A-LEVEL
ENVIRONMENTAL SCIENCE

7447/2 Paper 2
Report on the Examination

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On the whole students provided answers that suggested they had interpreted all of the questions well, suggesting an accessible paper. There was a good deal of evidence of well revised specification content throughout. The majority of marks missed by students who did show understanding, was due to poor communication and answer structure.

Many answers to simple definition questions presented evidence of a lack of knowledge of basic terms, such as biome (01) and species richness (03.1), as did named designations (05.2) and organisations (10.3).

There was a significant number of answers to practical questions where students appeared to have no or very little understanding, or again were poorly communicated, such as missing units (04.2) or descriptions lacking coherence.

The mathematical questions were more accessible than previous years, and calculations showed a greater level accuracy, however there was a large proportion of students not following all the instructions of the question and missing marks for not expressing their answers in the correct format eg significant figures, decimal places and standard form.

There was a narrow range of response to the analysis of graphical data, although some understanding of standard deviation was evident, but not in many cases. A wide variety of answers was seen in the levels of response questions (05.1, 11.1 and 11.2) and although there were some excellent answers, many lacked the scientific detail, coverage of a wide range of content and focus to all aspects of the question to achieve the higher levels.

Question 1

Species and community were the most common correct answers. Although a few gave ecosystem in place of community. Population and ecological niche were quite well answered; however, some were not clear that population only refers to one species or did not include an element of area in the definition. Biome was poorly answered with students very commonly not including the concept of unique community.

Question 02.1

Many excellent answers were given using technical language and some with detail beyond the mark scheme. Common incorrect parts of the answer included the interaction of ozone and UV, reflection being more frequently seen. In some answers students did not include the process of photosynthesis in the production of oxygen or confused it with respiration and some were not clear about how photosynthesis interacts with ozone. A few confused answers included the concept of ozone depletion by chlorine reactions.

Question 02.2

A well answered question with 48% of students scoring at least 3 marks and 74% scoring at least 2 marks. A few detailed answers included named biological molecules produced by photosynthesis or gave examples of the features of optimum conditions created by a warmer climate such as the presence of liquid water. Weaker answers stated that CO_2 is important for photosynthesis or in the maintenance of a warm climate but did not explain how for the second mark. Incorrect answers included confusion over CO_2 being used by plants in respiration

Question 02.3

Generally, a well answered question with most students giving temperature as the main factor affecting growth rates. Students who referred to CO_2 as the driving factor for the difference in growth did not achieve the mark. Some confused answers stated that more rings meant more growth, and some poorly constructed answers either did not refer to a date range, did not link the width of the rings to growth or they stated that temperature had changed without stating how.

Question 02.4

This was not well answered, with only 32% of students gaining the mark. The most common correct answer given was that trees only evolved relatively recently so the records do not go back very far and other factors such as nutrients affect growth. Simple answers such as it is unreliable or inaccurate were not enough for the mark, as more detail was required.

Question 03.1

A considerable number of students incorrectly referred to species richness as the density of a species, or gave a definition of a community or population, with only 42% of students gaining the mark.

Question 03.2

Generally, students either answered this question very well or very poorly. Those who did not achieve any marks often gave details of bat flight behaviour. The most common reason for 1 mark answers was, although stating that bat detectors measure sound, students did not give details of how that distinguished between different species.

Question 03.3

A well answered question with all of the mark points awarded. The most frequent incorrect answer was that males fly higher than females.

Question 03.4

To protect their habitat and prevent named threats were the most common answers seen. Some students repeated the same mark points about reducing threats or protecting areas. Better answers used good terminology, such as to designate protected areas or gave excellent descriptions of biological corridors. Weaker answers often only stated half the answer.

Question 03.5

53% of students gained the mark for this question, most students referring to stressful disturbance due to catching the animal to attach the device.

Question 04.1

Justification for random sampling was very well answered. However, justification for the transect was not. Unless the students gave the term environmental gradient, they often struggled to communicate the concept clearly enough for the mark. It was evident in many answers that students did not know the answer to this part of the question and gave simplistic answers, such as to increase accuracy.

Question 04.2

This question was not well answered with 65% of students not achieving a mark. Those that did achieve the mark most commonly gave 1m x 1m or 0.5m x 0.5m. Many gave very large numbers or failed to give any units.

Question 04.3

A well answered question with grid quadrat more commonly seen than point quadrat. Some students struggled to describe how the presence of the grid made it easier, instead just said it made it easier. However, overall the concept of a grid quadrat was generally well understood.

Question 04.4

Some students communicated their understanding of succession but did not specify a vegetation type, or link its distribution to the rate of recession. Some answers focused on growth rather than colonisation. Some students used named examples of vegetation from Table 2 in the correct context, but failed to describe how the distribution of that vegetation linked to the duration of time that the land beneath the glacier had been exposed and therefore the time for ecological succession. A few students gave an excellent answer clearly applying their understanding of the concept using technical terminology.

Question 04.5

Students needed to explain how the colonising species provide more suitable conditions. Many good answers were given about the provision of soil nutrients and the modifications of microclimate. However, some simplistic responses only gave two-word answers, such as provide nutrients. More detail was needed to answer the question fully and explain the process by which these conditions were created. Overall, there seemed good understanding of the process of succession and the main reason for not achieving full marks was due to poor answer structure.

Question 05.1

Level 3 answers included a good level of scientific content that is expected at A level, on a number of threats to both ecosystems as well as making direct comparisons of the threats. Level 2 answers often included a number of threats to both ecosystems but frequently failed to make comparisons between them and simply dealt with them independently.

Some level 2 answers included inaccurate or irrelevant content. Others lacked the depth of knowledge of scientific processes and relationships that enabled better answers to discuss the threats more effectively.

Level 1 answers often lacked enough content, or the content they did included was superficial with little or no scientific detail. Tourism and coral bleaching were the most common threats discussed for tropical coral reefs, with some students including some excellent details on the impacts of run off from land or the destruction of mangroves. Trawling and oil exploration were the two most common threats discussed for deep water reefs. Ocean acidification was also seen, but often with some confusion over the relationship with increasing temperatures.

Overall, this question differentiated well providing the students a good opportunity to include knowledge and apply scientific processes and relationships.

Question 05.2

MPA, MCZ and NTZ were the most frequently correct answers given. A few students gave one correct and one incorrect answer and therefore gained no marks. Some students gave confused answers, such as NATO, UNICEF and Greenpeace. 7% of students did not attempt this question.

Question 05.3

Many correct answers included reference to light and temperature. Some responses focused on the low diversity of the reef being a limiting factor for recovery and others did not explicitly state that growth rates are slower as a result of a named abiotic limiting factor, rather they simply repeated the part of question that they limit natural recovery.

Question 05.4

This was a poorly answered question with only 15% of students gaining the mark. Many responses simply repeated the question by stating that high biodiversity can resist change, without giving any new information of why or how. There were frequent references to species being more adapted and references to range of tolerance.

Question 06.1

Most students gained 1 mark for extracting the correct data from the graph but divided the data the wrong way around. Some did not show their working and so could not be awarded the error carried forward mark. Some lost the second mark for expressing their ratio the wrong way around on the answer line. A few confused answers found the difference between the input and output data. 2% of students did not attempt this question, 72% gained at least 1 mark and 24% gained the full 2 marks.

Question 06.2

81% gained the mark for this question.

Question 06.3

A well answered question with most responses detailing the energy used in heating barns and artificial light used to stimulate egg laying. Descriptions about how food inputs vary were often not well communicated, with some weaker answers simply saying that cows eat grass and not referring to chicken feed. However, a few very good answers were also seen where students detailed the embodied energy in the production of chicken feed and fertilisers, compared to cattle eating grass. Where students referred to higher energy outputs of cattle via movement or wastes they did not achieve a mark since these are outputs not inputs. Some vague answers included simple statements such as chickens eat more or more human input. Some confused statements included people eat more chicken or more chicken per area.

Question 07.1

29% of students did not achieve the mark for this question. The most common reason was a lack of clarity about the transfer of genetic material being between different species, rather than only between organisms. Some weaker answers stated that it was the introduction of desired traits, which does not differentiate from selective breeding. 3% of students did not attempt the question.

Question 07.2

The most common marks awarded included same species of caterpillar, same species of weeds, and fields with the same weather conditions. Answers about the duration of the trial and same size fields were not credited as these details were given in the question. Although responses referencing repeats for statistical testing show good knowledge of the research methods marks were not given as this is not a feature of standardisation.

Question 07.3

Few students scored full marks on this question. Most gained at least 1 mark for stating that the caterpillars that fed on the weeds in the non-GM corn field B had an overall higher mean mass. Those that differentiated the standard deviation data by day gained the marks for the data likely to be significantly different, however not all days provided evidence for this and so without referencing which days data students did not get the mark. The same outcome followed for references to the size of the standard deviation being greater in field B than A (only from day 5 onwards). Some students suggested explanations for the data rather than analysis, or made one analysis point and then explained it. A few students scored no marks for providing an answer that did not differentiate between the fields or days or referred to size of the caterpillars rather than mean mass.
On the whole, answers needed to be more specific, breaking down analysis by data for different days rather than as one outcome at the end of the trial.

Question 07.4

Some students referred to only the characteristics of the data, such as reliability rather than potential reasons causing the variation in data. Wind blowing pollen to some areas more than others was the most common suggestion, as was natural genetic variability to the toxin. Some missed the mark by not being definitive enough. Some students compared Field A and B rather than only the data within Field A.

Question 07.5

Some confused the dependent variable stating there was no difference in mean mass rather than % survival of the caterpillars. Some incomplete answers only gave a simplest statement of a null hypothesis being no difference rather than applying it to the specific investigation given in the question. A few confused answers referenced no correlation or gave an alternative hypothesis instead.

Question 07.6

A well answered question with 74% of students gaining the mark. However, 8% did not attempt an answer.

Question 07.7

This question differentiated well only awarding full marks to those who clearly understood how to use the data. However, 60% of students did not achieve any marks. Unfortunately, some showed good knowledge of using the smaller U value and comparing it to the critical value but then muddled the outcome of significance. Some confused answers subtracted the difference between the two U values and judged a difference of three being small therefore a low significance. 12% of students did not attempt an answer to this question.

Question 07.8

This question was not well answered, with over half of students not gaining any marks. It was evident that a large number of students did not clearly understand the concept of a p value and instead referred to it being the critical value or the alternative hypothesis. Those answers that showed more understanding but still did not achieve the mark confused the level stating a 0.05% probability that the difference was due to chance or a probability of 99.5% it was not due to chance. Some responses got it the wrong way around with a 5% probability the difference is significant. Other incorrect answers included references to accuracy and reliability. 8% of students did not attempt an answer.

Question 08.1

A well answered question for a simple % calculation with 74% of students gaining the mark. Those who did not achieve the mark often found the difference between the data but could not accurately calculate this as a % of the total income. Some failed to expressed their answer to one decimal place.

Question 08.2

Generally, students who attempted this question did very well, demonstrating a range of understanding of different strategies subsidised by the government, both positively and negatively. The most common being methods used within the Environmental Stewardship Scheme, such as beetle banks, buffer strips and maintenance of hedgerows. Set-aside and guaranteed markets were also described well. Students achieving full marks linked a change in farming practice to an impact on the environment, whereas some students failed to make explicit the link to the environmental impacts.

Question 09.1

62% of students correctly calculated the productivity gaining 1 mark. However, many students did not give their answer to the appropriate number of significant figures, with some giving their answer to five or six significant figures, with only 31% gaining full marks.

Question 09.2

A well answered question with 77% of students gaining 2 marks or more. Some responses that did not achieve full marks described the region as a large area or having high productivity rather than it having the largest area and highest productivity. The question required students to make a comparative statement. Those that did often then correctly linked an impact to both such as habitat destruction and high energy use from food inputs. Excellent answers expanded on their impacts providing consequences such as loss of biodiversity and CO_2 emissions. Weaker answers did not provide any impacts at all or just referred to having a greater effect on the area or causing more environmental damage without any specific details. A few answers suggested the students thought the question was about fishing rather than aquaculture.

Question 09.3

Faeces and food were the most common addition of waste into the water, with increased turbidity and deoxygenation as the resulting impacts on water quality. Many just gave the input of waste rather than a specific waste, such as faeces, and did not receive the mark. Other vague answers referred to chemicals in the water rather than examples of named chemical wastes. There was some confusion over pesticides causing eutrophication.

Question 10.1

Students gave this question a good go and 19% gained full marks. There was a variety of reasons for not achieving full marks. Some simply forgot to express their answer in standard form or did so incorrectly, gaining 2 marks. Some gave the wrong region, often Africa, but gained a mark for the correct calculation of the data (ecf) and a second mark if they then expressed their answer in standard form (ecf).

Question 10.2

There were some excellent full mark answers where students gave fully expanded, good technical accounts. A loss in carbon sequestration, food and medicinal resources were the most common points made, followed by a loss of interception and reduced evapotranspiration. A wide range of different answers was seen. However, responses that only focused on physical resources did not achieve more than 2 marks and students who did not give any expansions to say how a loss of service impacts humans could not achieve more than half marks.

Question 10.3

ITTO was the most common correct answer. SSSI, IUCN and WWF were frequently seen incorrect answers. 7% of students did not attempt an answer, however 43% gave a correct answer.

Question 11.1 and 11.2

Both essays provided responses with clear evidence a good amount of specification content. Students who chose 11.1 tended to give fewer methods than those who chose 11.2, however there tended to be a greater level of scientific detail on those methods than in 11.2. Frequently responses to 11.2 appeared more as a list of methods with little expansion of detail. Many struggled to structure their answer to include all elements of the question, especially the disadvantages or did not give enough information on the method itself. Those who achieved the top levels introduced each method, gave details on how it works to reduce an environmental impact and then addressed at least one disadvantage and often an additional advantage. On the whole, the language was technical and much of the key terminology associated with each topic was seen. Few students did not attempt to answer the question. On the whole the length of the essays was good. The distribution of marks was similar on both essays, with slightly more students achieving a level 5 on 11.1 (16%) than 11.2 (12%), and more students achieving a level 3 or 4 on 11.2 (61%) than those who chose 11.1 (51%).

Mark Ranges and Award of Grades

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