
LEVEL 3 Certificate and Extended Certificate in Applied Science

SCIENCE IN THE MODERN WORLD

Mark scheme (Internal-short version)

Unit Number: ASC3

SPECIMEN 2017

Version/ Stage: 1 (Pre-standardisation)

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.

Further copies of this mark scheme are available from aqa.org.uk

Marking methods

In fairness to candidates, all examiners must use the same marking methods. The following advice may seem obvious, but all examiners must follow it as closely as possible.

1. If you have any doubt about how to allocate marks to an answer, consult your Team Leader.
2. Refer constantly to the mark scheme and standardising scripts throughout the marking period.
3. Use the full range of marks. Don't hesitate to give full marks when the answer merits them.
4. The key to good and fair marking is consistency.

INTRODUCTION

The information provided for each question is intended to be a guide to the kind of answers anticipated and is neither exhaustive nor prescriptive. All appropriate responses should be given credit.

Where literary or linguistic terms appear in the Mark Scheme, they do so generally for the sake of brevity. Knowledge of such terms, other than those given in the specification, is not required. However, when determining the level of response for a particular answer, examiners should take into account any instances where the candidate uses these terms effectively to aid the clarity and precision of the argument.

DESCRIPTIONS OF LEVELS OF RESPONSE

The following procedure must be adopted in marking by levels of response:

- read the answer as a whole
- work up through the descriptors to find the one which best fits
- where there is more than one mark available in a level, determine the mark from the mark range judging whether the answer is nearer to the level above or to the one below.

Since answers will rarely match a descriptor in all respects, examiners must allow good performance in some aspects to compensate for shortcomings in other respects. Consequently, the level is determined by the 'best fit' rather than requiring every element of the descriptor to be matched. Examiners should aim to use the full range of levels and marks, taking into account the standard that can reasonably be expected of candidates.

SECTION A

| Question | Answers | Additional Comments | Mark | AO1 | AO2 | AO3 |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------|-----|-----|-----|
| 01.1 | <ul style="list-style-type: none"> • Can extract reserves that were previously inaccessible | | 1 | | | 1 |
| 01.2 | <ul style="list-style-type: none"> • Gas and oil are trapped in layers of shale rock • Well is drilled into the rock • water mixture pumped into the well • causes fractures/fissures in the shale • gas released into the well | any 3 for 1 mark each | 3 | | | 3 |
| 01.3 | <p><i>Water supply / fluid contamination</i></p> <ul style="list-style-type: none"> • wells cracking contaminating ground water • large amount of water needed during the process • insufficient ground water • chemicals in fluid used <p><i>Environmental issues</i></p> <ul style="list-style-type: none"> • Road traffic • Noise • fuel spillage • gas deposits near towns | | 1 1 | | | 2 |
| 01.4 | <ul style="list-style-type: none"> • in US people can get paid for having drilling on their land • mineral rights belong to crown in UK | any 1 for 1 mark | 1 | | | 1 |

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|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------|--|---|---|
| 02.1 | need to be able to forecast how much money could be made from Shale gas | | 1 | | | 1 |
| 02.2 | <ul style="list-style-type: none"> reserves are the gas that are financially worth extracting there will always be some gas left in the ground (so total resource is larger). | | 1 | | 2 | |
| 02.3 | 1800 billion (1800 billion / 77 billion) 23.4 years | | 1 | | 2 | |
| 02.4 | <ul style="list-style-type: none"> MPs have to decide on science issues (therefore) MPs need background information from experts (in order) to make evidence based decisions | | 1 1 1 | | 2 | 1 |
| 03.1 | less reliant on imported fuel / produce our own fuel | | 1 | | | 1 |
| 03.2 | local communities / public in local area <ul style="list-style-type: none"> Will be directly effected by disruption geologists / gas experts <ul style="list-style-type: none"> Can provide information about extent of shale (mechanical) engineers <ul style="list-style-type: none"> Will provide information about the drilling process Environmental groups <ul style="list-style-type: none"> Overview of how drilling will affect wildlife and environment Regulators (e.g. town planners, health and safety) <ul style="list-style-type: none"> How drilling will affect local area restrictions on drilling | Candidates should name two groups. 1 mark for group and 1 mark for reason they need to be consulted | 4 | | | 4 |
| 03.3 | (shale gas) produces less carbon dioxide (than coal fired power station) contributes less to greenhouse effect | Accept greenhouse gases | 1 1 | | | 2 |

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| 04.1 | <p>They have strong, opposite views, of fracking.</p> <p><i>Government</i></p> <ul style="list-style-type: none"> • positive viewpoint • want to encourage people to accept drilling • think individuals should benefit from disruption <p>FoE</p> <ul style="list-style-type: none"> • negative viewpoint • focus on the use of money to change minds • encourages selfish behaviour / not thinking of effect on others | <p>any 1 point for 1 mark.</p> <p>Max 3 marks from either list.</p> | 4 | | | 4 |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---|--|--|---|

| | | | | | | |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--|--|
| 04.2 | <ul style="list-style-type: none"> • announce things which (might be) newsworthy • provides quotes and statistics for journalists | . | 1 | 2 | | |
| | | | 1 | | | |

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| 04.3 | <ul style="list-style-type: none"> • allows them to send their story to lots of journalists • puts their point of view forward • publicity and awareness of their campaign • don't have to give lots of different interviews | any 2 for 1 mark each | 2 | 2 | | |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---|---|--|--|

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|------|---------|------------|---|---|--|--|
| 04.4 | A and C | automarked | 1 | 1 | | |
|------|---------|------------|---|---|--|--|

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|-----------|--|--|----|---|---|---|
| 5 | | | 9 | 0 | 2 | 7 |
| Total (A) | | | 40 | | | |

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 4 and apply a 'best-fit' approach to marking.

| 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"> • 1 valid point, one sided argument only • uses 1 source • limited information • unstructured • errors in grammar, punctuation and spelling | <ul style="list-style-type: none"> • 2 or more valid points but one sided argument only • uses 2 sources • claims partially supported by evidence • arguments shows some attempt at structure • ideas are expressed with reasonable clarity but with a few errors of grammar, punctuation and spelling | <ul style="list-style-type: none"> • 3 or more valid points with counter-argument given • Uses 3 or more sources • Claims supported by evidence. • Argument well structured, with minimal repetition or irrelevant points • Use of specialist vocabulary for science • Clear expression of ideas with only minor errors of grammar, punctuation or spelling. |

Examples of points made in the response

| Source | For fracking | Against fracking |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A | <ul style="list-style-type: none"> • Fracking widely used in US • Allows previously inaccessible reserves to be used • Limited risk of earthquakes • Strong regulation could minimise environmental risks | <ul style="list-style-type: none"> • Fluid used during fracking process contains wide range of chemicals • Water would have to be transported in trucks away from site to be cleaned • Potential contamination of drinking water • Noise and traffic problems for people living near the site. |
| B | <ul style="list-style-type: none"> • May be a lot of shale gas reserves in UK | <ul style="list-style-type: none"> • No official estimates, could be from zero to substantial • More research and measurement needed |
| C | <ul style="list-style-type: none"> • Could improve UK fuel security • Provide jobs / income in UK • Help transition to a low carbon economy | <ul style="list-style-type: none"> • Benefits unevenly distributed • Local communities will be more disadvantaged by environmental disruption / heavy road vehicles • Might prevent development of renewables to reach zero carbon by 2050 |
| D | | <ul style="list-style-type: none"> • Financial incentives are speculative (at least five years after fracking starts) • Only 33% of survey population wanted fracking in their area • Wind energy can be developed so cheaper than nuclear • |

Section B

| Question | Answers | Additional Comments | Mark | AO1 | AO2 | AO3 |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------|-----|-----|-----|
| 06.1 | <ul style="list-style-type: none"> Joule | | 1 | 1 | | |
| 06.2 | <p><i>Wind</i> Q1 and Q4 have higher generation than Q2 and Q3, weather is windier (unsettled) in October – March</p> <p><i>Solar</i> Q2 and Q3 have higher generation than Q4 and Q1. weather is (usually) sunnier in April - September</p> | | 1 1 1 1 | | | 4 |
| 06.3 | <ul style="list-style-type: none"> don't have to build new powerstations renewable fuel | any 2 for 1 mark each | 2 | 2 | | |
| 06.4 | <ul style="list-style-type: none"> Biomass generation has increased between 2010 and 2013 so headline is accurate about increase (However, when compared with generation from other renewables) biomass generates much less energy per year than other sources e.g. in 2015 biomass was 5219 TWh but Solar and wind was approx 48500 TWh e.g. biomass was lower in every year than in lowest Q of Solar/wind (Q3 2013 was 5750 TWh) | any 3 for 1 mark each max 2 if data not referred to. | 3 | | | 3 |
| 06.5 | <ul style="list-style-type: none"> Can more easily see the trends in the data Can see the relative increase of the values. | | 1 1 | | 2 | |
| 07.1 | <ul style="list-style-type: none"> have to go into the very tall turbines to fix them | | 1 | | | 1 |
| 07.2 | <ul style="list-style-type: none"> have to look for faults have to plan maintenance activity | Any 1 for 1 mark | 1 | | | 1 |
| 07.3 | <ul style="list-style-type: none"> has to report maintenance activity has to provide safety induction to visitors reports to a regional area manager | Any 1 for 1 mark | 1 | | | 1 |
| 07.4 | <ul style="list-style-type: none"> wind turbines are often in middle of fields far from public transport reports | Any 1 for 1 mark | 1 | | | 1 |

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| 8 | <ul style="list-style-type: none"> • Run national campaigns to highlight the issue to the public • Encourage public to write to their MPs • Support companies who want to build renewable energy • Hold meetings with MPs to try to persuade them to support legislation to increase renewable energy • Provide data about benefits of renewable energy • Provide data about disadvantages of non-renewable energy • Expose lobbying of large energy (oil) companies | Any 4 for 1 mark | 4 | 2 | 1 | 1 |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---|---|---|---|

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| Total (B) | | | 60 | 10 | 11 | 39 |
|-----------|--|--|----|----|----|----|

| Question | Assessment Objective 1 | Assessment Objective 2 | Assessment Objective 3 | Total |
|---------------|------------------------|------------------------|------------------------|-----------|
| 1 | | | 7 | 7 |
| 2 | | 6 | 2 | 8 |
| 3 | | | 7 | 7 |
| 4 | 5 | | 4 | 9 |
| 5 | | 2 | 7 | 9 |
| 6 | 3 | 2 | 7 | 12 |
| 7 | | | 4 | 4 |
| 8 | 2 | 1 | 1 | 4 |
| Totals | 10 | 11 | 39 | 60 |

| Question | Assessment Outcome 1 | Assessment Outcome 2 | Assessment Outcome 3 | Assessment Outcome 4 | Total |
|---------------|----------------------|----------------------|----------------------|----------------------|-----------|
| 1 | 4 | 1 | 2 | | 7 |
| 2 | 4 | 2 | 1 | 1 | 8 |
| 3 | 1 | | 4 | | 5 |
| 4 | 2 | 6 | 3 | | 11 |
| 5 | 4 | | 5 | | 9 |
| 6 | 5 | 5 | 2 | | 12 |
| 7 | | | | 4 | 4 |
| 8 | | 2 | 2 | | 4 |
| Totals | 20 | 16 | 19 | 5 | 60 |