ENVIRONMENTAL MANAGEMENT

Paper 0680/11
Theory

Key messages

Candidates should ensure they read each question carefully and provide responses with enough detail to meet the mark allocation. This is especially important for questions worth three marks or more, where fuller explanations or multiple, distinct points are required to achieve higher marks.

When answering graph questions, candidates need to choose appropriate and consistent scales and plot all points with precision. Accuracy in the placement of points and the presentation of axes is essential to access the full range of available marks.

For the six-mark, level of response question, candidates are expected to consider the statement provided and address the topic in a broad and balanced way. They should support their points with appropriate and relevant examples, ensuring they explore both sides of the argument rather than focusing on only one viewpoint. A clear and well-reasoned conclusion is required, stating whether they agree or disagree with the given statement and explaining the reasons for their judgement.

General comments

Most candidates attempted all questions, and there were very few instances where no response was provided.

Candidates are advised to pay close attention to the command words used in questions, such as *explain*, *describe*, and *state*. Responses should be clearly aligned with these instructions to gain full credit.

Overall, the standard of mathematical work was good. Candidates are encouraged to show their working whenever possible, particularly in questions worth two or more marks. This allows credit to be awarded for correct methods even when the final answer is incorrect.

Comments on specific questions

Section A

Question 1

(a) Many candidates were able to complete the bar for males accurately on the axes provided.

(b) Most candidates attempted this question, with many correctly noting that the number of males in the working population was greater than the number of females.

(c) Candidates were asked to state the maximum age of females. Many gave the correct answer gained credit. Responses that provided a range rather than the exact value were not credited.

(d) Candidates were required to tick the strategy that could increase the number of children under five years of age. Many correctly identified that improved healthcare would contribute to this.

(e) Most candidates were able to state at least one feature that distinguishes the population pyramid of an LEDC from that of a MEDC, most commonly noting that LEDCs typically have a wider base.

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Question 2

(a) Many candidates correctly identified the mine as an open-pit mine.

(b) This question was generally well answered. The majority of candidates demonstrated a clear understanding of the correct sequence for restoring land after mining.

(c) Candidates were required to describe bioremediation by linking the use of microorganisms to the breakdown or removal of pollutants. Many responses lacked one of these key elements and therefore did not gain full credit.

(d) Most candidates gained some credit. Many correctly identified basalt as an igneous rock, limestone as sedimentary, and marble as metamorphic. Candidates who did not achieve full credit often misclassified shale as a metamorphic rock.

(e) This question on sustainable development required two linked ideas: meeting the needs of the present while ensuring that future generations can meet their own needs. Many candidates were able to give one of these ideas and therefore gained partial credit.

Question 3

(a) Most candidates recognised that the use of a double-hulled tanker would help prevent oil from leaking, and many gained credit for this.

(b) Candidates found it challenging to describe how a skimmer works. Many confused skimmers with booms and described the role of booms instead, which did not gain credit.

(c) Candidates were asked to describe the impacts of an oil spill on marine mammals. While many understood that the oil would be toxic, a number of responses confused mammals with fish or birds, referring to oil coating gills or feathers. Such answers did not address the question and therefore did not gain credit.

Question 4

(a) This question invited candidates to link the absence of electricity with a consequence that could reduce life expectancy, such as food spoiling due to the lack of refrigeration. Responses that made this clear connection were credited.

(b) (i) The majority of candidates successfully calculated the mean percentage efficiency.

(ii) Many candidates offered at least one valid reason for the solar panels having a lower-than-expected efficiency, with the most frequent correct point being that sunlight is not constant.

(c) Candidates were asked to compare the electricity generated by solar power in 1992 and 2022. Many identified that solar electricity generation had increased, and several enhanced their answers by including comparative data to demonstrate this clearly.

(d) Many candidates recognised that biofuels are a renewable energy source and noted that they provide less energy than fossil fuels. Responses that specified their environmental benefits in more detail were able to gain full credit.

(e) This was a well-answered question, with most candidates identifying that organic or plant material is required for the formation of coal.

Question 5

(a) (i) Many candidates successfully calculated the percentage decrease in water use.

(ii) Candidates offered a range of ideas for why water conservation is important in Singapore. Responses that linked conservation to factors such as population growth or the limited supply of fresh water were credited.

(iii) Candidates used the meter readings in various ways to reach their answers.

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(b) Candidates were asked to present the data as a pie chart, and this skill was assessed using several criteria. These included placing the sectors in clockwise rank order, starting the largest sector at 'noon' (0°) and arranging the remaining sectors in descending rank. Accuracy in plotting was expected within a tolerance of ±1%, and a completed key matching the shading of each sector was also required. Regular practice with these steps can support candidates in further developing this graphical skill.

(c) (i) Many candidates named a desalination process. Candidates who also linked the process to the removal of salts to produce drinking water gained full credit.

(ii) Candidates suggested a variety of reasons for reducing electricity use during desalination.

(d) Many candidates identified at least one additional method of obtaining fresh water.

(e) (i) Many candidates identified the week at which the strategy was introduced.

(ii) Candidates compared the data trends for dengue fever in the two years. Many recognised that the number of cases was higher in 2020 than in 2019, and some enhanced their answers with comparative figures from specific weeks.

(iii) Most candidates recognised that covering water prevents certain forms of contamination.

(f) (i) Many candidates correctly calculated the range by selecting the highest and lowest values from the graph.

(ii) Almost all candidates identified the driest month.

(iii) The question asked candidates to link reduced water availability with decreased photosynthesis and therefore less glucose production. Responses that made this clear connection gained full credit.

Question 6

(a) This was a straightforward calculation, and many candidates successfully gave the answer.

(b) Many candidates demonstrated a clear understanding of the term subsistence farming.

(c) A range of ideas was presented. Some candidates linked global warming and rising temperatures with an increased likelihood of droughts.

(d) Candidates identified a variety of chemicals and described their effects on plant growth. Responses that named specific chemicals such as herbicides or fertilisers and explained their impact were able to access full credit.

(e) (i) Candidates offered several ideas about improving crop yields. Responses that focused on what the map could show farmers, such as soil quality or areas needing irrigation were credited.

(ii) Candidates showed good awareness of the benefits of using computer modelling to produce such a map. Many noted that it is faster, more efficient, and allows easy access to a wide range of data.

Question 7

(a) Most candidates recognised that the drinking water would experience some contamination from the cooking oil. Responses that focused on contamination rather than toxicity gained credit.

(b) This level-of-response question asked candidates to consider whether climate change is the main reason why people lack a source of clean water. Overall, responses were of a good standard. Many candidates outlined ways in which climate change can reduce the availability of clean water, while also considering additional contributing factors. Candidates who explored both sides of the argument and drew a clear, balanced conclusion based on their reasoning produced well-developed answers.

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ENVIRONMENTAL MANAGEMENT

Paper 0680/12
Theory

Key messages

Where a question requires a comparison between two items, candidates must make it clear which item they are referring to throughout their response.

Candidates should show their working for all mathematical calculations, as method marks may still be awarded even if a later error leads to an incorrect final answer.

When a question requires more than one example, each example provided must be clearly different and not a repeat of the same point.

Candidates should ensure that their response meets the requirements of the command word used in the question, such as explain or describe, as this indicates the level of detail and depth expected.

General comments

Stronger candidates were often able to include additional and specific detail in their responses, avoiding generalisations that can make answers too vague to be awarded credit.

The paper included some items that required direct recall from the syllabus, and performance on these was varied. For example, some candidates were able to state the meaning of the term ‘carrying capacity’ accurately, while others provided incomplete or incorrect definitions.

A recurring feature of this specification is the requirement for candidates to describe locations on a map, such as the distribution of volcanoes. A common weakness was limited ability to apply the points of the compass accurately, which resulted in some responses lacking clarity. Although candidates are not expected to identify specific countries, they are expected to use the names of continents confidently, as required in **Question 6(b)**.

There was evidence in many scripts of candidates planning their answers to the longer response questions, particularly the final six-mark extended writing task. This approach is beneficial as it supports the development of detailed and well-balanced responses that address all key aspects of the question and helps to avoid producing lengthy answers that do not meet the specific requirements.

Comments on specific questions

Section A

Question 1

(a) The introductory question required candidates to identify and name the three layers of the atmosphere in order to complete the diagram. One layer was provided to make the task more accessible. Candidates achieved this with varying levels of success; weaker candidates often identified one of the layers incorrectly as the ozone layer. Stronger candidates generally named all three layers accurately and in the correct sequence.

(b) This question proved more challenging for many candidates. While a significant number were able to identify the potential increased risk of cataracts or cancer in humans, fewer were able to explain

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the impact on vegetation. Responses often stated simply that plants would die, which was not sufficient to gain further credit, as a more detailed explanation was required.

Question 2

(a) The question specifically referred to fish, which therefore excluded this from the acceptable range of ocean resources that candidates could provide. A wide variety of appropriate ideas were credited; however, some responses were too vague, such as references to energy without specifying the type, which meant that further credit could not be awarded.

(b) This question was completed by most candidates, and a wide range of valid reasons for the presence of large numbers of fish on continental shelves was credited. The most common error was confusion between the physical characteristics of the location and how these benefit fish, and the effects of the El Niño Southern Oscillation (ENSO), which were not relevant to this question.

Question 3

(a) (i) Candidates were required to interpret a pie chart, and this was a skill that most demonstrated competently. There were relatively few incorrect responses, indicating that candidates were generally confident in handling this type of data presentation.

(ii) This part of the question was more challenging for many candidates. A number of candidates needed to read the question more carefully, as some provided examples that did not form part of the organic content required, which meant that these responses could not be credited.

(b) (i) A number of candidates were not able to correctly link the mineral particles to their relative size. The variation in responses suggests that this is not a topic with which many candidates were familiar.

(ii) The source of mineral particles in soil also proved challenging for many candidates. This led to a number of incorrect responses, and in some cases the answer was omitted altogether.

(iii) Most candidates were able to identify at least one difference between clay soil and sandy soil. In questions requiring a comparison, it is important that candidates clearly indicate which type of soil each characteristic refers to. Some responses were too vague to demonstrate secure understanding and therefore could not be fully credited.

Section B

Question 4

(a) (i) This question required candidates to interpret some unfamiliar data, in this case relating to the locations and characteristics of national parks. Most candidates were able to complete at least two of the statements correctly. The most challenging aspect was understanding the international boundary shown on the map and identifying the neighbouring country.

(ii) This calculation-based question proved challenging for a large proportion of candidates. Those who showed their working were able to gain credit for the correct application of numbers, even if their final answer contained an error. Many candidates could have gained further credit by including an appropriate unit with their response, as prompted on the answer line.

(iii) This graph-based question provided candidates with the plotted data. Stronger candidates completed the task confidently, following all the instructions given in the bullet points and therefore achieving full credit.

(b) (i) Where candidates showed their working for this percentage-change calculation, they were able to gain credit for a correct first step, even if a subsequent error led to an incorrect final answer.

(ii) This question required candidates to interpret information and draw conclusions. Responses that simply repeated statements from the stimulus material could not be awarded credit. As the command word was ‘suggest’, a broad range of plausible answers was accepted.

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(iii) Carrying capacity is a term included in the syllabus and should therefore be a direct recall of learned knowledge. Many candidates did not appear to be familiar with the term, which resulted in a number of incomplete or inaccurate responses.

(c) The topic of wildlife corridors was not well known across the cohort. Many candidates were able to use the diagram to identify that the corridor allowed tigers to access another national park, but they needed to develop their responses to explain how this would benefit the species. Stronger candidates provided this additional detail, often referring to concepts such as improvements to genetic diversity. However, many responses included incorrect information or did not provide the explanation required by the command word. A common misconception was that the wildlife corridor protects tigers from being hunted.

Question 5

(a) (i) Most candidates were able to interpret the diagram and successfully calculate the percentage of water sources classified as surface water and other sources.

(ii) Naming one additional source of fresh water proved challenging for many candidates. A common error was identifying a location of water underground rather than naming a valid source.

(iii) The command word for this question was 'explain', which required candidates to provide sufficient detail, such as outlining the source of the contamination of water, in order to gain credit. A wide range of different reasons was accepted.

(iv) This question required candidates to provide two distinct methods for producing safe drinking water. The most common response was boiling or distillation, but candidates were expected to offer two separate methods to gain full credit.

(b) Most candidates correctly identified the significantly larger volume of water used by a family in an urban area. Additional credit was awarded when candidates supported their answer with a specific example taken from the data.

(c) (i) Using the information provided in the table, most candidates found this question very accessible and correctly identified the village.

(ii) Most candidates understood the requirements of the question and correctly named the village where all families used the wells.

(iii) The command word for this question was 'suggest', meaning that a wide range of plausible reasons was acceptable and awarded credit. Common themes in successful responses included references to differences in rainfall levels and whether the water source was contaminated. As this was a comparison question, it was important for candidates to state clearly which source had more or less of the factor they were discussing.

(iv) Most candidates were able to explain that fresh water is a basic human need and provided a relevant example to support their response.

(v) Stronger candidates were able to provide three distinct reasons for the differences in access to safe drinking water. A relatively common error was the assumption that the urban area was located in a more economically developed country (MEDC), which indicated an incorrect reading of the question.

(d) The question required candidates to focus specifically on the environmental impact of dams, which narrowed the range of acceptable responses. Stronger candidates were able to identify and explain three distinct impacts, while weaker responses tended to be more generic and lacked sufficient detail to demonstrate how the issues described affected the environment.

Question 6

(a) This question required candidates to label the components of the Earth's structure. In most cases, the four terms provided were used appropriately. The most frequent error was the confusion between the oceanic crust and the continental crust.

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(b) Many candidates were able to describe the location of volcanoes accurately, making effective use of compass points. The inclusion of a north arrow on the map supported this skill. However, the frequent references to Africa indicated that some candidates would benefit from developing a stronger knowledge of world continents.

(c) For this more challenging question, the strongest candidates were able to clearly explain the relationship between earthquakes, volcanoes, and plate boundaries, with some responses demonstrating an impressive level of detail.

(d) Many candidates appeared well prepared for a question on this theme, providing responses that included a good range of strategies and enabling them to access all available credit. Others, however, needed to tailor their answers more closely to the specific scenario—particularly the strategies that could be implemented *before* an earthquake occurs. Strategies such as practice drills were credited, whereas responses referring to actions taken *after* an earthquake, such as evacuation, were not.

(e) The Richter scale appeared to be a less familiar topic for many candidates. This question required accurate interpretation of the diagram, as well as an understanding that the scale is logarithmic.

(f) The final question provided candidates with the opportunity to write at greater length and to draw upon concepts and ideas from across different areas of the syllabus. Candidates were encouraged to incorporate information from case studies completed during the course, and the question accommodated both a broad range of ideas or, alternatively, fewer points supported by more detailed explanation and examples.

The strongest responses presented a well-balanced and detailed argument that clearly supported the candidate's viewpoint. In contrast, weaker responses tended to lack depth and relied on only one or two undeveloped points.

It was evident that many candidates had practised this style of extended response question beforehand. Although the topic itself was unfamiliar, they demonstrated effective planning techniques prior to writing their answers. The published mark scheme for this question is intended to be indicative rather than exhaustive; a variety of alternative, relevant ideas were credited, as well as the use of specific examples to strengthen the response.

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ENVIRONMENTAL MANAGEMENT

Paper 0680/13
Theory

Key messages

It is important that candidates ensure the level of detail in their responses is directly linked to the scenario provided in the question, rather than relying on generic statements.

When completing mathematical calculations, candidates should show all working, as credit may still be awarded even if a later numerical error occurs.

To gain maximum credit in questions requiring multiple examples, candidates must provide examples that are clearly distinct from one another.

Responses should demonstrate a clear understanding of the differences between key concepts, including the enhanced greenhouse effect, ozone depletion, and the impacts of acid rain.

Drawing upon case study material completed during the course will strengthen candidates' answers, particularly for the six-mark extended-response question at the end of the paper.

General comments

The majority of candidates attempted all questions. This was especially noticeable in the mathematical items, where candidates could still receive credit for intermediate steps even if the final answer was incorrect. Wherever working was not shown, this opportunity for partial credit was lost.

There were several situations in which candidates would have benefited from using the command word, such as *explain*, to guide the level of detail required. Weaker responses often relied on generic statements that were too vague and did not provide sufficient development.

Some candidates also demonstrated uncertainty about key concepts, including the formation of smog and acid rain. Other areas that proved challenging included the pyramid of energy, the transmission of malaria, and the greenhouse effect.

Comments on specific questions

Section A

Question 1

(a) This introductory question required candidates to interpret part of the rock cycle. Most were able to identify the process as cooling or crystallisation.

(b) When candidates were unsure of the correct example for each rock type, they often listed more than one. This negated the correct response if a second, incorrect example was also provided.

(c) Drawing on syllabus knowledge, most candidates were able to give at least a partial description of how metamorphic rocks are formed. However, some potential credit was not awarded due to insufficient detail in the explanations.

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Question 2

(a) Many candidates were able to use the image effectively as stimulus material and demonstrated an understanding of the potential loss of topsoil or vegetation. A small number of candidates, however, misunderstood the purpose of the bunds.

(b) Candidates were generally confident in identifying other strategies for sustainable agriculture. Generic responses such as "irrigation" were not credited, as the question required a specific type to be named, for example trickle drip irrigation.

Question 3

(a) (i) Most candidates were able to correctly identify the process as photosynthesis.

(ii) Most responses correctly identified the orca as the tertiary consumer.

(iii) This part proved more challenging. Many candidates were unable to name the trophic levels, indicating a limited understanding of the pyramid of energy concept.

(b) Knowledge of the reasons for energy loss was not universal. Stronger candidates, who provided more detailed explanations, often achieved full credit. Some responses did not identify a valid method of energy loss, and there were frequent errors relating to the proportion of energy transferred, with some candidates citing 90% rather than 10%.

(c) Detailed explanations enabled candidates to achieve full credit on this question. Many were able to outline the impacts of oil spills; however, some responses needed to focus more on the impact on the pyramid of energy provided. References to birds were not credited, as they did not feature in the pyramid.

Question 4

(a) A clear majority of candidates demonstrated correct interpretation of the image. A small number, however, incorrectly identified one of the gases as methane, likely associating this with the cow.

(b) There were numerous errors in naming the substance that breaks down during respiration, indicating confusion between this process and photosynthesis.

Section B

Question 5

(a) (i) This question was very accessible, with most candidates recognising that they needed to comment on the overall trend rather than focus on a single year.

(ii) The majority understood the requirement to identify both the highest and lowest values and then calculate the range.

(iii) Many candidates were able to distinguish how a mean differs from a range. Stronger responses identified the influence of very high or very low numbers of wildfires on the mean, and some candidates noted the potential effect of an outlier or anomalous result.

(b) The impact of greenhouse gases was an area where many candidates showed limited understanding. In some cases, explanations were unclear, and in others, responses confused the greenhouse effect with the consequences of a hole in the ozone layer. Stronger candidates described the process in a logical sequence, sometimes providing additional detail about the gases involved.

(c) Most candidates were able to give relevant reasons why people may be forced to migrate. This topic appeared to be well understood across the cohort.

(d) A wide range of strategies to reduce the impact of climate change were creditworthy, including reducing the use of fossil fuels and implementing transport policies. To achieve full credit, candidates needed to provide three clearly distinct examples.

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Question 6

(a) This question required candidates to interpret a simple water cycle diagram. Most demonstrated some understanding, although infiltration proved to be the most challenging process to identify.

(b) (i) To gain credit, responses needed to refer directly to the image provided. Many candidates recognised the risk of faeces entering the water supply and the potential for soil to contaminate the water.

(ii) A wide range of possible answers was credited. Most candidates identified factors such as the availability of infrastructure and the capacity to treat water or sewage.

(c) (i) Using the stimulus material, most candidates successfully identified the organism as a mosquito.

(ii) Although the mosquito was correctly identified in the previous part, many candidates struggled to explain how malaria is transmitted. Full credit required reference to both the mosquito biting a human and the transfer of the parasite.

(iii) Many candidates did not recognise that the water collected in the containers would provide breeding sites for mosquitoes.

(iv) Most candidates were able to name at least two distinct methods a person could use to help prevent the spread of malaria. The question required examples of actions that an individual could take, so large-scale measures such as draining swamps were not credited.

(d) (i) Many candidates found it difficult to describe the distribution of malaria on the world map provided. Descriptions should refer to direction terms such as north and south rather than using expressions like “above” or “below” specific features, for example the Tropic of Cancer. While some responses named specific countries, this is not an expected skill for this specification. Candidates are, however, expected to be able to name the continents.

(ii) This question was more challenging. Candidates needed to provide some detail on how the area affected by malaria is expected to change, rather than simply stating that a difference will occur.

Question 7

(a) (i) Naming a substance that causes smog proved difficult for many candidates, and a large number were unable to provide an appropriate example.

(ii) This was a very challenging question for many. It was clear that the process was not well understood, and a number of explanations focused on the presence of valleys, even though these were not visible in the image provided. Many candidates gained some credit for mentioning temperature inversion, but further detail was required to describe the general process of smog formation.

(b) (i) Candidates should complete pie charts using the format recommended in the syllabus guidelines. Plotting errors were relatively few, but segments were often not drawn in clockwise rank order, which limited the credit available. Most responses included a key; however, this should be shaded or patterned to match the corresponding sectors rather than represented by numbers alone.

(ii) A variety of ways to reduce the burning of domestic waste were credited. Few candidates suggested landfill, while many identified the need or opportunity to recycle waste.

Question 8

(a) (i) This was a very accessible question, and the majority of candidates achieved full credit.

(ii) Determining the ratio proved to be a mathematical skill that many candidates were less familiar with. Stronger responses were generally able to simplify the ratio correctly. A small number of candidates reversed the ratio and therefore did not receive credit.

(iii) Many candidates successfully identified two reasons for the change in coal extraction. Some responses, however, were vague, with increased demand only implied rather than clearly stated.

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(b) The formation of coal was a familiar topic for most candidates and was generally well understood. A few responses attempted to describe the formation of rock more broadly rather than focusing on coal specifically.

(c) Most candidates recognised that an enhanced scale would improve accuracy, and many were able to achieve full credit.

(d) (i) The majority of candidates understood that the tree would affect the accurate collection of precipitation. Stronger responses developed this further by noting the potential influence of debris on the measurement.

(ii) Most candidates correctly identified the anomalous result. Credit was also awarded to those who gave the pH value alone.

(e) The final question on the paper requires candidates to produce a more extended response. It allows them to draw on a range of concepts from across the syllabus and, where appropriate, to support their points with evidence from case studies completed during the course. The mark scheme for this question is therefore indicative rather than exhaustive.

Although many candidates showed a general understanding of acid rain, a large number of responses were generic and lacked detail. While candidates correctly focused on pollution from the burning of fuels, this was rarely developed to include points such as the types of gases produced or the impact of alternative fuels. Natural causes, such as volcanic activity, were also often omitted.

The strongest candidates produced evidence of planning before writing their responses, which enabled them to present a balanced and well-structured argument.

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ENVIRONMENTAL MANAGEMENT

Paper 0680/21
Management in Context

Key messages

Candidates are not required to repeat the question in their answer, allowing them to make best use of the examination time.

Stronger candidates make effective use of the mark allocation, recognising that it indicates how many separate points are required in a response.

Using clear, concise points helps candidates ensure they address enough relevant ideas in their answers.

Diagrams, charts and graphs should be drawn with a sharp pencil and a ruler because errors are much more difficult to correct when using a pen.

Higher-performing candidates read each question carefully so that their response directly addresses what has been asked.

Candidates should always show their workings for calculation questions, as credit may still be awarded for correct workings even when the final answer is incorrect.

It is important that candidates follow the rubric of the question; for instance, if three reasons are requested, they should not provide a fourth, as an incorrect additional point may contradict earlier correct ones.

Most candidates were unfamiliar with the terms *extractive reserve* and *urbanisation*. They should ensure they understand all key terms in the syllabus and learn their definitions.

General comments

Candidates should avoid vague statements such as ‘impacts’, ‘damages’, ‘causes harm’, ‘causes pollution’, ‘affects the environment’, ‘reduces resources’, ‘causes death’ or ‘environmentally-friendly’. These expressions are too unspecific and are unlikely to gain credit.

Terms with precise scientific meanings, such as *accurate*, *reliable* or *valid*, should only be used when they are correct for the context of the answer.

Many candidates would benefit from greater experience with fieldwork or laboratory work. Systematic sampling was not well understood, and several candidates showed limited familiarity with describing fieldwork methods. This includes knowing how to scale up from a small sample to a wider study area. Since this question paper assesses environmental management in context, candidates must understand how data is collected, how fieldwork is conducted and how results are presented and analysed.

Candidates found plotting the bar chart challenging, and many would benefit from further practice. Rulers should always be used to draw the straight edges of bars.

The points of the compass were not known by all candidates.

Incorrect rounding was occasionally seen. All candidates should ensure they are familiar with the mathematical requirements of the syllabus.

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Comments on specific questions

Question 1

(a) (i) Most candidates were able to calculate the percentage of the population of the Netherlands that lived in Amsterdam in 2023.

(ii) The population density was often correctly calculated, although some candidates made rounding or truncation errors. Several also found the unit more challenging, with a common mistake being the omission of *people* and giving only km².

(b) (i) Many candidates correctly determined the number of years.

(ii) Those who recognised what the question required were often successful. Some candidates stated only one point, either *overall increase* or *fluctuates*, rather than both. Others focused on immigration and emigration rather than on migration balance, which the question required.

(c) (i) Good responses clearly labelled both axes, selected an appropriate linear scale that used at least half the grid, and plotted the bars accurately with equal widths using a ruler. Many candidates found plotting the bar chart challenging and would benefit from further practice.

(ii) Most candidates were able to give two reasons for migration, although some stated *jobs*, which was not credited as the question required reasons other than employment.

(d) The majority of candidates did not know the definition of *urbanisation*.

(e) Candidates often gave a basic statement that removing vegetation increases surface run-off. Fewer explained the effects on interception and infiltration, and very few described the impact of soil erosion.

Question 2

(a) (i) Candidates who performed less well simply stated that water was contaminated without explaining what it was contaminated with. Stronger responses referred to contamination with bacteria and named an infectious disease such as cholera. The strongest answers also described how overcrowding in temporary shelters after flooding can lead to poor sanitation, increasing the risk of water contamination with sewage.

(ii) Many candidates were able to state three impacts of flooding, although some did not recognise that the impacts needed to be other than loss of life or water-related diseases.

(iii) This sentence-completion question on storm hydrographs was poorly answered. The unit for river discharge was often incorrect, and through-flow and groundwater flow were frequently reversed. Occasionally, precipitation was confused with evaporation.

(b) Some good descriptions were seen of what the map showed about the height of land in the Netherlands, and most responses correctly used compass points. A common error, however, was to confuse east and west.

(c) Most candidates identified ‘36’, although some needed to include ‘million’ in their answer.

(d) Many candidates suggested that sea-level rise or climate change would require the dam to be higher. Good responses also noted that the dam was more than ninety years old and therefore likely to require maintenance.

(e) (i) The majority were able to calculate the total mass of blocks used, occasionally, answers were a power of ten out.

(ii) Candidates found this question challenging and often could not suggest reasons why using less concrete is beneficial. Good responses referred to the reduced need for raw materials such as lime and highlighted that this would result in less use of fossil fuels and lower carbon dioxide emissions. Some candidates wrote ‘cheaper’ without qualifying what this referred to.

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(f) (i) The most common suggestion for why people might oppose the construction of NEED was an economic impact such as high build cost. Candidates should always qualify 'cost' by explaining what it relates to; simply stating the figure of 500 billion euros repeated the information given and did not gain credit without further detail. Many candidates recognised that shipping routes would be disrupted and that fishing grounds would be lost. Few provided a full response, but stronger candidates were guided by the mark allocation and gave four developed points for this four-mark question.

(ii) Weaker responses copied the information in the question and stated 'so that countries cooperate', which did not add any original explanation. Good responses pointed out that NEED crosses the boundaries of more than one country or that the high cost could be shared between multiple countries.

Question 3

(a) Candidates found this question challenging. Many listed properties of clay, sand and silt without referring to the focus of the question, which was how using these materials from the bottom of the lake was of benefit when making the islands. Good responses recognised that there was less stated cost, such as reduced cost of extracting new materials, although simply stating 'cost' without specifying what it referred to was not sufficient. Some candidates recognised that silt can make the land fertile, and a few noted that removing material from the bottom of the lake increased the depth of the lake. The best responses recognised that this was a sustainable practice.

(b) (i) Some candidates found it difficult to state their reasoning clearly. For example, 'less food chain disruption' does not explain how this is influenced by presence or absence of people. Stronger responses included ideas such as 'less risk of introducing diseases or unwanted species' and 'no risk of hunting'.

(ii) Good answers included points such as 'introducing captive breeding programmes' rather than simply stating 'animals breed'. The strongest responses recognised that species could be returned to their natural environment after successful breeding. Many candidates stated that zoos provided resources such as food, and these answers often listed several resources. Weaker candidates needed to read the question more carefully, as they often focused on general benefits of zoos rather than how they can increase biodiversity.

(iii) The majority of candidates were able to suggest one reason why some people are against zoos.

(iv) This was poorly answered, and most candidates were not familiar with the term *extractive reserve*.

(c) Candidates found it challenging to correctly explain how wind power generates electricity. Some were able to state that wind rotates turbines, but this was often poorly expressed. Few candidates knew that the turbines are connected to a rotor, shaft or gears, which then cause a generator to rotate.

(d) (i) Many candidates did not know the difference between systematic and random sampling, and confused descriptions were common.

(ii) Weaker responses vaguely referred to accuracy or precision, but these terms required a clear explanation of how the method is more accurate or precise. The most common correct responses stated that aerial photographs are less labour-intensive and can be counted at any time. Overall, candidates found it difficult to give three advantages.

(iii) A common non-creditworthy response was to suggest that a random method would be an improvement. Weaker answers simply stated 'repeat' without explaining what should be repeated. Good examples included 'repeat on more than one day' or 'repeat at different times of the year'.

(iv) Candidates found this a challenging question and many were not able to clearly describe how to estimate the total number of pied avocets. Candidates are advised to be familiar with describing fieldwork methods, including how to scale up from a small sample to a larger area. Good responses calculated a mean number of birds in each grid and multiplied this by the total number of grids into which the island was divided.

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(v) Many candidates gave a simple explanation such as 'pitfall traps might harm pied avocets', but fewer gave more than one idea. Stronger responses recognised that pitfall traps are only suitable for crawling insects and that birds are able to fly out of them.

Question 4

(a) (i) Most candidates were able to give two benefits of nuclear power, though it was less common to see three correct benefits. A frequent error was to state that nuclear power is renewable.

(ii) Cost was a commonly stated limitation of nuclear power but was rarely qualified, for example as the cost of building or maintaining the reactor. Some candidates stated that nuclear power 'was dangerous', which was too vague; stronger responses referred specifically to the risk of a radiation leak.

(iii) The majority of candidates could suggest two energy resources in the 'other' group. Some incorrectly repeated energy resources already listed in the table, such as biomass or solar.

(iv) Candidates found it challenging to use the information in the table to support their answers. Weak responses copied text directly from the question, for example stating that '55% will be difficult to achieve,' without further explanation.

(b) (i) Many candidates were familiar with ratios, however, a few candidates reversed the order and gave exported : imported.

(ii) Candidates generally performed well in suggesting why countries export electricity. A minority confused export with import and answered in terms of energy being required rather than supplied.

Question 5

(a) Some strong answers were seen, with candidates making good use of the provided image to suggest two reasons why the road system encourages the use of bicycles.

(b) It was common to see the same point repeated, such as 'use public transport' and 'use trains'. Some responses referred to the use of bicycles even though the question asked for three *other* transport policies.

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ENVIRONMENTAL MANAGEMENT

Paper 0680/22
Management in Context

Key messages

Large numbers of candidates performed very well across this paper, demonstrating strong knowledge and understanding and handling the required skills with a high level of competence. A minority performed less well, often due to difficulties in interpreting questions correctly or in producing detailed and accurate responses. Most candidates were able to attempt all parts of the questions.

Some candidates would benefit from reading questions more carefully, taking time to consider the command words as well as the context and focus of each question. Command words such as *describe* and *explain* have specific meanings. Where the command word is *describe*, explanations are not required and cannot be credited, so candidates should avoid using time to provide them.

Responses should be of an appropriate length, guided by both the space provided in the answer booklet and the mark allocation for each question.

Subject-specific definitions should be learnt so that candidates can recall and use them accurately. When defining a term, candidates should avoid repeating any part of the word itself and instead use different wording that conveys the correct meaning.

When describing a trend on a graph, candidates should focus on identifying clear patterns or relationships, using terms such as *increase*, *decrease*, *constant*, *plateau* and *fluctuate* where appropriate.

When describing the distribution of a feature on a map, such as settlements, candidates should refer, where relevant, to scale, direction and other mapped features.

Candidates should show their workings for all calculations, even when this is not explicitly required, as credit may be awarded for a correct method even if the final answer is not accurate.

Candidates should provide only one response to questions requiring a single answer. If more than one answer is given and one is incorrect, the mark cannot be awarded.

General comments

Overall, candidates generally produced responses of a good standard across the paper. Rubric errors were very rare, and the overall standard was positive, with some excellent responses to individual questions and to the paper as a whole.

Candidates should continue to practise interpreting and using a range of geographical resources, including graphs, bar charts, pie charts, data tables, photographs, diagrams and maps. Graph-completion tasks should be carried out with care, using a ruler and a sharp pencil to ensure precision. When completing a line graph, axes should be labelled accurately using information from the data source, and the graph should make full use of the space provided. Data points should be plotted in pencil and joined using a ruler.

Candidates should aim to answer with precision and clarity, avoiding vague terms or unqualified statements. Such statements should always be expanded or explained. Listing without providing full explanations should also be avoided, and general responses such as ‘pollution’ should be developed further, for example by referring to ‘noise pollution’. Compass directions should be used to describe locations, such as the reference to the Arctic Circle in **Question 1(d)(i)**, rather than less specific terms such as ‘above’ or ‘below’.

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Comments on specific questions

Question 1

(a) (i) Candidates were required to plot a line graph and join the points with straight lines. While the majority selected the correct graph type, some candidates experienced difficulties with choosing an appropriate scale. A few omitted to label the axes fully, and in some cases the dependent variable was incorrectly plotted on the *x*-axis. Another common error was drawing a line of best fit instead of joining the points sequentially.

(ii) The vast majority of candidates correctly described the trend, noting not only that population increased but also that it stabilised after 1990. Weaker responses simply stated that the population increased. Dates were not required but, when used appropriately, often strengthened responses.

(b) (i) Most candidates understood that *migration* refers to the movement of people from one place to another. *Emigration* and *immigration* were also acceptable terms that some candidates used.

(ii) Candidates were required to consider how the climate, economy and education system in Greenland could lead to out-migration. Credit was also available for recognising how these factors might act as pull factors to other destinations. The impact of climate was generally addressed more effectively than the economy, as successful responses considered how economic conditions affected employment opportunities. Some responses were vague, for example stating that the economy was 'in decline' or that there were 'fewer exports' without explaining how this would lead to out-migration. Many candidates gained credit for education by referring to limited opportunities or a shortage of educational facilities.

(c) (i) The vast majority of candidates ranked the countries correctly.

(ii) Many candidates gave the correct percentage.

(d) (i) Using a map of Greenland, candidates were required to describe the distribution of settlements. Generally, responses outlined the overall pattern effectively. The strongest answers described the broad pattern first before referring to specific features from the resource. Some candidates confused east and west and needed to make full use of the lines of latitude and the north arrow. Others used non-geographical terms such as 'above', 'below', 'left' and 'right', which were not creditworthy. A minority explained the pattern rather than describing the distribution shown.

(ii) Candidates engaged positively with this question, and many gained full credit. The most common valid responses were travelling by plane and travelling by boat. Weaker responses that referred to 'ports' or 'airports' did not gain credit, as these are facilities rather than methods of transport.

(iii) Candidates were required to use the map scale to estimate the percentage of Greenland occupied by the national park. A sizeable minority found this challenging and incorrectly estimated the percentage as 30%.

(e) (i) Some candidates found this question challenging. While most were able to calculate the total annual precipitation for the north of Greenland, many did not calculate the temperature range for the south correctly. Although the temperature range for the north was given, some weaker responses were uncertain about how to calculate a range or were unsure whether maximum and minimum values should be combined or compared.

(ii) Most candidates successfully identified May, June and July as the summer months in Greenland. The most common error was selecting August as a summer month. In such cases, candidates had not made effective use of the information provided, including the hours of daylight shown in the climate data.

(iii) The majority of candidates gained full credit for explaining why people in northern Greenland use large amounts of electricity. Most responses correctly linked very low temperatures to the need for heating. Weaker answers stated only that it was 'cold' without explaining why this would increase electricity use.

(iv) Responses to this question were generally strong. Many candidates demonstrated clear understanding of strategies used in greenhouses to increase crop production and effectively linked

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these strategies to conditions that optimise photosynthesis. Nearly all candidates referred to controlling temperature, water and light. Some added valid points about protection from animals or extreme weather. A small minority confused the question and wrote about greenhouse gases increasing production; however, credit was given for correct references to controlling carbon dioxide.

(f) (i) Most candidates were familiar with food webs. A common misconception was that arrows show which organism eats another, rather than representing the direction of energy flow.

(ii) Trophic levels were generally well understood. Most candidates correctly identified the trophic levels as phytoplankton, zooplankton, fish, seal and polar bear, and used arrows in the correct direction.

(iii) Most candidates correctly identified the green pigment that captures light energy.

(iv) Most candidates were able to complete the word equation for photosynthesis correctly. The most common error was reversing the reactants and products.

(v) Some candidates found this question challenging. Strong responses used accurate terminology, while weaker answers used vague expressions such as 'pollen egg' for pollen, 'male part of the flower' for anther and 'female part of the flower' for stigma.

(g) (i) Most candidates placed the statements in the correct order.

(ii) Responses indicated that some candidates were unfamiliar with sampling methods, resulting in confusion between random and systematic sampling. A common error was spelling *systematic* as 'systemic'.

(iii) The majority of candidates correctly calculated the number of flowering plants. A common error was giving the answer as 4 000 000.

Question 2

(a) (i) This question assessed understanding of how HEP is used to generate electricity. The majority of candidates used the diagram effectively and demonstrated sound knowledge of the process. Stronger responses linked the movement of water from height to the turning of a turbine, which in turn drives a generator to convert kinetic energy into electricity. These candidates used accurate technical terminology and described the full sequence clearly. Weaker responses tended to describe the diagram without explanation. A common misconception was that the water needed to be converted to steam to turn the turbine, which is not the case in this system. Some candidates referred to water movement without mentioning height, while others did not use appropriate terms to describe the rotational movement of the turbine or blades.

(ii) Few candidates were able to describe permafrost correctly. Common misconceptions included describing it as a layer within a mountain, a sheet of ice, or a frozen forest. The term *frozen ground* alone was considered too vague for credit.

(iii) Many candidates suggested three valid reasons why the HEP station was automated, with a large proportion gaining full credit. Common correct points included reducing labour costs, compensating for a limited workforce and ensuring continuous operation.

(iv) Many candidates understood the question and provided well-developed explanations of why people in Greenland were in favour of the HEP station. Frequent credited points were that HEP is renewable, sustainable and does not emit greenhouse gases or cause acid rain.

(v) Most candidates correctly suggested ways people can use energy efficiently at home, such as using energy-efficient appliances, insulating homes and turning off lights. A small minority misinterpreted the question and discussed energy-efficient transport instead.

(b) Candidates showed a good understanding of the limitations of relying on solar energy for electricity generation. Many responses referred to weather dependency, high maintenance and battery costs, and the need for extensive land area. Credit was not given for stating that solar panels are expensive to build, as this was mentioned in the question.

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(c) Many candidates answered this question in terms of the general advantages of wind power rather than focusing on why the government of Greenland might wish to build wind turbines. Credit was awarded for noting that wind power does not produce carbon dioxide emissions and that wind is renewable and sustainable. Some candidates also gained credit for stating that wind power does not release sulfur dioxide (SO_2) or nitrogen oxides (NO_x), preventing acid rain. The absence of particulate emissions was also accepted and could have been developed with reference to reduced respiratory illness. A few candidates referred to Greenland being windy.

(d) Suggestions for why Greenland does not have geothermal power stations were often vague. The strongest responses explained that Greenland lacks active volcanoes or that it is too difficult to access hot rocks deep underground.

(e) Candidates were required to name one non-renewable energy source that is not a fossil fuel. Responses were mixed. Many candidates incorrectly stated coal, petroleum or natural gas. *Uranium* was also a frequent but incorrect answer, as it must be processed before it becomes a usable energy resource.

Question 3

(a) (i) This question was very accessible, and most candidates were able to suggest a valid reason why the mines were located close to the coast.

(ii) Most candidates made effective use of both the map and the table to identify correctly the two mines and the material extracted in 2022.

(iii) A wide variety of responses was seen. Candidates were required to tick the boxes that described an environmental impact assessment, limiting their selection to three boxes only. Any additional boxes ticked negated correct answers.

(b) The majority of candidates demonstrated a sound understanding of the limitations of sampling methods, and most gained full credit. The most common error was assuming that the process would be time-consuming.

(c) Candidates generally performed very well, with many gaining full credit. All valid suggestions from the mark scheme appeared in responses. Where marks were lost, it was usually because candidates omitted reference to the magma crystallising, solidifying or hardening.

(d) Most candidates showed clear understanding of strategies for the sustainable use of rocks and minerals. Many responses correctly identified increasing efficiency in extraction and use, and stronger answers discussed the use of alternatives. Weaker responses referred to legislation but did not explain what the legislation would achieve. A small minority misinterpreted the question and described uses of rocks and minerals, such as in construction or road building. These responses did not address the question and did not gain credit.

(e) Overall, candidates responded well and were generally able to suggest at least one reason why people in Greenland should be concerned about mercury in water. Bioaccumulation and biomagnification were common correct points, as were impacts on human activity and human health. Common errors included references to eutrophication or waterborne diseases. Responses such as ‘killing wildlife’, ‘death’ or ‘harmful to health’ were too vague and needed further explanation. Mercury poisoning was credited, but simply stating that mercury is toxic was not, as this repeated information provided in the question.

Question 4

(a) All candidates were able to state two negative environmental impacts of melting ice sheets with confidence. The most commonly cited impacts were sea level rise, flooding, loss of habitat and loss of biodiversity. A minority did not read the question carefully and gave responses such as loss of human life or destruction of property, which were not credited as these are social rather than environmental impacts.

(b) Candidates generally answered this question well, with many providing detailed explanations of how melting ice sheets and glaciers could benefit Greenland’s economy. The most frequently credited points included increased land suitable for agriculture, settlements and infrastructure, and greater

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access to minerals, making mining more feasible. Some candidates also referred to the potential for increased HEP production.

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ENVIRONMENTAL MANAGEMENT

Paper 0680/23
Management in Context

Key messages

A clear understanding of the command words *describe*, *explain*, *state* and *suggest* is essential, as each requires a different style and depth of response.

Careful reading of the question instructions helps ensure responses address exactly what is being asked.

Showing working in calculation questions is beneficial, as method marks may be awarded even when the final answer is incorrect.

Accurate graph work is supported by using a sharp pencil and a ruler, especially when joining points on line graphs.

The mark allocation and number of answer lines provide useful guidance on how much detail to include.

When numerical data is provided, making effective use of it can help strengthen responses.

Learning and recalling key definitions accurately remains important for achieving full credit.

General comments

This paper invited candidates to consider environmental issues and methods of gathering and interpreting data in the context of a single country. Many candidates engaged well with the source material and made effective use of the information provided, and their written responses were generally clear enough for credit to be awarded. A minority found some of the mathematical and graphical questions more challenging.

Candidates were able to complete the paper comfortably within the time available. Working through past papers is a useful way for candidates to become familiar with the style of questions and to learn how to make the most effective use of the information provided for each task.

Comments on specific questions

Question 1

(a) (i) Most candidates correctly calculated the number of working-age people in 2023.

(ii) Candidates were asked to label the axis of the population pyramid and plot data points for both males and females. The axis label was usually correct; however, some candidates did not plot the female percentage accurately.

(b) Most candidates described at least some impacts of poverty on population size. A minority provided general statements about poverty without linking these to population size. A wide range of valid points was seen overall.

(c) (i) The majority of candidates chose a sensible scale that allowed the taller bars to occupy more than half of the available grid. Plotting and labelling errors were rare.

(ii) Most candidates selected the correct numerical answer.

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(d) (i) Most candidates correctly identified the appropriate years from the information given. A small minority needed to study the data more carefully, as some incorrect years were chosen.

(ii) Many candidates calculated the percentage increase correctly. A significant number, however, lost marks by not giving the answer to one decimal place, as required.

(e) This question proved challenging for many candidates. Some described mining in general terms without referring specifically to e-waste. A minority provided valid reasons why it would be too difficult to recover gold from e-waste.

(f) Nearly all candidates correctly identified the photograph as showing a surface mine.

(g) (i) Candidates were asked to describe the process of bioaccumulation. Some responses covered enough key points to earn full credit, while many gained partial credit for describing some of the stages. A few responses were very vague and did not gain credit.

(ii) Many candidates found this question difficult to answer at the required level. There are several environmental issues associated with plastic waste beyond litter, and stronger responses demonstrated this with more developed suggestions.

(iii) Most candidates gave a sensible reason why river contamination from mining may continue in the future. The most common response was that the mining company would continue paying the fine rather than changing its practices.

(h) (i) Most candidates produced a table for the questionnaire results that gained full credit.

(ii) Describing a clear method for random or systematic sampling proved difficult for many candidates. Stronger candidates provided effective descriptions, but the majority gave answers that were too vague.

(i) Most candidates identified at least one way a National Park can help conserve biodiversity. A small number gave answers relating to captive breeding programmes, which did not address the question and therefore were not credited.

Question 2

(a) (i) Most candidates provided a partial description of how electricity can be generated from a hydro-electric dam. Stronger responses recognised that the generator must rotate or spin, rather than be ‘turned on’, in order to convert kinetic energy into electrical energy.

(ii) Most candidates identified a sensible benefit of exporting electricity.

(b) Many candidates correctly suggested that demand for electricity would be low because the population in this region of the country is small.

(c) Most candidates were able to give one or two economic benefits of constructing a dam.

(d) Most candidates successfully gave two impacts of flooding on agricultural land. Weaker responses were vague, for example stating only that ‘the soil turns to mud’.

(e) Nearly all candidates accurately identified three changes in electricity generation from the graphical information provided.

Question 3

(a) (i) Many candidates described the impacts of using insecticides effectively. A few responses suggested that insecticides would damage the crop plants themselves; this was not credited.

(ii) Candidates were asked to suggest why controlling a pest through co-operation across three countries was likely to be successful. This proved challenging for many, and only the stronger responses provided a valid explanation.

(b) (i) Nearly all candidates correctly identified the year with the highest yield.

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(ii) Nearly all candidates stated the highest yield accurately.

(iii) Candidates found it difficult to describe the benefit of using the overall trend in data rather than focusing on individual data points. Many simply described rises and falls on the graph instead of identifying the long-term increase in cotton yield over time.

(iv) Most candidates identified at least two ways farmers could increase cotton yield, and a wide range of creditworthy suggestions was seen regularly.

Question 4

(a) Most candidates described at least some economic impacts of a reduction in soybean production, and the effect of supply and demand was usually clearly explained.

(b) (i) A small number of candidates gained credit by describing drought as being caused by prolonged high pressure in the atmosphere.

(ii) Candidates were asked to describe how the impacts of drought can be managed. A small number of strong responses were seen, but many candidates either described drought conditions instead of management strategies or did not attempt the question.

Question 5

(a) (i) Candidates are expected to understand how to use the fieldwork methods specified in the syllabus. This question asked how to build and use a pitfall trap. Only a small number of candidates were able to give sufficiently complete answers to gain credit, and many responses were too incomplete to be awarded marks.

(ii) Many candidates were able to write two valid conclusions from the survey data provided. A small number needed to make it clear that there is a difference between the number of individuals and the number of species.

(iii) Many candidates suggested one way the survey could be improved, and a small number of responses gained full credit.

(b) (i) There were many correct calculations, with the answer correctly.

(ii) Most candidates understood why the mean number of beetles must be expressed as a whole number.

(c) (i) The process of pollination was often not clearly described.

(ii) Most candidates were able to use the data provided to identify when the beetles were first protected and to give a supporting reason.

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