

ENVIRONMENTAL MANAGEMENT

Paper 5014/12
Theory

Key messages

- Candidates should read questions with care and respond to the command verb to maximise the credit they achieve.
- The six-mark, level of response question requires candidates to look at the given topic broadly. The use of appropriate examples, either local or national, are beneficial to support their views. Question planning is important for this question and this was evident in some of the scripts seen.
- Candidates showed greater confidence in completing the mathematical activities within this paper and were generally able to form valid conclusions. Graph drawing was generally neater and there was a greater use of rulers, although care should be taken to ensure axes are labelled and appropriate scales are used.

General comments

There were relatively few examples of candidates not attempting questions. Candidates should attempt all questions even if they are less familiar with the topic as credit may still be available for weaker or incomplete responses. This is particularly important in questions where the command word is 'suggest', where responses are required that apply existing knowledge to an unfamiliar situation and a wide range of potential answers are credited.

There was also greater evidence of candidates providing answers that more closely addressed the command words such as 'explain', 'describe', or 'state'.

Candidates generally demonstrated a broad range of knowledge, although there were some significant misconceptions about the ways in which malaria is spread and how it may be controlled. Similarly, applying their knowledge to the unfamiliar scenario of gravel extraction from the oceans proved challenging for some.

The six-mark, level of response question at the end of the paper was attempted by most candidates, with a general improvement in the way in which it was approached. Some more able candidates showed good technique and supported their opinions with specific examples. Stronger candidates were able to provide a clear conclusion to the question posed, and also provide details on both points of view within their response.

Comments on specific questions

Section A

Question 1

- (a) There was varied success in identifying the layers of the atmosphere. Some candidates showed great confidence and there were some who left the answer lines blank.
- (b) Using the same diagram, candidates were required to mark the location of the ozone layer. Again, the success was variable. In a few cases, candidates did not answer this question.

- (c) Many responses showed that candidates generally understood the role of the ozone layer in absorbing UV radiation. Answers were required to give the specific reference to ultraviolet for credit to be awarded. Many also knew of the link to skin cancer and cataracts. There were relatively few responses that identified the role of the ozone layer in the natural greenhouse effect.

Question 2

- (a) (i) This question required candidates to measure a distance and apply a scale. A high proportion were successful.
- (ii) Most responses identified the impact on the tourism industry due to the ocean currents as the first local industry to be affected with a justification from the information within the map. Other valid industries were given credit if clearly named and justified. The most common error was omitting to name an industry, which was essential to confirm that the reasoning was valid.
- (b) Attempted by most candidates, the majority appeared to be prepared for such a question on oil spills. This was generally well answered with a small amount of confusion regarding the role of booms to retain the oil spill and some difficulty in explaining the role of the skimmers.

Question 3

- (a) The requirement to label the diagram was completed effectively by the majority of candidates with many scoring most or all of the credit. The most common error was to assume that subsidence farmers do not use any machinery. Whilst it may not be as sophisticated as that seen on many commercial farms, it is still often a feature.
- (b) Most candidates attempted this question and showed some understanding of the environmental issues relating to the use of insecticides, others needed to give further detail to gain the credit available. The most common error was to link the issue of insecticides to eutrophication, which is primarily an issue with the mismanagement of fertilisers so was not given credit in this context.
- (c) The majority of candidates were able to provide a suitable alternative to the use of insecticides; biological control and crop rotation were the most common answers, although more specialist examples such as the use of pheromone traps or breeding pest resistant varieties were also given credit as these might be common approaches locally to the candidate.

Section B

Question 4

- (a) (i) This question was designed to test the candidate's skills in evaluating the sufficiency and relevance of evidence, which is an important skill to develop to be able to interpret news reports and articles to measure their accuracy and reliability. Many candidates correctly identified the lack of comparative data to make a judgement, the idea that not all disasters are linked to climate change and that predictions are not valid as proof. Stronger candidates were able to identify three different issues with the article for full credit, while this question proved challenging for many weaker candidates.
- (ii) Responses showed a level of confidence in understanding the causes of drought, and many candidates were able to gain credit by stating the lack of rain; many struggled to provide a second reason to achieve full credit on this question.
- (iii) This question proved to be more challenging; whilst many responses described lack of rain causing soils to dry out, they needed to go on to make the connection that these lighter soils were more prone to erosion. There were some good examples of candidates identifying that drought would cause plant death which meant there were less roots to hold the soil.
- (b) There was generally a clear understanding of some of the reasons loss of homes in a natural disaster causes an increase in deaths. Many successfully linked issues such as unsafe water and lack of food to this scenario.

Question 5

- (a) (i) The majority of candidates correctly plotted the data for trout and followed the style already presented for the other organisms. The most common errors were to plot the pH bar to a value greater than 6.5 and in some cases not aligning the bar with the same relative spacings to the other bars as shown in the graph.
- (ii) Candidates showed confidence in interpreting the data in the graph with the significant majority identifying bacteria as living in the widest range of water pH.
- (iii) A more challenging question for some candidates, many had an understanding that some organisms would not survive in the more acidic conditions. Stronger responses included an interpretation of how this loss of species within the ecosystem might impact the other organisms through disruption to the food chain.
- (b) (i) The majority of responses correctly identified the role of sulfur dioxide and oxides of nitrogen, although the sources of these gases were less accurately understood. Some candidates did well in stating the acids formed when they reacted with atmospheric water vapour.
- (ii) Most candidates were successful in naming strategies that could be used to reduce acid rain. In addition to those focused on reducing emissions from vehicles, references were made to methods to reduce factory emissions such as flue-gas desulfurisation.

Question 6

- (a) (i) Using the world map, candidates were required to describe the distribution of countries where people are at risk of malaria. Credit was given to a wide range of descriptions, although any mention of a location made with reference to the tropics or the Equator needed to use the terms North and South rather than above and below.
- (ii) Many candidates had difficulty in providing a suggestion as to why some countries are not affected by malaria. The most common correct responses made a link with the climate being unsuitable for mosquitoes to thrive. Others identified access to suitable control methods.
- (b) (i) Some candidates were able to provide significant detail which achieved full credit. Within many other responses there was significant confusion over the mechanism for spreading malaria. Common misunderstandings included the risk of sharing food with an infected person and drinking contaminated water.
- (ii) Most candidates successfully identified two distinct methods of controlling malaria. Common correct responses included the use of mosquito nets, removing areas for the mosquitoes to breed and the use of medication. Common errors were often linked to a misunderstanding of the way malaria is transmitted.

Question 7

- (a) (i) Candidates were generally able to plot the data correctly and there were relatively few plotting errors. Similarly, most correctly drew lines to join the plots to the other data shown in the graph.
- (ii) In most cases, candidates correctly read the requirements of the question and referred to the trend rather than highlighting a specific year. Credit was awarded for identifying the overall trend within the graph, and for providing relevant information relating to this trend. Candidates showed confidence to attempt this question with relatively few not providing an answer.
- (iii) Testing mathematical skills, this question required the accurate reading of data from the graph and then calculating a percentage. A good proportion completed this correctly, although some were challenged with an appropriate rounding of the final answer.

- (b) (i)** This question required candidates to use their knowledge of environmental management topics in an unfamiliar context. Some demonstrated the skills required and suggested three distinct effects on the marine ecosystem. A wide range of effects were awarded credit, and many focused on the impact to the organisms in the seabed and the resultant impact on the food chain and biodiversity. Weaker candidates found this question more challenging. Some incorrectly suggested that this type of activity would cause eutrophication. Generic statements such as 'causes pollution' were too vague to be awarded credit.
- (ii)** Successful candidates understood the challenges of monitoring, such as the cost and the large areas involved; others also identified that commercial pressures due to high demand for the gravel made it difficult for governments to control. Weaker candidates were unable to apply their existing knowledge to this context.

Question 8

- (a) (i)** Candidates were generally able to complete the table as requested, understanding the directions of the question. There were relatively few errors seen.
- (ii)** There were relatively few examples of candidates attempting to draw the bars without the use of a ruler and the majority chose an appropriate linear scale that occupied over half of the space available. Common errors were a lack of labelling of the axes and drawing bars that were not all the same width.
- (iii)** The command word for this question was 'suggest', meaning that candidates should use their knowledge and apply it to an unfamiliar situation. In this case, to use the data and formulate reasons why the rhinoceros population had not increased. A wide range of plausible answers were given credit. Common themes seen in responses were the lack of suitability of conditions for breeding, the pressures on the animals in the wild, such as loss of habitat or poaching, and the fact that those held in captivity were all of one gender. Candidates frequently identified one valid point with the stronger candidates able to provide two.
- (b)** The six-mark, level of response question requires a longer answer from the candidate and allows them to combine their knowledge of environmental management to answer a specific question. Candidates are required to provide a range of details, or to focus on a lesser number in more depth, and elaborate on their points with relevant examples to support their opinion. Stronger candidates provided their own conclusion whilst demonstrating knowledge of both sides of the debate.

There were some very good examples where candidates took the time to plan their answer, and were able to provide a detailed, balanced response within the time constraints imposed by the examination. In some cases, these gave local examples, in others, international examples.

Only a small number of scripts were identified where this question was not attempted. Providing a balanced, evidence-based response was challenging for many who did not fully address the question posed. Many weaker candidates wrote about items that had not been included within the main themes of the previous questions, which did not always have great relevance to the challenge of balancing the needs for resources against the desire to prevent animal extinctions. Some weaker candidates provided a strong opinion but were not able to support this with any level of supporting evidence.

ENVIRONMENTAL MANAGEMENT

<p>Paper 5014/22 Management in Context</p>
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Key messages

- Higher-achieving candidates were guided by the mark allocation for each question which indicates the number of separate marking points required in a response. The use of bullet points helps to ensure concise answers that address a sufficient number of points. The rubric of a question should be followed. For example, if three reasons are asked for, candidates should not give a fourth as an incorrect answer can contradict a previous correct one.
- A conclusion should summarise the main findings of an investigation rather than focusing on one aspect, as in **Question 3(d)(iii)**.
- Candidates should be encouraged to check their question paper to ensure they have attempted every question.
- Candidates should avoid repeating the question in their answer. For example, stating ‘One benefit of geothermal energy is...’ can be omitted to make best use of examination time.
- Diagrams, charts and graphs should be drawn with a sharp pencil and ruler. Errors are more difficult to correct if a pen is used.
- Stronger candidates read each question carefully to ensure they fully understood what was required in their answers. This was particularly relevant in **Questions 1(a)(i), 1(c)(ii), 1(d)(ii) and 3(e)**.
- Candidates should always show their workings for calculation questions, as credit may be available for correct workings even if the final answer is incorrect.

General comments

Candidates could improve responses by avoiding vague statements such as ‘causes harm’, ‘causes pollution’, ‘affects the environment’, ‘causes death’, and instead give details of how these effects might come about.

Fieldwork skills such as sampling techniques, how to interpret data and how to give a sensible conclusion from data provided were not well known and were an area where improvements could be made. Strategies or sampling descriptions should be clear enough that another candidate could follow the written method.

Systematic and random sampling was not well understood.

Comments on specific questions

Question 1

- (a) (i) Some candidates analysed individual bars in the population pyramid instead of giving a description of the shape, as required by the question. Weaker responses stated ‘a pyramid’ – this was insufficient as the question stem informed candidates that the diagram is a population pyramid.
- (ii) The strongest responses to this calculation question showed full working out. Some answers were incorrect due to incorrect rounding.

- (iii) Many suggested that good employment and a lack of availability of contraception were reasons for the increase in population. Some answers were confused and suggested that poor healthcare would increase the population.
- (b) (i) Weaker responses stated that generating electricity by coal causes 'air pollution', without specifying what type of air pollution was involved.
 - (ii) Most candidates recognised that Laos has large quantities of natural water sources. Some also identified the suitable terrain and rainy season. It was insufficient to state 'good climate' or 'good weather' as this did not identify what aspect of the weather is good.
 - (iii) Good answers stated the creation of jobs and tourism. Weaker responses needed to focus on the economic benefits required by the question. Many needed to suggest a third economic benefit to gain full credit.
- (c) (i) The majority could suggest two reasons why people were affected when the dam burst. The third suggestion was often a repeat of an earlier answer. For example, 'infrastructure washed away' and 'roads washed away'.
 - (ii) Some responses needed to focus on the long-term effects as asked for in the question.
 - (iii) The majority calculated the quantity of electricity correctly to achieve the correct answer.
- (d) (i) Most candidates could state two distinct correct factors. Suggestions were often repeated in different words and so no further credit could be attained. For example, 'accessibility to the site', 'the location' and 'how easy it is to drive to the mine'.
 - (ii) Stronger responses answered the question posed and often gave full descriptions. Some detailed answers about creating a lake or a landfill site were seen – these did not answer the question that was asked.

Question 2

- (a) (i) Many very good bar charts were seen. The most common errors included omitting the label on the y-axis or the units. A few used non-linear scales or scales that did not cover half the grid.
 - (ii) Most candidates could suggest two reasons why annual fish consumption per person varies; fewer were able to give three reasons. Some suggested it was due to a larger population in different countries but as the question referred to 'per person', this was not relevant.
- (b) (i) Most calculated the range correctly to achieve the answer of 52. Errors included finding a mean rather than a range or not calculating the value and stating '60 – 6'.
 - (ii) Almost all candidates gave the names of the fish in rank order.
 - (iii) Candidates found this a challenging question and many focused on the health of the African catfish. The same idea was often repeated in different words, where a different limitation was required for further credit.
 - (iv) Common correct answers included 'to avoid bycatch' and 'prevent overfishing'.
- (c) (i) Candidates found this challenging and some answered in terms of how to select a representative sample of catfish rather than people to answer the questionnaire. There was confusion between random and systematic sampling. Some responses referred to stratified sampling, which is not a syllabus requirement.
 - (ii) The strongest answers added an explanation, as required by the question rubric, rather than simply copying down the data directly from the table. For example, 'more people do not eat more fish now than 5 years ago, this shows a reduction in demand'.
 - (iii) There was considerable confusion between abiotic and biotic factors.

- (iv) Candidates performed poorly on this question about why the farming of plant-eating fish is more energy efficient than the farming of insect-eating fish. Some knew that plant-eating fish are at a lower trophic level and that energy is lost between trophic levels. However, there was a lack of appreciation that energy is lost as heat or through metabolic processes.

Question 3

- (a) (i) Some candidates were able to identify terracing.
- (ii) A few repeated the strategy they had given in **Question 3(a)(i)** when the question asked for 'other' strategies.
- (b) Candidates had difficulty describing the effect of the activities shown on surface run-off and evaporation and performed poorly on this question.
- (c) Evaporation was a common incorrect answer for **A**. Precipitation was usually given for **B**; rain was also seen. Candidates were required to give the name of the process rather than the product.
- (d) (i) Weaker responses stated 1.76, which was not creditworthy as it was not rounded to the same number of decimal places as the rest of the figures in the table.
- (ii) Most knew that group A was a control.
- (iii) The strongest responses considered all the groups in their answer.
- (iv) Candidates performed well when providing suggestions for confirming the results. Most stated repeating the investigation and the higher-achieving responses went on to give details such as repeating 'with a different tree species' or 'at different locations'.
- (e) Many responses did not refer to afforestation and it was clear that many candidates believed this question was about deforestation. Most could state that trees remove carbon dioxide by photosynthesis. Many contradicted the impact of this by going on to suggest that ozone depletion, as well as global warming, would be reduced by a reduction in carbon dioxide in the atmosphere. The majority then went on to give a detailed explanation of how trees increase biodiversity or improve soil. These suggestions were not creditworthy as the question asked about the management of atmospheric pollution.