



**General Certificate of Secondary Education**

**Applied Science (Double Award)  
4861**

**4860/2H Science for the Needs of Society**

**Mark Scheme**

*2007 examination - June series*

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## Higher Tier / 2H

question	answers	extra information	marks
1(a)	ear		1
(b)(i)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• nucleus</li> <li>• cytoplasm</li> <li>• cell membrane</li> </ul>	allow neucleus / nuclus not cell wall	2
(ii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• long</li> <li>• many connections / branches</li> <li>• insulated</li> </ul>		2
(c)	glucose / sugar / food <u>reacts with</u> oxygen	accept respiration alone for <b>2</b> marks	1 1
(d)(i)	in the blood		1
(ii)	insulin / thyroxine / testosterone / oestrogen / glucagon / ADH  pancreas / thyroid / testes / ovary / pancreas / pituitary	independent marks, but must be correctly linked for <b>2</b> marks	1 1
<b>Total</b>			<b>10</b>

question	answers	extra information	marks
2(a)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• need to paint</li> <li>• not waterproof</li> <li>• wood will rot / biological damage</li> <li>• damaged by time / weather / warping</li> </ul>	ignore strength  not corrode	2
(b)(i)	flexible material  needs to be rigid (to support glass)	makes it less flexible / to stop it bending = <b>2</b> marks no marks for 'makes it strong'	1  1
(ii)	idea of two materials combined together	allow polymer has steel plate in it	1
(c)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• sand</li> <li>• limestone / <math>\text{CaCO}_3</math> / calcium carbonate</li> <li>• sodium carbonate / <math>\text{Na}_2\text{CO}_3</math> / soda ash</li> </ul>		2
(d)	reduced heat loss / better insulator  less fuel needed / heating on for less time		1  1
<b>Total</b>			<b>2</b>

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question	answers	extra information	marks
3(a)	speed = distance / time  <b>or</b>  description in words		1
(b)	any <b>two</b> from: <ul style="list-style-type: none"><li>• type of road surface</li><li>• driver's reaction time / thinking distance / tiredness / drugs / alcohol / concentration</li><li>• braking distance</li><li>• weather conditions</li><li>• condition of vehicle / brakes / tyres</li><li>• mass / load</li></ul>		2

question	answers	extra information	marks
3(c)	any <b>two</b> from <ul style="list-style-type: none"> <li>• driving test / lessons</li> <li>• punishment for breaking the law</li> <li>• breathalyser</li> <li>• advertising campaign / education programme</li> <li>• take a taxi home (drunken drivers)</li> <li>• warning other drivers (eg L-plates)</li> <li>• making them be accompanied (2 separate marks)</li> </ul>		2
(d)	50/3.3	answer alone = 2 marks	1
	= 15.2 (m/s)	allow 15.15 or 15	1
(e)	decreases / get lower/ lower pitch		1
<b>Total</b>			<b>8</b>

question	answers	extra information	marks
4(a)	venus earth mars jupiter		1
(b)	methane ammonia		1 1
(c)	less volcanic activity so less CO <sub>2</sub> produced / <u>more</u> green plants green plants / photosynthesis uses CO <sub>2</sub> green plants / photosynthesis produces O <sub>2</sub>	ignore humans and animals not respiration	1 1 1
(d)(i)	large concentration of carbon dioxide warmer / high temperature / 450°C	ignore closer to sun	1 1

question	answers	extra information	marks
4(d)(ii)	<p>wind / solar / wave / tidal</p> <p>only produces a small amount of electricity / not always sunny / not enough wind</p> <p><b>or</b></p> <p>HEP</p> <p>limited opportunity to dam rivers</p> <p><b>or</b></p> <p>wood</p> <p>limited supply</p>	<p>not just water</p> <p>must be correctly linked for <b>2</b> marks</p>	<p>1</p> <p>1</p>
(iii)	<p>any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>• nuclear power</li> <li>• better insulation in homes / energy efficient devices</li> <li>• use of public transport / alternative fuels eg H<sub>2</sub></li> <li>• recycling of materials</li> </ul>		1
<b>Total</b>			<b>11</b>



question	answers	extra information	marks
5(a)	antibiotic		1
(b)	any <b>three</b> from: <ul style="list-style-type: none"> <li>• mild or dead form of bacteria</li> <li>• white cells</li> <li>• produce antibodies</li> <li>• same organism recognised later</li> <li>• antibodies produced quickly</li> </ul>	not small amount	3
(c)	any sensible suggestion: <ul style="list-style-type: none"> <li>• isolation of patient / quarantine</li> <li>• health education</li> <li>• methods to prevent pathogens entering the body</li> <li>• sterilisation of equipment</li> </ul>		1
(d)	use of X-rays  different penetration / show diseased area in lung / photographic image of infection	not gamma rays	1  1

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<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>marks</b>
(e)	any <b>two</b> from: <ul style="list-style-type: none"><li>• bacteria have become resistant to infection / mutation</li><li>• more travel</li><li>• overcrowding / poor living conditions</li><li>• unprotected sex</li><li>• dirty needles</li><li>• reduced uptake of vaccination</li></ul>	not stronger	2
<b>Total</b>			<b>9</b>

question	answers	extra information	marks
6(a)	high melting point		1
(b)(i)	lead + carbon dioxide / carbon monoxide / carbon oxide		1
(ii)	PbO + C → Pb + CO  <b>or</b>  2PbO + C → 2Pb + CO <sub>2</sub>	symbols, formulae and balancing correct for 2 marks  one error in symbols or formulae or incorrect balancing for 1 mark	2
(iii)	removes the oxygen (from lead oxide) / carbon displaces lead		1
(c)(i)	eg roofing / flashing / cover gaps in roof / piping		1
(ii)	any <b>two</b> from:  • malleable / easily shaped  • unreactive  • waterproof	do not allow strong	2
(d)(i)	(100 – 62) = 38%		1

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<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>marks</b>
<b>6(d)(ii)</b>	48% tin for <b>1</b> mark		1
	120g of tin + 130g of lead for <b>2</b> marks		1
	<b>or</b>		
	86% tin for <b>1</b> mark		
	215g of tin + 35 of lead for <b>2</b> marks		
<b>Total</b>			<b>11</b>

question	answers	extra information	marks
7(a)	current = power / volts = 2700 / 230 = 11.74 (amps)	allow 11.739 / 11.7 / 12  the answer alone scores all 3 marks	1  1  1
(b)(i)	> 11.74 eg 13 amp	must have correct units  allow ecf	1
(b)(ii)	<ul style="list-style-type: none"> <li>• when current increases / current too high</li> <li>• fuse will blow / cut off the supply</li> </ul>		2
(c)	two insulated containers  same amount of hot water  temperature at start and end / temperature change / temperature comparison  same time / regular time intervals / time for fixed temperature change		1  1  1  1
<b>Total</b>			<b>10</b>

question	answers	extra information	marks
8(a)(i)	covalent	spelling must be correct	1
(ii)	weak forces / weak attraction between molecules / made up of molecules	not weak covalent bonds	1 1
(b)(i)	fermentation yeast	allow anaerobic respiration	1 1
(ii)	(fractional) distillation		1
(iii)	differences in boiling point / ethanol evaporates before water / ethanol has lower boiling point		1
(c)	any <b>two</b> from:  <ul style="list-style-type: none"> <li>• loss of self-control / accidents / effect on reaction time</li> <li>• liver damage</li> <li>• damage to brain / mental health problems</li> <li>• addiction / alcoholism / become dependent</li> <li>• effect on unborn babies</li> </ul>		2
<b>Total</b>			<b>9</b>

question	answers	extra information	marks
9(a)	radio waves – TV / radio		1
	microwaves – mobile phones / ovens / heating food		1
	infrared – remote control for TV / DVD player		1
(b)(i)	number of vibrations / waves		1
	per second		1
(ii)	wavelength = speed of light / frequency = $3 \times 10^8 / 3 \times 10^9$		1
	= 0.1(m)		1
(c)(i)	treatment of cancer (using high energy radiation) / used to destroy cancer cells		1
(ii)	highest energy / most penetrating / highest frequency / causes cancer / kills cells		1
(d)(i)	any <b>two</b> from:  • alpha  • beta  • neutrons		2
(ii)	loss of 2 protons		1
	loss of 2 neutrons / loss of 4 nucleons	(alpha emitter = 2 marks) ignore any reference to electrons	1
<b>Total</b>			<b>13</b>