

# **Additional Applied Science**

General Certificate of Secondary Education

Unit **A192/02**: Science of Materials and Production (Foundation Tier)

## **Mark Scheme for June 2013**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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**Marking Instructions**

For answers marked by levels of response:

- a. **Read through the whole answer from start to finish**
- b. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
- c. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- d. Use the **L1, L2, L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:









- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

**Annotations**

Used in the detailed Mark Scheme:

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
ORA	or reverse argument

Available in scoris to annotate scripts

Annotation	Meaning
	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

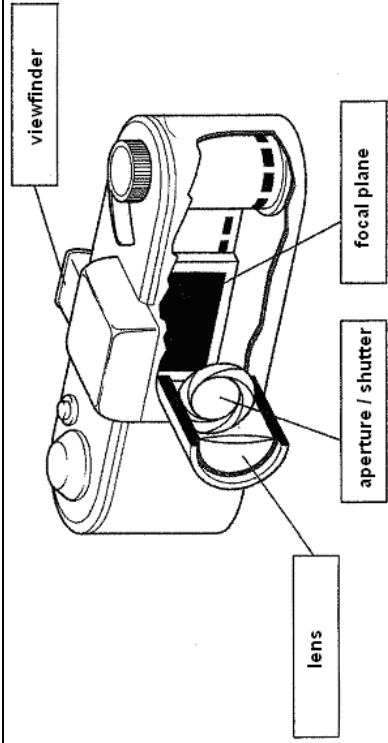
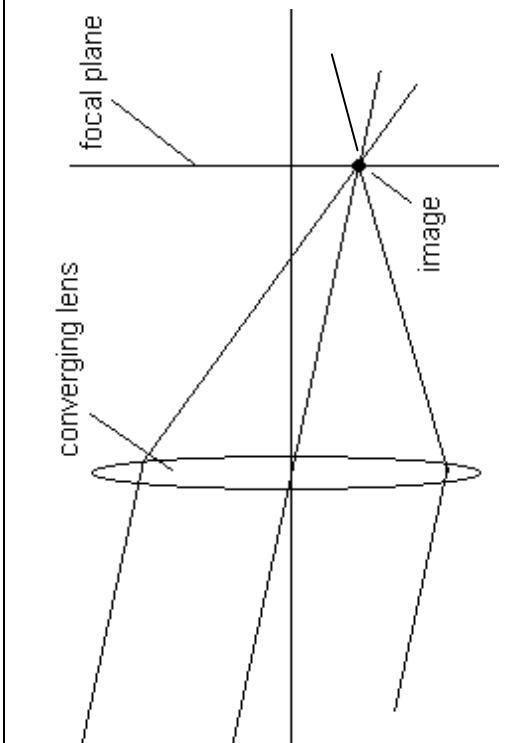
Question	Answer	Marks	Guidance
1 (a)	$\boxed{\text{CuSO}_4} + \boxed{\text{Na}_2\text{CO}_3} \rightarrow \boxed{\text{CuCO}_3} + \boxed{\text{Na}_2\text{SO}_4}$	2	reactants $\text{CuSO}_4$ and $\text{Na}_2\text{CO}_3$ , product $\text{CuCO}_3$ (1) second product $\text{Na}_2\text{SO}_4$ (1)
(b)	(i) 920 / 115; = 8 litres	1 1	correct answer with no working for [2] <b>ecf:</b> (920 / 250 =) 3.7 litres for [1] <b>ecf:</b> (920 / 108 =) 8.5 litres for [1] <b>ecf:</b> (920 / 72 =) 13 litres for [1] <b>ecf:</b> (920 / 36 =) 26 litres for [1]
(ii)	EITHER yes because it gives highest / best yield (at 115 g/litre) [1]; OR 200 (g/litre) is best / as good; because it still gives 115 (g/litre) / same yield [2]; OR 200 (g/litre) is best / as good; because it still gives 115 (g/litre); for less copper sulfate / expense / owttie [3] OR 150 (g/litre) is best; because it gives a high yield; without leaving any unreacted copper sulfate [3]	3	<b>accept</b> between 150 and 160 g/litre

Question	Answer	Marks	Guidance
2	<p><b>Level 3 (5–6 marks)</b> Suggests design features <b>and</b> explains them with relevant science. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Suggests a design feature <b>and</b> explains it with relevant science. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> <b>Either</b> suggests a design feature <b>or</b> provides some relevant science. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>relevant design features include:</b></p> <ul style="list-style-type: none"> <li>• carpets on the floor</li> <li>• double glazed windows</li> <li>• acoustic ceiling tiles</li> <li>• cavity walls between flats</li> <li>• solid floors / ceilings</li> <li>• solid external doors</li> <li>• sound insulation / proofing</li> <li>• brick instead of flimsy material</li> <li>• thicker walls</li> <li>• soft materials e.g. foams</li> </ul> <p><b>relevant science includes:</b></p> <ol style="list-style-type: none"> <li>1 sound (waves) absorbed by / won't pass through</li> <li>2 fluffy surfaces / gaps in materials</li> <li>3 sound (waves) reflected by / bounce off</li> <li>4 hard / shiny / smooth surfaces</li> </ol>

Question	Answer	Marks	Guidance
3	<p><b>Level 3 (5–6 marks)</b> Includes at least two costs and correctly linked reasons for increase. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Includes cost linked to correct reason for increase. For the most part the information is relevant and presented in a structured and coherent format. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Includes one or more unrelated costs/reasons for increase. Answer may be simplistic. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>relevant costs include:</b></p> <ul style="list-style-type: none"> <li>• increased demand</li> <li>• soil preparation</li> <li>• spraying with pesticides and herbicides</li> <li>• applying fertiliser</li> <li>• harvesting</li> <li>• transport</li> <li>• storage.</li> </ul> <p><b>relevant reasons for cost increase include:</b></p> <ul style="list-style-type: none"> <li>• increase in fuel price for farm machinery</li> <li>• inclement weather reducing yield</li> <li>• poor local harvest resulting in import of potatoes</li> <li>• wet weather at harvest so crop has to be dried</li> <li>• crop failure elsewhere increasing demand</li> <li>• increased losses to pests and disease.</li> <li>• lower yield therefore need to put up price to make profit</li> </ul>



Question	Answer	Marks	Guidance
4 (a)	$k = 5.0 \times 10^4 / 50\,000$ (N/m); $x = 15 \times 10^{-3}$ m / 0.015 m;	2	allow ecf from incorrect $k$ allow correct answer for (2)
(b)	(i) 400 N	1	allow 390 - 410
(ii)	elastic materials go back to original shape/size (after being deformed/force released) plastic materials don't go back to original shape/size (after being deformed/force released)	2	
(iii)	area under graph = $0.5 \times 400 \times 20 = 4000$ for (1) energy = $0.5 \times 400 \text{ N} \times 0.02 \text{ m} = 4 \text{ J}$ for (2)	2	If no units max 1
5 (a)	<b>any two</b> of the following: strong - so that it doesn't bend/break (1) hard - so that it keeps a cutting edge/doesn't dent (1) stiff - so that it doesn't change shape when loaded (1) tough/not brittle - so that it doesn't break (1) durable - so that it lasts a long time (1)	2	
(b)	handle poor conductor of heat/good thermal insulator (1) metal conducts heat quicker/better (1)	2	
(c)	named fibre eg carbon in carbon fibre, glass in GRP; named matrix eg resin/glue in carbon fibre and GRP;	2	

Question	Answer	Marks	Guidance
6 (a)		2	all three correct for 2 marks two correct for 1 mark allow iris for aperture
(b)		2	two rays from lens meeting at image point (1) two parallel rays to the left of lens at the correct angle by eye (1) accept straight lines drawn by hand
(c)	move lens away from focal plane/film; to keep the image in focus;	2	accept move lens towards object/away from image

Question	Answer	Marks	Guidance
7	<p><b>Level 3 (5–6 marks)</b> Discusses most of the relevant points. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Discusses some of the relevant points. For the most part the information is relevant and presented in a structured and coherent format. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Discusses a few of the relevant points. Answer may be simplistic. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>relevant points include:</b></p> <ul style="list-style-type: none"> <li>• is it a continuous or batch process?</li> <li>• design of vessel for reacting chemicals</li> <li>• how to measure out reactants</li> <li>• how to mix reactants</li> <li>• how to warm reactants</li> <li>• recycling of excess solid</li> <li>• separating out excess solid</li> <li>• method of heating solution</li> <li>• method of separating crystals from solution</li> <li>• how to monitor the flow of reactants/temperature.</li> </ul> <p>must be related to manufacture of copper sulfate</p>

Question	Answer	Marks	Guidance					
8 (a)	$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$	2	second product $CO_2$ for 1 mark equation balanced for 1 mark i.e. $2CO_2$					
(b)	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; padding: 2px 10px; margin-right: 5px;">alcohol</div> <div style="margin: 0 5px;">+</div> <div style="border: 1px solid black; padding: 2px 10px; margin-right: 5px;">oxygen</div> <div style="margin: 0 5px;">→</div> <div style="border: 1px solid black; padding: 2px 10px; margin-right: 5px;">acetic acid</div> <div style="margin: 0 5px;">+</div> <div style="border: 1px solid black; padding: 2px 10px; margin-right: 5px;">water</div> </div>	1	<b>accept</b> reactants in any order <b>accept</b> ethanol for alcohol <b>accept</b> ethanoic acid for acetic acid					
(ii)	<p>numbers increase rapidly (exponential phase) as they consume food;</p> <p>numbers level off and fall (senescence) as food runs out</p>	2						
(iii)	<p>Keep the wine above room temperature.</p> <p>Filter the wine as it goes into the bottle.</p> <p>Wash the bottle before filling it with wine.</p> <p>Make sure that air can't get past the cork.</p> <p>Boil the wine before it goes into the bottle.</p> <div style="display: flex; align-items: center; margin-top: 10px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;">✓</td></tr> <tr><td style="width: 20px; height: 20px;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table> </div>			✓	✓		1	<b>both</b> correct for (1)
✓								
✓								

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**Education and Learning**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

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**OCR (Oxford Cambridge and RSA Examinations)**  
**Head office**  
**Telephone: 01223 552552**  
**Facsimile: 01223 552553**

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