b)(i)	photosynthesis ;	1
7(b)(ii)	(concentration increases) less CO ₂ removed ; because photosynthesis reduced ; (CO ₂ continues to be) added to atmosphere by respiration / combustion ;	max 2
7(c)	dissolves in rainwater / owtte ; forms acid rain ; consequence of pollution by acid rain ; (e.g. harm to plants / animals / water courses damage to building materials)	3

Question	Answer	Marks
8(a)(i)	the idea that the number of outer electrons is the same as the group number ;	1
8(a)(ii)	more (outer-shell) electrons more non-metallic ; metallic elements have fewer (outer-shell) electrons ;	1
8(b)(i)	temperature in range 21–62 (°C) ;	1
8(b)(ii)	rubidium is more reactive ;	1
8(c)	kill / destroy bacteria / microbes / microorganisms ;	1
8(d)(i)	thermal / heat energy released (by chemical reaction) / (chemical reaction causes) temperature increase ; chemical energy converted (to thermal / heat energy) ;	2
8(d)(ii)	sodium hydroxide / NaOH / sodium carbonate / Na ₂ CO ₃ / sodium hydrogen carbonate / sodium bicarbonate / NaHCO ₃ ;	1

Question	Answer	Marks
9(a)(i)	two opposite vertical force arrows ; both arrows from the load ;	2
9(a)(ii)	weight / gravitational force ;	1
9(b)(i)	constant acceleration constant speed changing acceleration (in this order) ;	1
9(b)(ii)	selection of area under graph as method ; calculation of area: $\frac{1}{2} \times 50 \times 1 + (125 - 50) \times 1 = 100 \text{ m} ;$	2
9(b)(iii)	$(P =) E / t$ or $(P =) 2\,000\,000 \div 150 ;$ $= 13\,300 \text{ (W)} / 13\,000 \text{ (W)} ;$	2
9(c)	density = mass / volume ; unit change noted: $5000 \text{ dm}^3 = 5 \text{ m}^3 ;$ mass (= volume x density) = $5 \times 1025 = 5125 \text{ (kg)} ;$	3