



## General Certificate of Secondary Education

# Applied Science (Double Award) 3861

*3860/2F Science for the Needs of Society*

## Mark Scheme

*2006 examination – June series*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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question	answers	extra information	marks
1(a)	crucible and tripod		2
(b)	plastic funnel / funnel / plastic filter paper / filter / paper		2
(c)	condenser and flask		2
(d)	tripod / crucible	must be from list	1
	plastic funnel / plastic / funnel	(accept filter paper)	1
	crucible / condenser / flask		1
<b>Total</b>			<b>9</b>

question	answers	extra information	marks
2(a)	solution		1
	gel		1
(b)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• stir / shake</li> <li>• use more hot / boiling water</li> <li>• cut into pieces</li> </ul>		2
(c)(i)	6		1
(ii)	20/6	allow error carried forward	1
	= (3 1/3) / 4		1
(d)	any <b>three</b> from: <ul style="list-style-type: none"> <li>• at least two different temperatures (water or environment)</li> <li>• measure with thermometer</li> <li>• record the time taken (for jelly to set)</li> <li>• any attempt to make fair test</li> </ul>	<b>not</b> dissolve  <b>not</b> just 'make a fair test' / <b>not</b> time	3
<b>Total</b>			<b>10</b>

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question	answers	extra information	marks
3(a)	membrane		1
	nucleus		1
	cytoplasm		1
(b)	any <b>two</b> from: <ul style="list-style-type: none"><li>• size</li><li>• nucleus / shape of nucleus</li><li>• shape (of cell)</li></ul>	do <b>not</b> accept reference to colour or function	2
(c)	red		1
	lungs		1
	respiration		1
(d)	plasma		1
<b>Total</b>			<b>9</b>

question	answers	extra information	marks
4(a)	pesticide		1
	herbicide		1
	fungicide		1
(b)	no competition for light / minerals / nutrients (food) / water / space	do <b>not</b> accept grow better / healthier / less competition (without clarification) / weeds kill the crops / strangle crops	1
(c)(i)	P	<b>must</b> have correct symbols, but ignore case	1
	K		1
(ii)	nitrogen (allow nitrate)	allow iron / calcium / sulphur / manganese / boron / copper / zinc / molybdenum	1
	magnesium	allow symbols only if correct	1
(d)(i)	manure / animal waste / dung / compost	allow crop rotation	1
(ii)	dig them up / by hand / mechanical weeder / weeding / ploughing / hoeing (owtte)		1
(iii)	use other insects to eat them / use other plants to attract insects / pheromone traps / ladybirds / marigolds / predator	ignore reference to plants killing insects  allow organic pesticide  do <b>not</b> allow covering crops / greenhouse	1

question	answers	extra information	marks
4(e)(i)	<ul style="list-style-type: none"> <li>plants don't grow as fast / big</li> </ul>		1
	<ul style="list-style-type: none"> <li>less nutrient in soil / no artificial fertiliser / more disease / eaten by pests / more weeds etc</li> </ul>	ignore reference to cost	1
(ii)	52/2.3		1
	= £22.61	allow 22.6/22.60 / full calculator display (22.60869565) / £23	1
		<b>not</b> £22	
<b>Total</b>			<b>15</b>
5(a)	(good) electrical conductivity		1
	(high) density		1
	attractive / appearance		1
(b)	copper		1
	strongest forces / bonds (of attraction between atoms)	second mark independent of first <b>not</b> just tensile strength – <b>must</b> be idea of strength of forces	1
(c)	zinc makes the alloy stronger		1
	the more zinc the stronger it becomes / higher the tensile strength	second point only = 2 marks	1

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question	answers	extra information	marks
(d)	any <b>two</b> from: <ul style="list-style-type: none"><li>• brass is strong / harder to break</li><li>• zinc corrodes easily / (brass) does not corrode</li><li>• brass looks better / appearance</li></ul>	accept strength  ignore rust  'it' = brass	1  1
<b>Total</b>			<b>9</b>

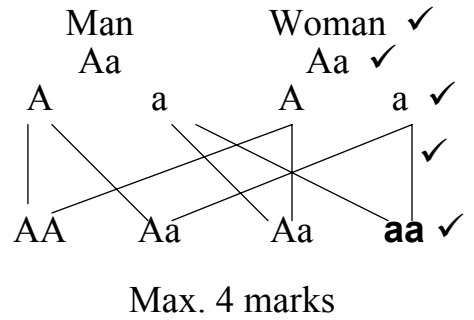
question	answers	extra information	marks
6(a)(i)	decreases		1
(ii)	increases		1
(iii)	evaporation		1
(b)(i)	recessive		1
(ii)	<p>identification of homozygous recessive aa</p> <p>then <b>three</b> from:</p> <ul style="list-style-type: none"> <li>• parental genotypes identified as Aa      Aa</li> <li>• gametes identified as A      a</li> <li>• parent or gamete correctly labelled</li> <li>• correct identification of combination</li> </ul> <p>(see sample Punnet squares and F<sub>1</sub> diagrams on next page)</p>		1  3
(iii)	$\frac{1}{4}$ / 0.25 / 25% / 1:3 / one in four      (do <b>not</b> accept 1:4 / 3:1 / 1/3)		1
<b>Total</b>			<b>9</b>



Question 6(a)(ii) – Samples for marking

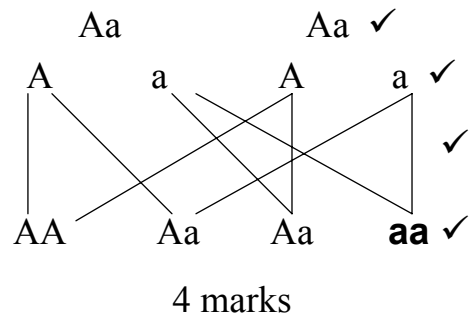
Parents ✓      Aa   Aa ✓

	A	a ✓	
A	AA	Aa ✓	
a	Aa	<b>aa</b> ✓	Max. 4 marks

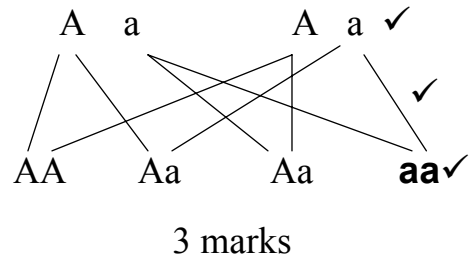


Father

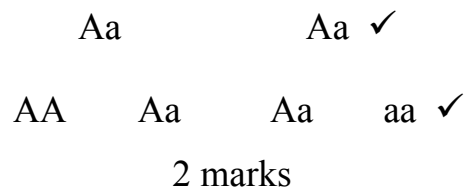
		Mother ✓	
	A	A	a ✓
A	AA	Aa	
a	Aa	<b>aa</b> ✓	4 marks



	A	a ✓	
A	AA	Aa ✓	
a	Aa	<b>aa</b> ✓	3 marks

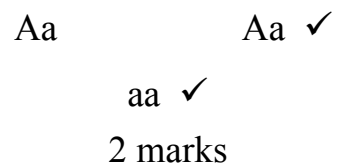


	A	a ✓	
A	AA	Aa ✓	
a	Aa	aa	2 marks



Parents ✓      Aa      Aa ✓

**aa** ✓      3 marks



question	answers	extra information	marks
7(a)	$3 \times 8$		1
	$= 24$		1
(b)	$24 \times 7$		1
	$= 168$	allow £1.68 if correct symbol given	1
(c)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• conduction / heats the air</li> <li>• convection / hot air rises / air movement</li> <li>• radiation / waves</li> </ul>		2
(d)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• cavity wall (insulation)</li> <li>• roof insulation / loft insulation</li> <li>• carpet</li> <li>• double glazing</li> <li>• draught proofing / fill the gaps</li> <li>• curtains</li> <li>• keep door closed / window closed</li> <li>• silver foil behind radiator</li> </ul>	insulation alone = 1 mark	2

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question	answers	extra information	marks
(e)	any <b>one</b> from: <ul style="list-style-type: none"><li>• water may boil / freeze</li><li>• oil has higher boiling point / water may evaporate</li><li>• less corrosion / rust</li><li>• higher heat capacity / holds more heat / stays hotter longer</li></ul>	ignore reference to relative rates of heat transfer	1
<b>Total</b>			<b>9</b>

question	answers	extra information	marks
8(a)	oil / coal	allow fuels separated from oil	1
(b)	easy to light		1
	burns with a clean flame		1
(c)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• contains carbon</li> <li>• derived from living material (owtte)</li> </ul>	ignore hydrogen	1
(d)(i)	carbon and hydrogen	do <b>not</b> accept C and H	1
(ii)	2		1
(iii)	carbon dioxide / carbon oxide	<b>not</b> carbon monoxide	1
	water / hydrogen oxide	do <b>not</b> accept CO <sub>2</sub> and H <sub>2</sub> O	1
(iv)	combustion		1
	exothermic		1
<b>Total</b>			<b>10</b>
<b>Overall marks = 80</b>			