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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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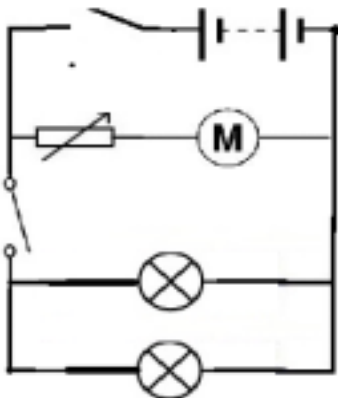
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This document consists of **10** printed pages.

Question	Answer	Marks
1(a)	right atrium ; right ventricle ; pulmonary artery ;	3
1(b)(i)	blood passes through heart twice, in each cycle / blood has two circulation paths (to the lungs and to the body) ;	1
1(b)(ii)	<i>(higher pressure on left side)</i> needed for blood going all round the body / blood travels further ; <i>(lower pressure on right side)</i> needed for blood going to the lungs / shorter distance / so the blood capillaries are not damaged ;	2
1(c)(i)	to take oxygen / glucose to the cells / muscles more quickly / to take more oxygen / more glucose to cells / muscles remove carbon dioxide from cells / muscles more quickly / remove more carbon dioxide from cells / muscles ; correct reference to respiration ;	max 2
1(c)(ii)	to take more oxygen (into blood) / remove carbon dioxide (from blood) more quickly ;	1
1(d)	<i>any two from</i> tar increases mucus / tar builds up in lungs / paralyses / destroys cilia / causes cancer ; or nicotine causes addiction / increases blood pressure / leads to heart disease ; or carbon monoxide reduces the concentration of oxygen carried by the blood / makes carboxyhaemoglobin ;	2

Question	Answer	Marks
2(a)	(a pure substance) A or D ; (a mixture) B or C ; (an alloy) C ; (a compound) D ; (1) for any two or three correct (2) for all four correct	2
2(b)(i)	$(\text{Ca}(\text{s})) + 2\text{HCl}(\text{aq}) \rightarrow \dots\text{CaCl}_2\dots(\text{aq}) + \dots\text{H}_2\dots(\text{g})$;; species RHS (1) state symbols (1) for species given	2
2(b)(ii)	(effect on rate) decreases ; (explanation) particles collide less often / less frequently / less chance of collisions ;	2
2(b)(iii)	silver nitrate solution ; <u>white</u> solid / precipitate ;	2
2(c)	Fe_2S_3 ;	1

Question	Answer	Marks
3(a)	 <p>variable resistor in motor branch, correct symbol ; switch for headlamps after motor branch, before first headlamp branch ;</p>	2
3(b)	(decreasing resistance) increases current, (so faster motor) ;	1
3(c)	in parallel ; the same as ; less than ;	3
3(d)	10 min = $1/6$ h / $5/60 = 0.083$ (km/min) ; distance = speed \times time = $5 \times 1/6 = 0.83$ km / distance = speed \times time = $0.083 \times 10 = 0.83$ km ;	2

Question	Answer	Marks
4(a)	letter A label going to small intestine / ileum ;	1
4(b)(i)	stomach ; stomach has acidic conditions ; enzyme only worked in tube 1 / at pH 2 / in an acidic environment ;	3
4(b)(ii)	<i>any two from</i> enzyme will become denatured ; further detail of denaturation ; correct reference to (likely) optimum temperature ;	max2
4(b)(iii)	<i>any two from</i> large / insoluble molecules are broken down ; small / soluble molecules are produced ; by the action of an enzyme ;	max 2

Question	Answer	Marks
5(a)	(trend) increase (in boiling point) ; (explanation) bigger molecules ; greater intermolecular forces ;	3
5(b)(i)	cracking ;	1
5(b)(ii)	ethene ; allow ethylene	1
5(b)(iii)	alkene / unsaturated ;	1
5(b)(iv)	(from) orange / brown (to) colourless / decolourises ;	1
5(c)	chemical (energy) to thermal / heat (energy) ; <i>and one from</i> temperature increases ; thermal energy (heat) released ;	max 2

Question	Answer	Marks
6(a)(i)	atoms / molecules / particles vibrate (faster) and / transfer this vibration / energy to neighbouring particles owtte ;	1
6(a)(ii)	gas molecules far apart, no vibration ;	1
6(b)	radiation ;	1
6(c)(i)	$P = IV$; (or alternative expression) $I = 80 / 240$; $= 0.33 (A)$;	2
6(c)(ii)	$E = P \times t / E = V \times I \times t / E = 80 \times 3600$; $= 288\,000 (J)$;	2

Question	Answer	Marks
7(a)	transpiration ;	1
7(b)	decomposers ; break down dead organisms (or their leaves) ;	2
7(c)	rainfall reduced because less water is being transpired / evaporated from trees ;	1
7(d)	soil will be eroded ; no trees / tree roots to stabilise the soil ;	2
7(e)	carbon dioxide increases (no mark) less taken in during photosynthesis ; oxygen decreases (no mark) less given out by photosynthesis ;	2

Question	Answer	Marks												
8(a)(i)	2 electrons in 1st shell and 6 electrons in 2nd shell ;	1												
8(a)(ii)	<p>2 bonding pairs ; 2 lone pairs and no extra electrons anywhere ;</p>	2												
8(b)(i)	II / 2 / two ;	1												
8(b)(ii)	<u>2+</u> ; loses two electrons ;	2												
8(c)	<table border="1" data-bbox="342 715 1552 1086"> <thead> <tr> <th data-bbox="342 715 745 767"><i>order of reactivity</i></th> <th data-bbox="745 715 1149 767"><i>metal</i></th> <th data-bbox="1149 715 1552 767"><i>method of extraction</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="342 767 745 1086"> <p><i>most reactive</i></p> <p style="text-align: center;">↓</p> <p><i>least reactive</i></p> </td> <td data-bbox="745 767 1149 874">potassium / K</td> <td data-bbox="1149 767 1552 874">electrolysis ;</td> </tr> <tr> <td data-bbox="342 874 745 981"></td> <td data-bbox="745 874 1149 981">iron / Fe</td> <td data-bbox="1149 874 1552 981">blast furnace / reduction by C / CO ;</td> </tr> <tr> <td data-bbox="342 981 745 1086"></td> <td data-bbox="745 981 1149 1086">copper / Cu ;</td> <td data-bbox="1149 981 1552 1086">carbon reduction / heat with carbon ;</td> </tr> </tbody> </table> <p>order of reactivity ; electrolysis linked to potassium ; carbon reduction owtte for both Fe and Cu ;</p>	<i>order of reactivity</i>	<i>metal</i>	<i>method of extraction</i>	<p><i>most reactive</i></p> <p style="text-align: center;">↓</p> <p><i>least reactive</i></p>	potassium / K	electrolysis ;		iron / Fe	blast furnace / reduction by C / CO ;		copper / Cu ;	carbon reduction / heat with carbon ;	3
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	copper / Cu ;	carbon reduction / heat with carbon ;												

Question	Answer	Marks							
9(a)(i)	(Q =) friction / (water) resistance ;	1							
9(a)(ii)	(force Q cf force S) equal / balanced ;	1							
9(a)(iii)	$W = mg = 3\,000\,000 \times 10 ;$ $= 30\,000\,000 \text{ (N)} ;$	2							
9(b)	work done = force \times distance / $F \times d = 100\,000 \times 50 ;$ $= 5\,000\,000 \text{ (J)} ;$	2							
9(c)(i)	$v = f \lambda$ and $\lambda = 3 \times 10^8 / 120 \times 10^6 ;$ $= 2.5 \text{ (m)} ;$	2							
9(c)(ii)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 15%;">gamma</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;">visible light</td> <td style="width: 15%;"></td> <td style="width: 15%;">micro-waves</td> <td style="width: 15%;">radio waves ;</td> </tr> </table>	gamma			visible light		micro-waves	radio waves ;	1
gamma			visible light		micro-waves	radio waves ;			
9(c)(iii)	<i>any two from</i> longitudinal (wave / vibration) / compressions and rarefactions ; (water) molecules / particles vibrate / oscillate ; pass on vibration / energy (through water) ;	max2							