Level 3 Certificate/Extended Certificate
APPLIED SCIENCE
ASC3

Unit 3 SCIENCE in the Modern World

Mark scheme

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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

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	sugar		1	AO1
Total			**1**	

Question	Answers	Additional comments	Mark	AO
02.1	algae are coloured (and) the algae leave the coral (causing) the coral to turn white **or** (causing) the coral to lose its colour		1 1 1	AO3
02.2	coral loses its food source coral becomes more susceptible to disease		1 1	AO3
Total			**5**	

Question	Answers	Additional comments	Mark	AO
03	the people / (Queensland) government who are trying to protect the Great Barrier Reef have also approved a new coal mine (therefore) this could make coral bleaching worse **or** (therefore) this will increase global warming	 ignore release of CO_2 unqualified	1 1 1	AO3
Total			**3**	

Question	Answers	Additional comments	Mark	AO
04.1	sunscreens contain oxybenzone / octinoxate (that harm coral reefs)	allow sunscreens contain chemicals that harm coral reefs	1	AO1
04.2	any **two** from: • coral reefs are around the coast of Hawaii • lots of tourists in Hawaii resulting in a lot of sunscreen runoff into the sea • ecotourism in Hawaii could be affected • reduced fish / food source • corals attract tourists to Hawaii so locals want to protect coral to keep tourists	allow converse	2	AO3
04.3	research scientist		1	AO1
Total			**4**	

Question	Answers	Additional comments	Mark	AO
05.1	author		1	AO1
05.2	(people think that) there is not enough reliable evidence (to prove a ban is necessary) **or** (people think that) the evidence may be biased		1	AO3
05.3	any **two** from: • oxybenzone is the most effective chemical used in sunscreens • there are no other effective chemicals available in the US • (oxybenzone) helps to prevent skin cancer • loss of jobs (at the sunscreen factory) • does not solve bigger problems (such as overfishing / which is damaging coral)	allow octinoxate is the most effective chemical used in sunscreens	2	AO3
Total			**4**	

Question	Answers	Additional comments	Mark	AO
06.1	(pontoon) keeps the machine afloat **or** for people to stand on to fix / service / access the machine (solar panels) produces electricity to run the electric motor (electric motor) turns the impeller **or** pulls the cooler water up		1 1 1	AO3
06.2	any **two** from: • water / corrosion resistance • (UV) light resistance • heat resistance • abrasion resistance • strength • flexibility / stiffness	allow density	2	AO2
06.3	any **one** from: • monitor the coral over time to see if coral bleaching is reduced • monitor the water temperature of the coral reef • evaluate the impact on other marine species		1	AO2
Total			**6**	

Question	Answers	Additional comments	Mark	AO
07.1	any **two** from: • water pollution • nutrients from agriculture • acidification • disease • climate change • over-fishing • direct damage such as walking on coral or damage from boats	ignore pollution / agriculture / tourists unqualified	2	AO1
07.2	split the coral into pieces attach the coral to artificial trees		1 1	AO1
07.3	greater numbers **or** grows faster **or** ensures conditions are optimal for growth		1	AO3
07.4	educating the public **or** training the educators **or** collaborating with other countries		1	AO3
07.5	$\frac{18\,000 \times 8}{10}$ $= 14\,400$	an answer of 14 400 scores **2** marks	 1 1	AO2
Total			**8**	

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 no answer	• uses **1** source and describes validity or effectiveness • description shows little attempt at structure • little use of scientific vocabulary	• uses **at least 2** sources and describes validity and/or effectiveness • description shows some attempt at structure • some use of scientific vocabulary	• uses **3 or 4** sources and describes validity and effectiveness • description 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	The Conversation is a not-for-profit organisation. Articles are authored by academics, edited by professional journalists. Written by a university scientist and refers to other scientists.	Colourful, easy to read diagram for students. Some difficult language (eg anthropomorphise).
B	BBC News is a respected source of information. BBC is impartial/non-biased. Quotes from many professionals/experts.	Article describes why Hawaii wants to ban sunscreens containing oxybenzone. Some good arguments but very limited information about what coral bleaching is.
C	Newspaper so may exaggerate to make good news. Respected newspaper – the Times.	Informative about one way that scientists are trying to cool the water around coral reefs. Good clear and colourful diagram which explains how it works. This will appeal to students. Map to show where in Australia it is taking place.
D	Newspaper so may exaggerate to make good news. Respected newspaper – the Guardian.	Informative about what scientists are doing to try and repopulate coral reefs. Heavy going – large amount of information, no diagrams or pictures so may not be effective for students (depends on age).

Question	Answers	Additional comments	Mark	AO
09.1	any **two** from: • more people believe that climate change is due to human activity • fewer people believe that climate change is due to natural processes • fewer people believe that climate change is due to a mixture of both human and natural processes • in 2012 most people believed climate change was due to human **and** natural processes • in 2018 most people believed climate change was due to human activity • a similar percentage of people still don't know anything about climate change		2	AO3
09.2	to compare (years / responses)	allow discrete qualitative data	1	AO2
09.3	any **two** from: • highlighting issues in newspaper headlines • regular articles about the same issue • producing TV documentaries about the issue • more use of experts' views in the media than there used to be • online campaigns	if no other marks awarded allow 1 mark for idea of increasing awareness	2	AO3
09.4	any **two** from: • size of the sample • who conducted / funded the survey • how people were selected for the survey • geographical location (of people) • age • what jobs do they do	allow completion rate for the survey allow was it representative of society	2	AO2
Total			**7**	

Question	Answers	Additional comments	Mark	AO
10	countries that produce the most carbon dioxide per person		1	AO3
	are the least concerned about climate change		1	
	(so) reducing climate change may be difficult **or** (so) reducing carbon dioxide emissions may be difficult	allow so may be difficult to get them to change their behaviour	1	

Total			**3**

Question	Answers	Additional comments	Mark	AO
11.1	$658.7 - 351.5 = 307.2$ $\frac{307.2}{658.7} \times 100 = 46.6(\%)$	an answer of 46.6 / 47.0 (%) scores **2** marks allow 47(.0)	1 1	AO2
11.2	reduction in burning fossil fuels (because) increased use of alternative energy sources **or** (because) people are using less electricity **or** (because) electrical appliances are more efficient **OR** renewable energy sources do not **produce** greenhouse gases (1) (so) increased use of alternative / renewable energy sources (has decreased emissions) (1)	 allow named alternatives allow better home insulation allow named alternatives	1 1	AO1
11.3	industrial processes waste management	in any order	1 1	AO3
11.4	remove carbon dioxide from the air (because) plants use carbon dioxide for photosynthesis		1 1	AO3
11.5	any **two** from: • more trees planted • less deforestation • less use of wood		2	AO3
Total			**10**	