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# Level 3 Certificate/Extended Certificate

## APPLIED SCIENCE

### ASC3

Unit 3 Science in the Modern World

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Mark scheme

June 2023

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Version: 1.0 Final



Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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.

Further copies of this mark scheme are available from [aqa.org.uk](http://aqa.org.uk)

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## Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

### Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

### Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

**Question 1**

<b>Question</b>	<b>Answers</b>	<b>Extra information</b>	<b>Mark</b>	<b>AO/ Spec. Ref.</b>
<b>01.1</b>	She has enough money to live well.		1	AO3

<b>Question</b>	<b>Answers</b>	<b>Extra information</b>	<b>Mark</b>	<b>AO/ Spec. Ref.</b>
<b>01.2</b>	any <b>one</b> from: <ul style="list-style-type: none"> <li>• investigating / monitoring animal welfare / behaviour</li> <li>• advising farmers on animal welfare</li> <li>• educating people about animal welfare in farming</li> </ul>	allow studying animal welfare / behaviour	1	AO1

<b>Total Question 1</b>		<b>2</b>
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**Question 2**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>02.1</b>	selling items at a loss brings in customers		1	AO3
	(so) that they then buy more (profitable) items	allow (so) they then spend more money	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>02.2</b>	any <b>one</b> from: <ul style="list-style-type: none"> <li>• customers buy it regularly</li> <li>• most customers drink it</li> <li>• it is a staple (food)</li> </ul>		1	AO1

<b>Total Question 2</b>		<b>3</b>
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**Question 3**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.1	(cheap food is) less nutritious	allow (cheap food) has more fat or sugar or salt	1	AO1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.2	animals move around less because they are housed in indoor / small spaces  <b>or</b> animals may not be looked after as well (1)  because herds are larger (1)	allow any reasonable consequence to cattle being housed indoors or in larger herds for the first mark point   allow any reasonable consequence to a delay in welfare issues being addressed	1  1	AO3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.3	any <b>one</b> from: • slurry / cattle release greenhouse gases • slurry gives off ammonia • deforestation to provide land for cattle feed		1	AO3

<b>Total Question 3</b>		<b>4</b>
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**Question 4**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.1	geneticist		1	AO1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.2	any <b>one</b> from: <ul style="list-style-type: none"> <li>• these chickpeas are more nutritious</li> <li>• chickpeas are a primary source of protein</li> <li>• less animal farming needed</li> </ul>		1	AO3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.3	any <b>one</b> from: <ul style="list-style-type: none"> <li>• can withstand drought</li> <li>• resistant to pests</li> </ul>	allow resistance to climate change or other correct examples of climate change	1	AO1

<b>Total Question 4</b>		<b>3</b>
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**Question 5**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>05.1</b>	$10 - 7.8 = 2.2$	allow 28%	1	AO2
	$\left(\frac{2.2}{7.8} \times 100 =\right) 28.2\%$		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>05.2</b>	any <b>one</b> from: <ul style="list-style-type: none"> <li>• destruction of topsoil</li> <li>• pesticides in soil and water</li> </ul>		1	AO1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>05.3</b>	we eat foods that are not in season		1	AO3
	(because) we eat foods that are not locally produced		1	

<b>Total Question 5</b>		<b>5</b>
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**Question 6**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>06.1</b>	bees carry beneficial microorganisms between plants		1	AO3
	so that less pesticides are used  <b>or</b> so protect plants from pests		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>06.2</b>	(solution) education		1	AO3
	(reason) so people understand the problem		1	
	<b>or</b>			
	(solution) drones / satellites (1)			
	(reason) so farmers can monitor health of crops (1)			
	<b>or</b>			
(solution) financial aid (1)				
(reason) so water waste can be reduced (1)				

<b>Total Question 6</b>		<b>4</b>
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**Question 7**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>07.1</b>	any <b>one</b> from: <ul style="list-style-type: none"> <li>• milk</li> <li>• dairy products</li> <li>• butter</li> <li>• eggs</li> <li>• leather</li> <li>• honey</li> </ul>		1	AO3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>07.2</b>	any <b>two</b> from: <ul style="list-style-type: none"> <li>• killing of male calves (in dairy herds)</li> <li>• killing of cows when their milk production decreases</li> <li>• killing of male chicks (in egg production)</li> </ul>		2	AO3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
<b>07.3</b>	less deforestation  (because) less land is needed to produce feed for animals  <b>or</b>  less methane (1)  (because) fewer cows releasing methane during digestion (1)		1  1	AO3

<b>Total Question 7</b>		<b>5</b>
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**Question 9**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09	<p>(monoculture advantage) any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>• higher yields</li> <li>• less land needed</li> <li>• simpler to run</li> </ul> <p>(monoculture disadvantage) any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>• destruction of habitats / wildlife</li> <li>• reduced biodiversity</li> <li>• needs ploughing</li> <li>• carbon dioxide air pollution</li> <li>• requires artificial fertiliser</li> <li>• requires pesticides</li> </ul> <p>(mixed farming advantage) any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>• animals eat crop residues / weeds</li> <li>• animals fertilise / repair soil</li> <li>• creates native habitats</li> </ul> <p>(mixed farming disadvantage) any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>• need more land</li> <li>• lower yields</li> <li>• hard to manage</li> </ul>	allow other correct responses	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	AO3
<b>Total Question 9</b>			<b>4</b>	

**Question 10**

Question	Answers			Mark	AO/ Spec. Ref.
<b>10</b>	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 3 and apply a 'best-fit' approach to the marking.			9	9 x AO3
<b>0 marks</b>	<b>Level 1 (1–3 marks)</b>	<b>Level 2 (4–6 marks)</b>	<b>Level 3 (7–9 marks)</b>		
incorrect no answer	<ul style="list-style-type: none"> <li>uses <b>1</b> source and discusses validity and / or effectiveness</li> <li>discussion shows little attempt at structure</li> <li>little use of scientific vocabulary</li> </ul>	<ul style="list-style-type: none"> <li>uses <b>at least 2</b> sources and discusses validity and / or effectiveness</li> <li>discussion shows some attempt at structure</li> <li>some use of scientific vocabulary</li> </ul>	<ul style="list-style-type: none"> <li>uses <b>3 or 4</b> sources and discusses validity and effectiveness</li> <li>discussion is well-structured with minimal repetition or irrelevant points</li> <li>good use of scientific vocabulary</li> </ul>		
<b>Source</b>	<b>Validity</b>		<b>Effectiveness</b>		
<b>A</b>	Written by a zoologist who is an expert in this field so valid. But maybe some bias since she works for the Sustainable Food Trust – one-sided information. May have been peer reviewed.		<b>Engagement:</b> Got an attention-grabbing title. Refers to Greta Thunberg who students will have heard of and who is their age. Refers to an Indian Prophecy. Explains some terms.  <b>Information:</b> Explains why current system is unsustainable and what some of the problems are. Does not really explain what it should look like or how people can help.		
<b>B</b>	Written for the BBC – a trusted source of information. However, does say that these are the author's own views. Author is a journalist and TV presenter, not a scientist. Refers to several scientists – increases its validity. Will not have been peer reviewed.		<b>Engagement:</b> Title looks like it might answer the questions of students. Nice little story to engage at start.  <b>Information:</b> Explains the problem, and some solutions. Doesn't explain how students can help other than to be educated about the problem.		

<p><b>C</b></p>	<p>From the Vegan Society – so is one-sided information. But the Vegan Society are not a profit-making organisation. Don't know who the author is or how up-to-date the information is. May not have been peer reviewed.</p>	<p><b>Engagement:</b> The title suggests it may answer some questions. Set out well with subheadings and short paragraphs. Some shocking information about animal cruelty that would keep students reading.</p> <p><b>Information:</b> Doesn't completely answer the question about why our food is unsustainable. Trying to persuade people to become vegan is their main agenda.</p>
<p><b>D</b></p>	<p>Written for The Guardian newspaper so may not be as valid as other sources. Will not have been peer reviewed. Author is a farmer, so he is directly affected by how food is produced. Could see this as more valid as the farmer is an expert, or less valid because he could be bias. Most up-to-date of all the sources.</p>	<p><b>Engagement:</b> Title does engage people and make them want to read more as they might think that 'local' and 'organic' are the answers, but he says not.</p> <p><b>Information:</b> Does give answers to all the questions about the problem, a solution and what students can do (best one for suggesting this).</p>

<p><b>Total Question 10</b></p>		<p><b>9</b></p>
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**Question 11**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
11.1	land that can be lived on		1	AO3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
11.2	any <b>one</b> from: <ul style="list-style-type: none"> <li>• (fresh) water</li> <li>• soil</li> </ul>	ignore food	1	AO3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
11.3	29% × 71% × 50%		1	AO2
	or 0.29 × 0.71 × 0.50 0.103 × 100 = 10.3%		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
11.4	$\left(\frac{51 \times 100}{10} =\right) 510$	allow $\frac{51 \times 100}{10.3} = 495$	1	AO2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
11.5	$(51 \times 77\% =) 39.27$		1	AO2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
11.6	any <b>two</b> from: <ul style="list-style-type: none"> <li>• animals require more land</li> <li>• animals provide less of the world's calories</li> <li>• animals provide less of the world's protein</li> </ul>	allow the converse with plants allow descriptions using data	2	AO3
<b>Total Question 11</b>			<b>8</b>	



**Question 12**

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
12.1	axes labelled correctly		1	AO2
	bars plotted correctly		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
12.2	any <b>two</b> from: <ul style="list-style-type: none"> <li>• farm / food machinery</li> <li>• transporting food</li> <li>• producing packaging materials</li> <li>• refrigeration</li> <li>• deforestation to make space for agriculture</li> <li>• fertiliser manufacture</li> </ul>		2	AO3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
12.3	19		1	AO2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
12.4	any <b>one</b> from: <ul style="list-style-type: none"> <li>• fertilisers</li> <li>• pesticides</li> <li>• antibiotics / drug residues from animals</li> <li>• oil spills from machinery</li> </ul>		1	AO3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
12.5	biodiversity is decreasing (due to agriculture)		1	AO3
	because agriculture is responsible for 86% of extinction threats	allow because 95% of mammals are farm animals	1	

