



COMBINED SCIENCE

0653/43

Paper 4 Extended Theory

October/November 2017

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

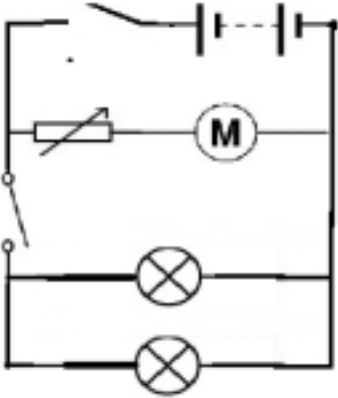
Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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="342 715 745 762"><i>order of reactivity</i></th> <th data-bbox="745 715 1149 762"><i>metal</i></th> <th data-bbox="1149 715 1552 762"><i>method of extraction</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="342 762 745 1086"> <p><i>most reactive</i></p> <p style="text-align: center;">↓</p> <p><i>least reactive</i></p> </td> <td data-bbox="745 762 1149 874">potassium / K</td> <td data-bbox="1149 762 1552 874">electrolysis ;</td> </tr> <tr> <td data-bbox="745 874 1149 978"></td> <td data-bbox="745 874 1149 978">iron / Fe</td> <td data-bbox="1149 874 1552 978">blast furnace / reduction by C / CO ;</td> </tr> <tr> <td data-bbox="745 978 1149 1086"></td> <td data-bbox="745 978 1149 1086">copper / Cu ;</td> <td data-bbox="1149 978 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							