Questions matter

A-level
Environmental Science

7447/2 Paper 2

Report on the Examination

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Overview

This year there was an increase in the total student numbers taking Environmental Science and the standard of responses continues to improve. The students performed at a similar level to 2023 but the mean was a marginal improvement, and it was good to see an increasing range in the number of marks achieved. On the whole the students performed better on Paper 1. Students found questions requiring explanations or extended writing accessible. It was also pleasing to see many more students attempting and scoring on questions requiring mathematical skills and data processing. It was evident that students are familiar with environmental terminology; however, cases of poor expression limited the performance of some. This was particularly evident in short answer questions. The continued use of question framing, eg explain two, allows students to structure their answers appropriately.

This paper allowed students to show their understanding of complex scientific concepts and the application of practical skills and principles. Students showed in depth knowledge of how genetics impacts conservation, embryo transfer, environmental impacts of pesticides and the control of factors influencing aquaculture. High scoring students could logically articulate and apply their knowledge of these concepts to novel situations, showing clear preparation for the topics of Paper 2. Understanding of sampling methodology, data collection and data analysis were all shown in the answers to questions throughout the paper, though it is clear that some skills are more focused on than others. For example, kick sampling was much better understood than the role of satellites in data collection.

Levels of response questions were the best at discriminating students on the paper. There were some excellent examples of students' planning and clear attempts to provide a structure to the 25-mark essay questions, especially when the question had multiple parts. Despite the improvement we would suggest centres encourage students to ensure they are answering the entire question and try not to focus on parts. Both 11.1 and 11.2 showed examples of students who could accurately identify the points but could not link them to the context of the question, eg many could name legislation, but fewer could articulate how it benefited the conservation of biodiversity. We also encourage centres to focus their essay practice on the working of the Level of Response mark scheme rather than the indicative content.

Timing is always critical on this paper. It was evident that some students did not manage their time. Students are encouraged, where possible, to attempt higher tariff questions earlier in the examination so that they maximise their chances of accumulating marks.

It was great to see a continued student improvement on this paper, which is a reflection of the hard work centres undertake to prepare their students.

1.1

This multiple-choice question was answered well, showing students understood the concepts of both the IUCN's Red List and evolutionary distinct species.

1.2

Students identified the importance of genetic resources however could improve their conceptual knowledge of an evolutionarily distinct species.

1.3

Although the general concept of an edge score changing was understood this question provided a challenge to most but the higher scoring students. To improve performance students needed to give the changing direction of edge score or link the concept to the 'score.'

2.1

This question also presented a challenge to students with over 60% scoring just one mark. This was largely due to students needing to carefully read the stem of the question. Common answers included references to protecting the rhino habitat, but this information was included therefore did not gain credit. There was also a need to understand the word 'management' in the context of conservation. Good answers were able to reference specific references to genetics, e.g. small genetic diversity or an increased vulnerability to diseases. Students could also improve by clarifying terms, for example 'interbreeding' was often confused with 'inbreeding.'

2.2

The majority of students (over 85%) were able to score one mark however a relatively low proportion were able to score two. This was largely due to the confusion between difficulties of captivity and difficulties of breeding in captivity. Good answers referred to the habitat size and food mark. However, a significant minority would repeat the habitat requirement mark, once with size and once with abiotic factors, preventing them from getting both marks.

2.3

This question discriminated well and around half of students scored 1 mark. This was note often for the named method e.g. embryo transfer which was commonly confused with 'artificial insemination.' Despite this students could still achieve marks but again there was a need to be specific with terminology for example the use of the terms eggs / embryos / nucleus / unfertilised eggs / artificial insemination / hybridization.

2.4

The use of radio collars was generally understood, and students were often able to determine how the collar was used to collect data. However there was a need to improve the application of these data to conservation. Sometime students inferred that radio collars could give information on animal behaviour but this is not possible.

3.1

Many students understood the concept of albedo but were limited by their ability to follow the command 'explain.' Good answers linked the cause and effect, for example 'white surfaces have a high albedo leading to the reflection short wave radiation.' Sometimes students were limited by use of inappropriate terminology eg deflect, refract rather than reflect.

3.2

This mathematical skilled question presented a challenge as less than half managed to score full marks. Some students attempted to complete a percentage increase when the mean rate of change was required. Although it was good to see students use the working space which led to many scoring at least one mark for errors carried forward.

3.3

This question also provided a challenge to students with less than 15% scoring full marks. Some generic answers about 'migration' limited some responses. Good answers were able to understand how environmental changes such as changes to ocean currents or ice melt may lead to favourable conditions for colonisation.

3.4

A significant number of students (over 65%) were able to achieve the mark for the Antarctic Treaty. However lower scoring students were limited by non-specific alternatives such as Antarctic Peace treaty, the Arctic Treaty and the Montreal Protocol.

3.5

This question required students to identify two atmospheric threats in Antarctica and show how they are being monitored. Generally, the threats were well answered, but only a small percentage of students were able to describe how two threats were being monitored. Common threats included carbon dioxide levels or ozone levels. Good answers gave specific references to named satellites or could give some specific detail on monitoring techniques such as sensors on helium balloons.

4.1

This question required students to work out the area : perimeter ratio of the ponds, this was achievable for over half the students. However, some incorrect answers mis-interpreted the question not including all ponds or did not use the scale correctly. Graph paper is often provided to help students with this.

4.2

Although this question discriminated well the two core concepts of this question, edge effect and ratios were a challenge to many. Many higher scoring students were able to recognise the greater availability of potential food sources or nesting sites. References to size of the area were not clear and this undermined the student understanding of edge effect in many cases.

4.3

The crux of this question was about using auditory monitoring to improve the identification of bird species. Therefore, students had to show how the use of the equipment made identification easier. Lower scoring students struggled with this concept. Good answers referred to the not having to see the birds to identify them, or the ability to record and identify at a later time.

4.4

Many students (over 55%) scored full marks on this question. Common mistakes included understanding the 'sum of' part of the equation or inverting the equation. On the whole, it was pleasing to see this skill this has been practiced by centres and hence the question discriminated well.

5.1

Another well practised mathematical skill with over 49% of students scoring full marks. Common mistakes on this question included not answering to 2 significant figures or confusing the order of the percentage change calculation .

5.2

This question discriminated well and despite a good understanding shown by students of how the insecticides impacted the environment, the naming of insecticide types was often where students lost marks. Many students recognised bioaccumulation / biomagnification for lipid soluble insecticides, although, eutrophication came up a surprising number of times despite not being relevant.

5.3

Many students were able to identify the correct technique, kick sampling to score at least one mark. Only a small proportion of students were able to identify two forms of standardising this technique and sometime two of the same standardisation methods were mentioned, eg two ways to standardise kicking. Higher scoring students referred to other factors such as net size or same depth.

5.4

Over 50% of students were able to score a mark for why the results collected may not be reliable and many referred to the washing of pesticides downstream. However some students were self-limiting by not referring to the figure in their answer.

6.1

Many students were able to score one mark for naming an ethical factor but less than 25% of students were able to explain the factor in the context of the question. Some answers confused ethical with other factors. Common answers included animal welfare leading to reduced meat consumption or focused on the benefits of organic farming.

6.2

Although the concept of 'Quotas' was understood some students were limited by linking their answers to fishing. Despite this over 50% of students scored the mark.

6.3

Many students were able to understand a relevant political factor and hence over 65% of students scoring one mark. However, like 6.1, students lost marks for not fully linking their chosen point to its impact on agriculture.

7.1

The concept of mean was well understood, and this enabled most students to score full marks. Loss of marks often came from incorrect reading of the graph.

7.2

This question again discriminated well as many students were able to correctly identify a method. However less than 40% were able to apply this to the context of rivers. Catch quotas and No Take Zones were frequent correct answers.

7.3

There was a need for students to recognise the compatibility of laser recorded data with that taken from those fishing. Often students scored a mark for recognising the collection over time. There was a need to recognise the number of people fishing or the need to collect laser data from the same location as those fishing.

7.4 and 7.5

Both questions required students to interpret Figure 5 and apply their understanding. This was well attempted on 7.5 where students understood the impact of a dam on the reproductive success of salmon. Common correct answers included blocking salmon from reaching reproductive grounds or the impact of the dam on river discharge levels. Question 7.4 was less well understood although most students could recognise a relevant factor e.g. use of fertilisers but struggled to fully explain it. Stronger answers were clear in response to these questions.

8.1

This question worked very well as a discriminator and over 40% of students scored two marks. Many students at all levels were able to identify relevant factors however they were discriminated by their ability to explain. A common example was referencing antibiotic but not linking the use to the control of pathogens.

8.2

Similarly to 8.1 this was a well attempted question with a majority scoring at least one mark and many scoring two. However, the biggest limitation was a lack of explanation linked to high productivity. Some incorrect responses referred to commercial sea fishing not aquaculture.

8.3

As with all Levels of Response questions, 8.3 worked very well and discriminated effectively. One key differentiation between Level 1 and 2 responses was the range and depth of answers. Those with a range of comparatives and use of environmental terminology were able to access Level 2 more readily. Good Level 3 responses additionally made clear evaluative statements after each comparison or at the end in a concluding statement. One area where students can improve is by explaining fully both the agreement and disagreement that extensive systems have lower environmental impacts. As in 8.2 some students did not gain credit for references to commercial sea fishing. Overall this was a well attempted question with over 15% of students scoring a Level 3 response and over half scoring in Level 2.

9.1

Over 75% of students were able to score at least one mark with over 35% scoring full marks. Attempts of each part were similar in standard. Although students who used information from the stem often found more success. Some generalised terms did not get the mark, e.g. climate, soil, carbon.

9.2

While many students understand the concept of a null hypothesis there is a need to refer to the 'no significant difference' to gain the mark. Identification of variables was often correct, but there was confusion with correlation in some answers.

9.3

The question was answered well as many students were able to calculate the standard deviation in Table 5 and then use the equations to calculate the t-test value. Centres should keep practising these methods as student performance has improved over the past series. It is important to show working as many students were able to gain marks in error carried forward despite incorrect values given in the table.

9.4

Interpreting statistical significance continues to be a challenge for many students and is one aspect of statistics that could be practised, as less than 45% of student scored the correct option.

9.5

This was a very accessible question and well attempted by the students. Good answers showed an understanding with accurate definitions of coppicing and could link this to changes in biotic and abiotic factors. Lower scoring students were limited by their lack of understanding of coppicing.

10.1

Many students were able to link to a natural process, the most common being decomposition to score one mark. However, less than 20% of students were able to achieve the second mark largely due to an inability to carefully explain the link to a human system.

10.2

This question was low scoring. Students that got no marks often ignored the questions prompt and wrote about why not recycling was not part of the circular economy. Good answers understood the energy demands of recycling or that over time materials would degrade leading to need for more raw material.

10.3

Many student were able to score at least one mark for identification of product design improving their recyclability. However, most struggled to get two ideas. Common correct answers included clear labelling or separable materials.

10.4

A well attempted question which also discriminated effectively. Most students gained up to two marks for named Greenhouse gases. However, they were limited by their ability to explain how recycling reduces them. For example, generic answers referred to reducing landfill, whereas fully explained answers referred to anaerobic respiration.

11.1

The legislation, protocols and international agreements where answered surprisingly well, with lower scoring answers including some of each. There was some confusion between Montreal, Kyoto and Paris, and ozone depletion and global climate change in general.

Links to biodiversity were poorly made. Many students reworded the question back as an explanation, meaning they had no explanation in their final answer, eg '...this protects biodiversity.' The 'how?' was not being answered. Some students related the policies to a species or taxa, but struggled to make wider ecological points at the level of detail the course requires.

11.2

Many students wrote about how agriculture impacts the environment, but not specifically relating to global climate change eg references to deforestation, eutrophication, the impacts of pesticides. There was clear lack of understanding of the difference between pesticides and fertilisers. Weaker answers did not differentiate between reductions and adaptations. Higher scoring students did a good job of not just stating the methods, but also explaining how they helped and evaluated their effectiveness.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.