ENVIRONMENTAL MANAGEMENT

Paper 5014/12
Theory

Key messages

- Candidates should read questions carefully to ensure their responses provide appropriate detail and relate to the specific scenario of the question.
- The six-mark level of response question requires candidates to look at the topic broadly and use appropriate examples to support their views. This question benefits from a level of planning.
- When describing locations on maps, candidates should use the terms North and South rather than phrases such as 'above' and 'below'.
- Candidates showed confidence in completing the mathematical activities within the questions and were generally able to form valid conclusions.
- There was some uncertainty of the impact of the transition from fossil fuels towards biofuels, particularly the potential negative impacts.

General comments

Across the paper, there was a good understanding of the subjects within the syllabus. The majority of candidates attempted all questions on the paper. This strategy enabled weaker candidates to gain some credit for their responses even if their answers were incomplete.

Some questions required answers to be tailored to a specific context. This was sometimes not acknowledged within the answer provided; for example, with the impacts of the storm surge and strategies to reduce these impacts of flooding in **Question 8(a)**, responses were required to be suitable for the situation in the photograph.

Candidates should continue to use the number of marks allocated to a question as a guide to the number of points they should make in their responses. Command words such as 'describe' or 'explain' will also provide key information about the style of response required and the level of detail needed to gain credit.

There was evidence of appropriate and accurate use of scientific terminology within some scripts, although some responses to questions were too generic to receive credit, for example, the word 'pollution' needs to be qualified.

The responses to the six-mark level of response question were well structured. The stronger responses considered a range of points and supported them with examples, where relevant. Candidates should also ensure that these answers include a clear conclusion.

Comments on specific questions

Section A

Question 1

(a) This introductory question was very accessible to most candidates. A wide range of potential responses were given credit. Where pollution was mentioned, it was expected that the type of pollution was named.

(b) Many candidates were able to cite one good reason for how rock and mineral extraction can benefit the local community, with more able candidates able to provide two reasons for full credit.

(c)   This question provided a photographic stimulus which required the candidate to apply their response to the specific scenario presented. This was done successfully by many respondents; the majority identified the formation of a lake and the planting of trees.

Question 2

(a)   Candidates were required to interpret the activities taking place in the photograph. Most responses correctly stated that the bycatch was being returned to the sea; fewer showed understanding that the reason for this return was due to the bycatch being unwanted.

(b) (i)   There was a general understanding of the impact of overfishing, with the majority of responses identifying the impact on the food chain. Stronger candidates were able to provide a second impact to obtain full credit.

(ii)   Some good examples of strategies to reduce overfishing were given. The use of quotas and restrictions to fishing during the breeding season were common responses. Some candidates needed to be clearer when describing alterations to nets. Larger nets or smaller mesh would not have the desired effect.

Question 3

(a) (i)   This question, requiring candidates to interpret data, proved very accessible with most able to identify that transport and travel makes the largest contribution to the annual carbon footprint.

(ii)   The calculation was correctly completed by the majority of the cohort to achieve an answer of 20 (tonnes).

(iii)   This calculation was slightly more complex and was achieved competently by a good proportion of the candidates to achieve an answer of 14.

(b)   A varied range of strategies for reducing an individual's carbon footprint were suggested, with a wide range gaining credit. Stronger candidates identified the need to provide two distinct strategies to obtain all of the credit available.

Question 4

(a)   Candidates were required to describe the distribution of average life expectancy in Africa. This was attempted by most of the cohort, although the weaker candidates often missed out on credit for using terms such as 'above' or 'below' rather than using points of the compass in relation to the Equator or the tropics.

(b)   A wide range of valid responses were given credit, with reasoning not limited to the continent of Africa. Many identified the role improved health services and food availability could have on life expectancy; similarly, many identified the risks posed by climate change, war and the risk of an epidemic. Responses such as 'education' were considered to be too vague and not given credit unless the candidate provided clarity of the impact they would have.

Section B

Question 5

(a) (i)   This proved to be a more challenging question for many candidates. Whilst many made use of the diagram to interpret the pitfall trap, weaker candidates often stated only one feature, limiting the credit they could achieve. There was also some confusion with regards to the role of the cover; some responses suggested this closed on to the jar once an organism had fallen in.

(ii)   The limitations of using this type of trap for sampling proved to be more challenging. Some incorrectly suggested that the organism could burrow out, neglecting the glass jar shown in this example. Good responses included ideas of predation whilst in the jar, and the organisms trapped not being representative of the whole population.

(b) (i)   A question requiring candidates to complete a simple addition of data, this was completed accurately by most to achieve an answer of 61. There were a proportion of candidates who did not

attempt this question, suggesting that they needed to read the instructions more carefully and had missed the gap within the table.

(ii) The majority of candidates attempted to complete the bar chart and achieved some credit. A common error was to omit the labelling of the axes. Most responses provided a suitable scale which covered over 50% of the graph paper, and plotted bars of the same width.

Question 6

(a) (i) This question proved to be very accessible to candidates; the majority were able to determine the quantity of biofuel produced accurately to give an answer of 5.

(ii) A wide range of responses were given credit and candidates generally showed understanding of the idea that biofuels were renewable, although many incorrectly stated that their use did not produce CO_2. More detailed responses which identified that biofuels had a smaller carbon footprint, or the fact that the carbon capture during growth, offset its release during burning, were considered to be creditworthy.

(iii) This question proved to be more challenging for many candidates. Few identified the impact that growing these crops would have on food production or deforestation due to the large area that would be required to grow them.

(iv) This was a more evaluative question, requiring the candidate to form a judgement. Either conclusion (yes, or no) was valid, with credit awarded for the reasons given for their decision. Higher achieving candidates often also identified the large difference between current gasoline production/consumption and that of biofuels.

(b) (i) Candidates were required to interpret data and present it in a table. This was completed with variable effectiveness across the cohort. Common errors included missing headings for the two columns or the omission of one of the five sets of data. Some candidates had difficulty dealing with the range in the sizes of the number of vehicles in each class, and as a result there were some examples of candidates incorrectly inputting the data.

(ii) Many candidates wrote enthusiastically about electric vehicles in this question and provided some extremely valid ideas for the increase in numbers. Many focused on the greater awareness of environmental issues and the improvements to technology which made this type of vehicle more practical. Some also spoke about government incentives such as subsidies or payment for scrapping older vehicles.

Question 7

(a) (i) Some weaker candidates found linking the type of farming to its description challenging, confusing arable and pastoral, although this was not a problem with more able candidates.

(ii) Credit was awarded for ideas of production being sold rather than consumed by the family. Responses that discussed the level of mechanisation or the types of crops grown were not considered to be worthy of credit.

(b) Candidates were asked to state two problems caused by the mismanagement of irrigation. Whilst attempted by the majority, more able candidates were able to provide two distinct reasons, commonly mentioning the risk of waterlogging, salinisation and leaching of nutrients.

(c) Both techniques to increase agricultural yield appeared to be familiar to most candidates, although they sometimes had difficulty describing how they would benefit cropping within their responses. Some of the correct responses included the reduction of pests and diseases and the opportunity for crop rotation to maximise nutrient use. Relatively few answers identified that selective breeding might also increase the rate of growth.

(d) (i) Candidates were required to use the stimulus material to support their answers within this question. This enabled them to apply their existing knowledge to an unfamiliar scenario. This was achieved with varying levels of success. Many responses correctly identified that Australia provided favourable growing conditions for the cactus. Some of the stronger candidates also identified that as it was a non-native species, it was likely that there were no natural predators to slow its spread.

(ii) A wide range of potential answers were given credit; many included the idea that the spread of the cactus meant there was less available land to farm. Other common themes were the competition for nutrients and water that would take place as the cactus spread. A few responses identified the additional costs to the farmer spent to control the cactus. This was also given credit.

(iii) Many candidates found this question challenging; rather than stating the type of control (biological) they stated the agent used (the cactus moth).

Question 8

(a) (i) Candidates were required to name one impact of the storm surge seen in the photograph. This limited the range of answers and meant that items unrelated to the photograph were excluded. Responses such as damage to buildings and roads were amongst the answers commonly seen and given credit.

(ii) Candidates provided a broad range of suggestions for strategies to reduce the impacts of flooding. The question specified that responses should be appropriate to this location and this limited the credit achieved by some candidates. Responses included the development of flood defences, location of buildings in areas less likely to flood, and making structures more resistant to storm surges. Others focused on the development of monitoring and warning systems, linked to disaster preparation processes. Both types of answer were valid.

(b) (i) The majority of candidates were able to list at least one additional cause of flooding.

(ii) Whilst many knew the causes of flooding in the previous question, many found explaining why climate change might increase the impact of tropical cyclones more challenging. The stronger responses showed an ability to think of the issue of climate change more holistically and how this would impact on cyclones. Good responses identified that climate change might mean warmer seas which would increase the areas in which cyclones may form. Similarly, the increase in global temperatures might mean an increase in sea level as ice caps melt, making more land at risk from flooding. Weaker candidates had less structure to their responses and gained credit for ideas stated even if they did not show the same levels of linkage.

Question 9

(a) This question proved challenging for many candidates, although there were very few examples of scripts where there had been no attempt to produce an answer. Whilst many responses made the link between an increase in population and the increase in demand for drinking water, fewer made the link to other uses of this water and the competition this might bring. Many cited an increase in pollution, and these responses needed to identify the source of the pollution, e.g. industry or sewage, to gain credit.

(b) (i) Most candidates were confident in interpreting the data and obtained the correct answer (location 1).

(ii) Most candidates correctly calculated the range in concentration for potassium as 9.2.

(iii) Credit was awarded for the explanations provided. The majority of candidates correctly stated that location 3 had the highest level of N, P and K, although some needed to make the link that these components are those commonly found in fertilisers to gain full credit.

(c) The six-mark, level of response question allows a wide range of potential answers and provides the opportunity for candidates to utilise their knowledge across the broader syllabus and apply it to the scenario given. As a result, the mark scheme is indicative of the likely content, but it is not expected that candidates will cover all of these points and it is entirely possible for new ideas to be introduced and be awarded credit.

The stronger responses provided a balanced view as to whether dam construction was the most appropriate way to ensure a constant water supply, and in the best cases came to a conclusion. It is beneficial within this type of question for candidates to support their arguments with specific examples; in this case some used dams which were familiar to them, either locally or through case studies they had studied as part of their course.

Weaker responses were often too narrow in their focus, only gave one viewpoint, or limited their response to bullet points.

Higher performing candidates showed a level of planning before the start of their responses. This helped to ensure that their answers were balanced and presented in a logical order, making attainment at the higher levels more achievable.

ENVIRONMENTAL MANAGEMENT

> **Paper 5014/22**
> **Management in Context**

Key messages

*   Candidates are not required to repeat the question in their answer. This allows candidates to make best use of examination time.
*   The mark allocation for a question can be used as a guide for candidates to indicate the number of separate marking points that are required in a response.
*   The use of bullet points in a response helps to ensure concise answers that address a sufficient number of points.
*   A conclusion should summarise the main findings of an investigation rather than focus on one aspect.
*   Candidates should check their question paper to ensure they have attempted every question.
*   Diagrams, charts and graphs should be drawn with a sharp pencil and ruler. The use of a pencil makes correcting errors easier.

General comments

Candidates should avoid vague statements such as, 'causes harm', 'causes pollution', 'affects the environment', 'causes death'; these unspecific statements are unlikely to gain credit.

Some candidates would benefit from improving their field work skills as sampling techniques, how to interpret data and how to give a reasonable conclusion from data provided were not well known. Strategies or sampling descriptions should be clear enough that another student could follow the written method.

The drawing of graphs was an area for improvement for some. Candidates should focus on the correct labelling of axes and choosing of appropriate linear scales that occupy at least half the grid.

Systematic sampling was poorly understood.

Comments on specific questions

Question 1

(a) (i)   Many candidates were not confident in naming a specific rock or rock type formed by volcanic activity.

(ii)   Most responses included a benefit of geothermal energy; 'renewable resource' was the most common correct answer.

(iii)   The majority of candidates were able to explain how the turbine rotates and state that water is sent underground and is heated to become steam. A minority linked the turbine causing rotation in the generator.

(b) (i)   Many candidates described shaking of the earth. A few gave vague responses such as 'they felt it'.

(ii)   A few candidates repeated information in the question and stated that the magnitude was less than 2 on the Richter scale. These responses did not add their own reasons and were not awarded credit.

(iii) Most referred to movement of tectonic plates. Fewer explained this movement by referring to convection currents. Many described a build-up and release of pressure. A minority referred to friction.

(iv) The impacts of a high-magnitude earthquake were well known. Stronger responses were guided by the mark allocation and used bullet points to ensure they described four impacts.

Question 2

(a) (i) The majority named El Hierro. Some stated Valverde which was not the name of the island.

(ii) Those who had learnt the names of the mineral ions found in fertile soil were able to gain credit.

(iii) The majority were able to calculate the area that cannot be used for farming. Some misread the question and determined the area that can be used.

(b) (i) Stronger candidates were able to give the amount of dust added or number of days after planting as the independent variable and the average height of seedlings for the dependent variable.

(ii) Many graphs were plotted in pen or with pencils that were not sharp. This resulted in difficulty in correcting errors and imprecise plotting. Some candidates chose challenging scales for the *y*-axis, increasing in 3 s intervals, that made the accurate plotting of points more difficult. Others did not use at least half the grid space. Units were often missing from the *y*-axis label. Many lines of best fit were drawn where the instruction was to join each plotted point, and lines were extended back to zero or extrapolated beyond 30 days.

(iii) Some responses needed to focus on the difference in the trends in the graph rather than on describing specific data points.

(iv) Creditworthy conclusions summarised the main findings of the investigation rather than focusing on one aspect. The weakest responses repeated their answer to **Question 2(b) (iii)**.

(v) Good suggestions included comparing the effect of the dust on growth from different species of plant.

(c) (i) 6.5 cm was a common incorrect response.

(ii) Candidates found this question challenging and many were unable to work with the scale. Some misread the question and despite determining that the distance was less than 200 m, went on to conclude that the house could not be built. A minority did not show working out. This was an essential part of the response as indicated in the question.

(d) (i) Most candidates knew that a producer creates its own food by photosynthesis. Some incorrectly answered in terms of the beetle. A few responses gave a correct equation for photosynthesis.

(ii) Many stated that collecting all the beetles would threaten extinction; weaker responses referred to the plant needing the beetle.

(iii) A minority confused commercial intensive farming with commercial farming.

(e) (i) Candidates are advised to be familiar with a range of agricultural techniques that they can then apply to specific scenarios presented.

(ii) Clay was well known. Common incorrect responses included dirt, salt and stones.

(iii) Many descriptions were confused and it was clear that the use of bunds to prevent soil erosion was not well understood.

Question 3

(a) (i) Many correct percentages were calculated to achieve the answer of 7(%). Some used an incorrect value for the total population of the Canary Islands. A minority simply divided 151 by 1000.

(ii) Many candidates completed the table with the correct answer of 178. 179 was a common incorrectly rounded answer.

(b) (i) Some candidates needed to address the full question and give a reason for their answers.

(ii) This was well answered with many candidates able to give four ways of controlling the number of blue marlin caught.

(c) (i) The conclusions needed to summarise the main findings of the investigation rather than focus on one aspect. Some responses focused on only one point of view, such as that of the tourists, and needed to consider the views of the local people.

(ii) The majority of responses described a random method when a systematic method was asked for.

(iii) Most responses gave a reasoned point of view, supported by good examples, on whether a tourist tax should be introduced.

(d) Many good responses used the photograph to suggest why the location was not developed.

(e) (i) The majority described water purification rather than desalination. Distillation was better known than reverse osmosis.

(ii) Most were able to suggest a sensible reason.

(f) (i) Factors to consider before installing solar panels were well known.

(ii) Most responses stated at least one environmental benefit. Stronger answers compared the benefits of solar power with another energy resource, such as burning fossil fuels.

(iii) The majority of candidates were able to suggest another renewable energy resource. A minority stated 'solar' or 'the Sun', despite this being ruled out in the question.