



Level 3 Certificate/Extended Certificate

APPLIED SCIENCE

ASC3

Unit 3 Science in the Modern World

Mark scheme

June 2019

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 Assessment Writer.

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.

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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 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 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	Answers	Additional comments	Mark	AO
01.1	distance travelled was not an important factor		1	AO1
01.2	any three from: <ul style="list-style-type: none"> • roads were improved or road networks increased • petrol was cheaper • petrol cars became more popular • electric cars had a limited range • people wanted to travel further 	allow technological improvements in petrol cars	3	AO1
01.3	any two from: <ul style="list-style-type: none"> • petrol prices were volatile / high • legislation was set • cities were smog ridden 	allow climate concerns means that exhaust emissions needed to be reduced as alternative to either 2nd or 3rd bullet point	2	AO1
Total			6	

Question	Answers	Additional comments	Mark	AO
02.1	factories are being built to make (electric car) batteries		1	AO3
02.2	<p>electric cars / batteries were expensive</p> <p>cheaper batteries mean that the electric cars can be cheaper</p> <p>electric cars had a limited range or electric cars needed charging frequently</p> <p>batteries now last longer so cars have a greater range (between charges)</p>	<p>mark as pairs</p> <p>allow batteries in short supply</p> <p>allow more factories built so more supply of batteries</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>AO3</p> <p>AO3</p> <p>AO3</p> <p>AO3</p>
02.3	<p>any two from:</p> <ul style="list-style-type: none"> • China has the biggest market share (of the automotive industry) • European car manufacturers must compete with the Chinese • Chinese manufacturers will soon be exporting to Europe. 		2	AO3
Total			7	

Question	Answers	Additional comments	Mark	AO
3	(Paris climate talks aim is to) reduce carbon dioxide emissions		1	AO3
	by reducing the use of fossil fuels or reducing the number of petrol and diesel vehicles		1	AO3 AO3
	so car manufacturers need an alternative to petrol and diesel cars or so car manufacturers need to make more electric cars		1	
Total			3	

Question	Answers	Additional comments	Mark	AO
04	environmental benefit any one from: <ul style="list-style-type: none"> • lower carbon dioxide emissions • less pollution 		1	AO3
	social benefit any one from: <ul style="list-style-type: none"> • more jobs / employment • improved health 	ignore cost	1	AO3
Total			2	

Question	Answers	Additional comments	Mark	AO
05.1	any one from: <ul style="list-style-type: none"> • Tesla had massive number of sales before the car was produced • 400 000 people put down a deposit on a Tesla before it was made • Tesla sales topped the list of all cars sold in Norway 		1	AO3
05.2	any one from: <ul style="list-style-type: none"> • affordable or only \$35 000 • targeted at the right people • good publicity (by founder of Tesla, Elon Musk) 		1	AO1
05.3	any one from: <ul style="list-style-type: none"> • limited range of distance • very few charging stations 	allow people purchased without viewing / testing the car	1	AO1
Total			3	

Question	Answers	Additional comments	Mark	AO
06.1	lack of noise		1	AO3
	(therefore) could cause accidents with other road users / pedestrians		1	AO3
06.2	sensors to detect objects	allow sensors so the car won't hit anything for 2 marks	1	AO3
	(so) the car can steer away or (so) car is prevented from hitting anyone		1	AO3
Total			4	

Question	Answers	Additional comments	Mark	AO
07.1	$\frac{60}{600}$	an answer of 10 (%) scores 2 marks with no working shown	1	AO2
	$\frac{60}{600} \times 100 = 10 (\%)$	allow 1 mark for $\frac{60}{120} \times 100$ or 50 (%)	1	AO2
07.2	$60 - 14 = 46$	correct answer gains 2 marks with no working shown	1	AO2
	$\frac{46}{60} \times 100 = 76.7 (\%)$	allow 77 and 76.6	1	AO2
		allow 1 mark for $\frac{14}{60} \times 100$ or 23 (%)		
07.3	time for facilities to be put in place	ignore cost allow reference to specific facility eg charging stations, factories to make batteries, more efficient electric cars	1	AO3
	time to retrain staff	allow reference to specific people eg manufacturers, service/repair mechanics	1	AO3
07.4	all the emissions associated with manufacture, use (and scrappage)		1	AO1
07.5	so that a direct comparison with petrol and diesel cars can be made		1	AO3
Total			8	

Question	Answers	Additional comments	Mark	AO
08	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	AO3
0 marks	Level 1 (1–3 marks)	Level 2 (4–6 marks)	Level 3 (7–9 marks)	
incorrect or no answer	<ul style="list-style-type: none"> uses 1 source and discusses validity or effectiveness. discussion shows little attempt at structure. little use of scientific vocabulary. 	<ul style="list-style-type: none"> discusses at least 2 sources and discusses validity and/or effectiveness. discussion shows some attempt at structure. some use of scientific vocabulary. 	<ul style="list-style-type: none"> uses 3 or 4 sources and discusses validity and effectiveness. discussion is well-structured with minimal repetition or irrelevant points. good use of scientific vocabulary. 	

Examples of the points made in the response

Source	Validity	Effectiveness
A	Newspaper so may exaggerate to make good news Respected newspaper – the Telegraph	Not much information about how electric cars work – just the history Wouldn't help me make a decision about buying an electric car
B	This is a blog so is someone's personal opinion Not peer reviewed and no references so might not be valid 'Opinion article by Politico' – so may be politically motivated with an agenda Bit out of date (Dec 2016)	Mentions a lot of brand names of car manufacturers who make electric cars In favour of electric cars so bit persuasive Discussing mainly concept cars rather than cars real people are likely to buy
C	Newspaper article so may exaggerate to make good news Respected newspaper – The Guardian More up to date (August 2017)	Not in favour of electric cars so may put me off – written in quite a negative way Discusses someone dying while driving an electric car Discusses some down sides

D	<p>Scientific article – should have been peer reviewed Refers to other articles and organisations More up to date (July 2017) Lots of statistical data to support the article</p>	<p>Very informative with lots of good reasons to buy an electric car (eg reduced carbon emissions). Debunks the myth that electric cars will cause problems with power demand. Very long so may put people off reading. Scientific language is difficult for general public. Only read by those interested in electric cars or the environment.</p>
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Total			9
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Question	Answers	Additional comments	Mark	AO
09.1	alternative to fossil fuel or renewable energy or nuclear power	allow named renewable energy eg solar power	1	AO1
09.2	(between 2005 and 2010) greenhouse gas emissions from the transport sector went down	no mark is given for the year	1	AO3
09.3	285.5 – 149.5 = 136 $\frac{136}{25} = 5.4(4)$		1 1	AO2 AO2
09.4	any two from: <ul style="list-style-type: none"> • increasing awareness / education on environmental issues • recycling of waste • more efficient appliances • more use of solar panels on houses 		2	AO3
09.5	agriculture any one from: <ul style="list-style-type: none"> • reduction in livestock • changes in management of manure / waste • restrictions in use of artificial fertilisers mining and quarrying any one from: <ul style="list-style-type: none"> • less mining taking place • running out of resources to mine manufacturing any one from: <ul style="list-style-type: none"> • more efficient processes • less products being manufactured • more products being imported • more recycling 		3	AO2

Total			9
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Question	Answers	Additional comments	Mark	AO
10	<p>any three from:</p> <ul style="list-style-type: none"> • total GHG emissions have gone down (so climate change initiatives successful) • carbon dioxide emissions have gone down (so climate change initiatives successful) • proportionally carbon dioxide hasn't gone down as much or carbon dioxide is a bigger percentage of total than it was in 1990 • shows that success has been more in other GHGs than carbon dioxide. 		3	AO3

Total			3
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Question	Answers	Additional comments	Mark	AO
11.1	monitoring / investigating the effects of GHG emissions		1	AO2
	on organisms / environment (to make suggestions / recommendations)		1	AO2
11.2	collecting together data or conducting experiments / tests		1	AO2
	to inform others or to identify patterns	allow to develop new techniques	1	AO2
11.3	producing more efficient products or developing more efficient processes or incorporate new technologies		1	AO2
	so that less GHG emissions are produced or to use less energy		1	AO2
Total			6	