



A-level Environmental Science

7447/1

Report on the examination

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Overview

Once again 2025 saw an increase in the number of students taking A Level Environmental Science. We welcome those students and centres to the specification. It is great to see the improvements in performance over the past three exam series and centres following the advice from training. Once again, the attempt on mathematical and statistical questions showed an improvement, with students clearly showing their working.

Extended writing questions were also well attempted on the paper with many students leaving sufficient time to complete these items, often making a difference to their mark achieved. While the length of the papers presents a challenge to some, it was also good to see students leaving fewer items 'not attempted' and using the space allocated to maximum effect.

However, for the first time in the past three series the mean mark on 7447.1 (Paper 1) fell. This reflected challenges with content on atmospheric components, ozone depletion and some of the multi-stage maths questions. Despite this, students showed a good understanding of topics including water management, renewable energy, and soil erosion. Students' performance on the 9-mark question showed improvement this year with a higher mean and clear attempts to explicitly compare the success of climate change and ozone management methods.

The rest of this report outlines, item by item, an evaluation of student performance. I would like to take this opportunity to thank centres for their hard work in preparing centres and to the students who attempted the paper.

1

This question was well attempted by students. Most students scored at least two correct answers. Most students correctly identified 'Inter-basin transfer / Water transfer' as the sharing of water between catchments and 'Water meter' as the device calculating and recording water use. Common mistakes included confusing 'Tidal barrage' for 'Dam' or not identifying how water was exploited from an aquifer, instead just saying what an aquifer was. The term 'grey water' was understood by most students but less successful expression limited student performance. A need to refer to 're-use' of wastewater or alternatively giving an example of what the reuse was for, e.g. using shower water for watering plants. Some students confused grey water with industrial reuse.

2.1

This question required students to interpret the cumulative area graph and describe the change in solar contribution. Many students recognised the increase in solar contribution, however fewer were able to correctly identify the correct percentage increase (28%). Some students did not include data. When graphs include grid lines there is often little leeway on the accepted answer.

2.2

While the concept of this question was straight forward, to calculate the percentage difference in renewable energy contribution from 2020 to 2050, a considerable number of students found this a challenge. The main issue was reading the area graph accurately or misinterpreting what were 'renewables'.

2.3

This question was well attempted with many students able to give at least one reason for the difficulties in predicting the contribution of different energy sources to global electricity supply. However, many students limited themselves with generic comments such as 'fossil fuels run out' or 'population might change.' Answers with a clear focus did well. Common answers included the development of new technology, the intermittency of some renewable energy types, the introduction of laws, or lack of monitoring of some energy systems. For many students it was a challenge to identify three distinct reasons.

3.1

A mixed response to definitions of contamination and exposure. The key words here were 'contact' for contamination and 'absorption' for exposure. Many students confused the two. Some also thought it was a product of distance while others a link to time of exposure. In places quality of description meant that the students struggled to express the precise definitions. Using the specification key terminology would improve the students' responses.

3.2

This was a well answered item with most students able to correctly identify the fraction of dose received at a given distance. Common mistakes included not putting reciprocal e.g. $1/225$, instead giving 225.

3.3

The concept inverse square law was not understood well or expressed by most students. Common mistakes included confusing dose and distance or square vs square root. Many students correctly identified most of the equation but missed one element e.g. reciprocal. Those that had learned the equation often scored the mark through expressing it.

3.4

This question required students to outline the advantages and disadvantages of using nuclear fusion in the future. This was a well attempted question. However, a common mistake was confusing fission and fusion which often led to the disadvantages being incorrect. Despite this, students still picked up advantages (relevant to both) including 'high energy density' and 'low GHG emissions.' Some students only focused on one advantage or disadvantage which was limiting in a question asking for advantages and disadvantages. Therefore, they needed at least two of advantages and two disadvantages to get to max marks.

4.1

Students coped well on this data interpretation question. Most students scored at least one mark for a comparative comment. Some confused the idea of global warming potential. But

other common errors included stating a fact rather than comparing the data e.g. Carbon dioxide has a high concentration (416ppm) without making the comparison.

4.2

Student found this question a challenge in the time given. While most students scored one mark only a small proportion scored full marks. This question required students to use the information on residence time from the table 3 and Figures 2a-3a. A decline in carbon dioxide will still lead to a relative increase due to the long residence time. This would result in an increase. Students were credited for levelling off this rise after the 2050 period to show a change in rate. However, methane levels with a shorter residence time would see a decrease in concentration with levels falling to relative zero after 2052 (allowing for the residence time). Therefore, a decrease beyond 2052 would score two marks. Many students just dropped both values to zero and did not consider the residence times. This limited their attempts. Considering the challenge the item presented it was good to see so many students attempting the question.

4.3

This was a well attempted question. Many students understood the role of reducing landfill (or increasing landfill gas collection) in reducing methane. Agricultural methods were also well understood. However, most students struggled to achieve a third reason. Some understood the idea of reducing fossil fuel combustion to prevent methane emissions from permafrost or reducing coal mining. However, common incorrect answers included using catalytic convertors (but not specifying for natural gas engines), or repeating multiple agricultural methods, e.g. reducing livestock and rice farming.

4.4

Students were required to calculate the temperature change of the mean rates from the listed gases in Figure 4. However, while many were able to calculate 1.5 degrees Celsius as the correct value, many divided the answer by six to give 0.25. They misread the question as calculating the mean rather than reading the graph which showed mean rates.

4.5

This question had mixed responses from students, with most students only able to score one mark. The understanding of aerosols impact was poorly understood, many students just referring to ozone breakdown, which was not relevant to the question. Many did not understand the mechanism that aerosols (e.g. sulphur dioxide) increase albedo therefore reduce UV reaching the surface and therefore decrease temperature. However, greenhouse gases were better understood. Many understood that they absorbed radiation. However, many described the process as 'trapping heat' which was not credited. Accuracy in expression could improve some students' responses. Finally, some students described the processes but did not link to the impact on surface temperature, which was needed to answer the question. Centres could focus on helping students better understand the impact of atmospheric molecules on surface temperatures.

4.6

Many students were able to get credit for a correct year as most students scored one mark here. However, fewer students knew the reason and instead gave a description of the actual

increase or decrease in percentage rather than linking to the overlapping standard deviation bars. The understanding on this concept was, however, an improvement from previous series.

5.1

Most students identified B as the correct answer.

5.2

The level of understanding shown by students was high in this question with most students scoring one mark. However, students need to develop points to explain their responses. Answers on mulching were better than on texture (loam). Answers such as mulching increases stability were not enough to explain why. There needed to be a link to formation of organic matter, or improved protection from the mulch. Many higher scoring students understood the role of increased organic matter increasing the stability/ reducing erosion. Loam soil was understood but sometimes confused. The idea of loam being 'denser' needed qualification to gain credit. Higher scoring students focused on the improved porosity of loam allowing drainage or the ability for plants to develop root networks binding the soil. There was a need for students to say how increased drainage / increased aeration led to reduced erosion in loam soils.

5.3

This question was well attempted by students with a majority scoring at least two marks. Those systematically discussing sampling, then measurements and variables did well. Some higher scoring students limited themselves at 4 marks by not stating which method could be used to measure statistically significant differences. Common correct answers included the use of systematic sampling, measuring over a named period, measuring depth of soil, and measuring in same soil texture / management. Some did not clarify why same measuring over a given time was important (i.e. link to named changing weather conditions - rainfall).

5.4

A question that challenged many students and resulted in most achieving only one mark. Lower scoring students found the concept of texture challenging and did not mention 'more sandy soil' even if they had a valid reason. Higher scoring students linked to wind erosion. Many students understood that organic matter would reduce but did not clearly explain how desertification led to this. Higher scoring students made the link between reduced moisture / plant growth reduction in organic matter production.

6.1

This question challenged many students resulted in being one of the lowest scoring items on the paper. The 'not attempted' rate was also much higher than the norm for a 1-mark question. Few students understood the correct answer as 'photosynthesis'. Many instead gave answers such as absorption, electrolysis, or ionisation.

6.2

Like 6.1 few found this question straightforward with many students scoring zero marks. Many students used the space to describe the formation or breakdown of ozone which was not

relevant. Some understood that ozone absorbed UV radiation but did not develop this to show the link to stratospheric temperature profile. Good answers understood the role of ozone absorption leading to increased temperatures with height, but these were in a relative minority.

6.3

This question was well attempted with many scoring at least one mark, but students often confused the processes. Credit was offered for recognition of high albedo. However, many students confused the impact of this on direction of reduced surface temperatures – stating that there is a reduction. Cirrus clouds lead to a net increase in temperatures due to the re-radiation of infra-red light back to the surface.

7.1

This answer was well understood with most students scoring two marks and getting the correct answer 2.6:1. Common mistakes included counting the squares incorrectly or applying the ratio in the wrong direction. Some managed to get the correct answer but did not give their answer to one decimal place.

7.2

Most students scored one mark, recognising the difference in number of sites, or the relative proportions of rocks A and B. However, comments on the relationship with the river were not credited as not deemed relevant to this study.

7.3

While most students understood the concept those who did not achieve the mark were limited by their expression. There was a need to compare both coarse and medium material between the sites.

7.4

Most students were able to score one mark on this question. Often for describing the proximity of site six to the river. Higher scoring students also noted the process deposition as a reason. Some students limited their answers by giving the first half of marking couplets e.g. the proximity or amount of quartz but not developing the reason (these were first marking points in marking couplets).

7.5

This question was well attempted with most students scoring two marks. A common error was not knowing the name of the method, particularly sedimentation. Sedimentation was better described than sieving, but students should be mindful to clearly describe how the measurement of proportions takes place.

8.1

Most students understood at least one reason for choosing biofuels over renewables, with many also getting a second. Common answers included 'high energy density' or a 'lack of intermittency.' Comments around cost needed qualification, i.e. they could not just say they were cheap.'

8.2

Both 8.2 and 8.3 caused issues for students. Most students only scored one mark on this item and few scored full marks. Many students were able to calculate 3.9×10^{11} (total production). However, fewer students successfully managed to calculate 'Mass of sugar cane converted to energy' and 'Total energy supply per hectare.' Knowledge of the mass, density, volume triangle would help here. Many students also found the conversion petajoules into megajoules a challenge. This would result in correct number values but not the correct answer.

8.3

Many students attempted 8.3 despite not scoring the correct values for 8.2, though most students scored less than one mark. One mark was available for the calculation of total land – 15,625,000. However, a common mistake was not accounting for the existing 5 million ha of land (which had to be subtracted) giving 10625000. The final mark was available needed a conversion to both standard form and two significant figures. This created some rounding errors. Even though many found the calculation a challenge they attempted an answer in standard form and to two significant figures. Commonly, if students had not attempted 8.2, they did not attempt 8.3 leading to a loss of six marks across the paper.

8.4

This question was well attempted with most students scoring one mark. A common correct answer referred to using transport to deliver biofuel leading to carbon dioxide emissions. Common errors included not understanding that burning biofuels accounted for embodied carbon.

9.1

Students coped well on this with the majority scoring one mark. Many were able to recognise appropriate trends as change over time. Common mistakes included only referring to one year. Higher scoring students gave a range of years, and some used the DU units to qualify statements. Answers needed to compare the northern and southern hemispheres to get credit.

9.2

This answer presented a challenge to many students, resulting in low scoring answers. A minority of students found the concepts of southern hemisphere and high latitude a challenge and tried to link their answers to equatorial locations. Those that had the knowledge of ozone breakdown were able to apply it to the context of the southern hemisphere. This included the role of photolysis. Higher scoring students who understood the context as Antarctica were able to link to the role of the polar vortex, the formation of stratospheric clouds and the role of ice crystals in the process. A significant minority also were able to understand how these factors led to the formation of chlorine free radicals. Some students also understood that persistent CFCs (with long atmospheric residence periods) were still able to break down ozone. There were many students who scored zero on this question suggesting centres may need to review this content.

9.3

This question was well attempted with most students scoring in Level 2 or above. Reference to the success of ozone reduction measures were well understood and students could often link to a range of relevant points, e.g. Montreal protocol banning CFCs, the introduction and subsequent reduction of HCFCs or alternative measures to reduce ozone. Measures to reduce climate change were understood, commonly afforestation and renewable energy, but they were explained in less depth. Students commonly found it difficult to talk on the specifics of climate change policy, though it was good to see specific details (e.g. 1.5°C reduction by 2100 or use of Nationally Determined Contributions) on Paris Agreement. Many students showed an ability to make comparisons. Some even gave reasons for the relative success of one measure over another. High scoring students were not only able to compare the success of measures between the two (ozone and climate change) but also the relative success of different measures. It was great to see students coherently constructing their answers and including detailed conclusions.

10.1

The correct answer, incomplete combustion, alluded many students. Many students referred to producing steam / smoke but did not link to combustion. Some lower scoring students referred to particulates combining to make bigger particles or referred to the role of greenhouse gas – neither were relevant.

10.2

A well attempted question with many students scoring at least two marks. Many understood the concept of dispersal for the wind factor. Temperature led to the greatest number of errors with some commenting that increased temperatures led to increased reactions. Those who mentioned the role of temperature inversions needed to link them to trapping or holding the particulate matter (PM) or explain how it would change it. For rainfall many correctly understood the concept of 'washing out to decreasing PM,' however, some confused the idea that water would act as a solute and dissolve PM.

10.3

Another well attempted question with most students scoring at least one mark. Some students, influenced by 10.2, incorrectly put climatological reasons which were not relevant. Common correct answers included greater access to wood, greater burning of wet wood, or the reliance on wood burning stoves as a heating system / for cooking. Students sometimes limited themselves by giving mirror images e.g. Less connection to electricity system in rural area, vs urban sites have better access to electricity. Students should avoid mirrored statements.

10.4

This question tested students understanding of PM sources in urban and rural areas. While many scored some credit few were able to reach full marks. Often students limited themselves by repeating the same methods in both urban and rural, e.g. factories in both locations. Higher scoring students were specific to the context e.g. agricultural machinery needed to be linked to combustion, or increased BBQs in urban areas. Some students were limited referring to car emissions which were not credited as this was in the question.

11.1/11.2

The essay questions had comparable mean values this year suggesting equal demand. They were however slightly lower scoring than previous series. Both questions required students to comment on either storage/conservation or water pollution control technologies to reduce use/pollutant and the impact of use/pollutant. Where questions have these different elements, it is important that the students plan to answer all aspects of the question.

It was good to see students using the space to create detailed plans to show how they will structure their answers.

It is important for students to attempt all parts of the question as otherwise the response can be considered partial, thereby resulting in a Level 2 response. For most students who correctly attempted the question and drew on all aspects of the question they found themselves in Level 3. Level 4 responses were those where students covered all elements of the question but either had range or depth in their responses and some explanation including appropriate scientific processes or terminology. Those students scoring a Level 5 response made a sustained attempt to answer the question and had (often) range and depth in their responses. Often in Level 4 and 5 answers students included a relative commentary on the differences between approaches showing a nuanced understanding.

11.1 – Lower scoring students were often limited by their understanding of energy storage methods and therefore often described energy types e.g. solar and wind energy (without a clear link to storage). Higher scoring students gave a range of storage types, commonly molten salt, peak shaving (HEP storage), batteries, hydrogen cells or vehicle / power to grid. Conservation methods were better understood and students commonly linked to building design or building materials. Some higher scoring students were able to develop their points with reference to named examples of construction or the explore the environmental impact of using these approaches.

11.2 Lower scoring students in 11.2 were often limited to fewer pollutants. Some focusing on just sewage or oil, therefore limiting their answers by not referring to a range. Sometimes lower scoring students limited their answers by focusing on the environmental impact rather than the technology used to reduce the impact. Higher scoring students often included a range of methods, commonly different measures to reduce oil pollution (double hull, GPS, ballast tanks and booms/skimmer), thermal pollution (cooling towers), the various stages of sewage/water treatment, managing nitrates and acid-mine drainage. Those students able to focus on the role of the technologies often scored well.

Overall, it is pleasing to see improved performance in planning, structure, and development in essays – with fewer students scoring L1 and lower L2 responses.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.