

ENVIRONMENTAL MANAGEMENT

Paper 5014/12 Theory

Key messages

Candidates should use precise language in their responses, such as explaining the reasons for an organism's death rather than simply stating that it has died.

When a question requires the annotation of a map or diagram, candidates must ensure that these annotations are clear and adhere to the instructions provided.

When creating bar charts, it is important to ensure they are correctly oriented and that the bars are of equal width.

Gaining experience in sampling populations and interpreting data are valuable skills for this qualification.

General comments

Candidates were generally well-prepared for this paper, demonstrating knowledge across most subject areas. Most candidates used the correct equipment for the graph question, such as a ruler and pencil. While some weaker candidates struggled with the correct orientation of the axes for the bar chart. There were few instances of candidates omitting questions. Most candidates showed their mathematical workings, allowing intermediate stages in calculations to be awarded credit even if there was a subsequent error.

Almost all candidates answered the six-mark level of response question, **Question 9(c)**. Some responses showed evidence of planning and an understanding of the need for balanced answers, though some lacked a clear conclusion. The strongest responses demonstrated viewpoints supported by relevant examples and considered several issues impacting the use of fossil fuels.

Candidates should avoid using terms like 'above' and 'below' to describe locations on a map. Similarly, command words in questions such as 'explain' require more than a basic statement. Several candidates needed to take greater care to provide comparative answers when prompted, rather than focusing on the details of one item.

Some aspects of the syllabus proved challenging for many, particularly drawing warm and cold currents on the map. Few candidates drew their lines in a clockwise cyclical manner while also identifying the direction of travel of the currents.

The design of pitfall traps and the interpretation of collected data were general weaknesses across the cohort.

In **Question 4**, candidates were required to apply their knowledge of photosynthesis and respiration to an unfamiliar situation, which proved challenging for many, as did understanding the implications of light pollution on animal behaviour.

Overall, the cohort demonstrated a good understanding of rock formation and were able to use the photograph to identify the type of mining taking place.

Comments on specific questions

Section A

Question 1

- (a) Candidates were required to interpret the rock cycle and name the three types of rocks. Most named the three types, in a few instances there was confusion between metamorphic and igneous rocks.
- (b) Many candidates were correct in identifying marble as a metamorphic rock and were able to do so even if they had misinterpreted the rock cycle in **Question 1(a)**.
- (c) (i) Almost all candidates could identify the type of mining shown in the photograph. A broad range of terms were credited if they described the extraction correctly.
(ii) This question proved to be more challenging, as most strong responses merely stated examples from the syllabus content. Common errors included focusing on the impacts of rock extraction rather than the factors influencing the decision to extract.

Question 2

- (a) The majority of candidates were able to interpret the diagram correctly and circle the boundary as being a conservative one.
- (b) More challenging, some candidates provided a description of how a volcano forms rather than addressing the question posed. As a result, they did not perform well on this question.
- (c) Many candidates correctly identified the risk of earthquakes within the scenario described.

Question 3

- (a) Two ideas could be credited for this question, one the identification that tropical cyclones occur over water and secondly the latitudes at which this is likely to occur. Generally, this was answered well by most candidates who were able to apply their learnt statement to the map provided.
- (b) Most candidates were able to provide creditworthy information relating to the way in which a tropical cyclone increases water-related diseases. Where credit was limited, this was often due to a lack of sufficient detail within the response or a number of misconceptions, the most common being that the cyclone brought the diseases to the area.
- (c) Elements of a disaster plan were generally well understood. The need for food and medical supplies were common features of many answers.
- (d) Many responses did not fully provide the reasons why monitoring will be beneficial, often identifying that the population would know that the cyclone was coming but they then needed to develop their answer further, for example, including a statement such as 'so that evacuation can take place'.

Section B

Question 4

- (a) This question required the application of the candidate's knowledge to an unfamiliar situation and proved challenging for many, although the strongest candidates were able to provide clear and accurate answers. Many misinterpreted and linked the algae to the issue of eutrophication instead of the correct answer that as producers, algae are able to photosynthesise. Some responses gave a good account of the process of photosynthesis in algae and needed to go on to relate their answer to the oxygen concentration of the lake. Similarly, there was confusion relating to the impact of night hours on the oxygen concentration of the lake.
- (b) (i) Stronger candidates understood the reasons why the frogs were more active at night and identified the risk of predation; weaker responses focused more on the risk to the frogs' eyesight.

- (ii) Many answers to this question were vague, a common misconception was to focus on the impact of the growth of the frog population rather than the growth rate of the frog.
- (c) Many candidates understood the uses of artificial light within the urban environment; some needed to address the question fully by stating the effect that urbanisation would have on light levels.
- (d) A very accessible question, most candidates correctly interpreted the data in the graph to identify low-pressure sodium.

Question 5

- (a) As with similar questions describing locations, the most successful candidates were those who were able to provide clear descriptions of the information presented. Many identified the location of the specific zones and their proximity to the Californian coast, although some were confused between the plastic density and the total mass of plastic in a zone.
- (b)(i) There was a general confidence within the cohort regarding the plotting of the bar chart data. Most selected an appropriate scale and plotted the data accurately. There were a few instances of the incorrect application of axes whilst the most common error was missing labels on axes. Most responses were awarded credit for drawing bars of equal width. The vast majority of candidates used a ruler and pencil that allowed errors to be rectified more easily and clearly.
- (ii) Most candidates correctly completed the calculation using the data presented to achieve the answer of 21%.
- (iii) The use of the term 'trillion' within this question did not prove to be a great distractor to this cohort, many successfully completed the calculation to get the answer of 0.14 trillion.
- (c) Most candidates provided a response to this question, and most gained some credit, typically for successfully stating the impact on the fishing industry. Some responses relating to the impact on marine animals were too vague; where death was stated, it was expected that a reason for the death was included to provide more detail.
- (d) The stronger candidates were able to achieve full credit here. Many responses needed to identify that the colder currents originate from the North in the Northern hemisphere and similarly the point of origin of the warmer currents. A very few candidates remembered that currents typically move in a circular motion.

Question 6

- (a) The majority of candidates were able to suggest suitable alternative techniques to reduce soil erosion on this broadly open, level site.
- (b)(i) The concept of crop rotation was identified by most candidates within this cohort.
- (ii) There were some strong explanations of how crop rotation is a beneficial strategy. While it may not increase the overall yield (compared to growing only one crop), candidates identified the benefits of spreading the demands of activities such as harvesting and the reduced risk of total crop failure. Others were able to describe the impact of the inclusion of legumes within the rotation to retain soil fertility.
- (c) A good range of benefits and limitations were provided within the responses. Many benefits related to the coverage of large areas reducing the need for labour, whereas many saw the impact of the cost of purchase as a limitation as well as the potential issue of the lack of penetration of the water to the soil/roots by this method.

Question 7

- (a) Candidates were required to complete the sentences using a series of words provided. This was achieved with a level of success, although care needed to be taken to read the instructions carefully as some words needed to be used more than once.

- (b) The majority of candidates correctly identified which year had the greatest impact, although many missed the prompt in the question to use the data and therefore missed out on full credit.
- (c) Generally well answered, most candidates were able to provide some significant detail about the impact of drought, although a few responses also provided reasons why droughts occurred which was not required within this question.

Question 8

- (a) (i) The use of pitfall traps was not well understood. The stronger candidates correctly identified the potential issue with rainfall. Many were unable to interpret the question correctly and perceived that the sloping of the soil outside the trap was to prevent organisms escaping.
- (ii) Many were unable to correctly identify the role of the hole in the container (to allow water to drain), perceiving it was required for gas exchange or for organisms to enter. The style of responses indicated candidates' unfamiliarity with the common tools used for population sampling.
- (iii) Candidates were often able to provide a valid reason for checking the trap regularly, typically relating to the welfare of the captured animals, however it was clear that many candidates were unclear of sampling processes.
- (b) (i) Most candidates were able to use the data in the table to calculate the mean.
- (ii) Weaker responses often did not identify the similarity between the results of the different types of cover and came to an incorrect conclusion. The data presented is similar to that which would be collected from the candidates' own investigations, and it is expected that they would understand the type of variability such an investigation would have.
- (c) Many candidates focused on the measurement and definition of the sample area (using quadrats and transects) rather than the use of a pooter or net to collect small organisms, suggesting inexperience in completing similar population investigations.

Question 9

- (a) (i) Candidates showed skill in being able to interpret the data presented within the diagram.
- (ii) Candidates were generally confident in identifying the country with most planned coal-fired power stations. There were very few examples of candidates not providing an answer.
- (b) (i) Candidates were generally able to complete this percentage calculation correctly. Where candidates provided their working, this allowed for credit to be awarded for the correct method even if an arithmetic error had been made. The most common error was the incorrect rounding of the final answer.
- (ii) A wide range of potential answers were given credit. Candidates were expected to apply their knowledge to this less familiar situation which many were able to do successfully.
- (c) The final question allows candidates to write more extensively about a subject, incorporating concepts and ideas from various sources. This six-mark question is assessed based on the quality of the answer. The strongest responses provide information supporting both viewpoints and then reach a clear conclusion. While some candidates were able to consider both sides of the argument, their conclusions were sometimes unclear.

Most of the cohort attempted this question. Many focused on the impact of burning fossil fuels, the release of CO₂, and climate change. Others highlighted the finite nature of these resources. Conversely, issues such as access to technology, lack of suitable sites, and the abundance of fossil fuel reserves in some countries were also cited. The argument that fossil fuels create jobs is less clear, as other electricity generation sources also require a workforce.

The best responses provided a broad overview of the different issues and included specific examples to support their statements. Weaker responses often lacked these examples and included only key statements, sometimes in bullet form.

Cambridge Ordinary Level
5014 Environmental Management November 2024
Principal Examiner Report for Teachers

Candidates have generally become increasingly well-prepared for this type of question, with evidence of planning notes often seen to ensure that responses are clear, logical, and balanced.

ENVIRONMENTAL MANAGEMENT

Paper 5014/22 Management in Context
--

Key messages

To make best use of examination time, candidates should avoid repeating the question in their answer. For example, 'Two factors that affect demand for electricity are...' is not required.

Stronger-performing candidates are guided by the mark allocation for a question which indicates the number of separate marking points that are required in a response.

The use of bullet points in a response can help to ensure concise answers that address a sufficient number of points.

Candidates should be encouraged to check their question paper to ensure they have attempted every question.

Diagrams, charts and graphs should be drawn with a sharp pencil and ruler. Errors are more difficult to correct if pen is used.

Candidates should always show their workings out to calculation questions, as credit may be available for correct workings even if the final answer is incorrect.

Candidates should follow the rubric of a question. For example, if three reasons are asked for, they should not give a fourth as an incorrect answer can contradict a previous correct one.

General comments

Candidates should avoid vague statements like "*causes harm*," "*causes pollution*," "*affects the environment*," "*reduces resources*," or "*causes death*." These general phrases, if not elaborated upon, are unlikely to earn credit.

Acid rain and temperature inversions were not well-known areas of the syllabus.

Pie chart drawing was an area for improvement.

Some key terms in the syllabus were not known by candidates.

Comments on specific questions

Question 1

- (a) Most candidates were able to calculate the percentage of the population that were cotton farmers to achieve the answer of 0.44. Occasional rounding errors were seen.
- (b) Candidates generally recognised that cotton is a non-edible crop which can result in food insecurity and that if cotton is grown there would be no space for growing other food crops. Many also stated that the cotton crop is a cash crop. A minority suggested that cotton provides a focus for the economy which is more profitable rather than concentrating on food crops. Weaker responses repeated the same points in other wording.
- (c) (i) The source of energy of photosynthesis was well known. There were some responses that stated carbon dioxide.

- (ii) Chlorophyll was well known. Some poor spellings were seen, and some candidates left this question blank.
 - (iii) A significant number were not able to provide a correct word equation for photosynthesis. Sunlight, chlorophyll, chloroplasts and energy were sometimes included in the equation. Some responses used a mixture of symbols and words.
 - (iv) Producers were well known. Occasionally, names of producers were incorrectly given.
- (d) Candidates generally performed well on this question with the majority suggesting the advantage that time taken would decrease and that this would be less labour intensive. A number of candidates repeated the same idea, such as 'it is quicker' and 'it is more efficient' or 'it is faster'. Many responses recognised that mechanisation changes farming practice in terms of increasing yield. For disadvantages, there was a clear understanding that jobs would be negatively impacted by mechanisation and that the cost to purchase or maintain machines is expensive. Weaker responses stated 'cost' without explaining what this related to.
- (e) (i) Candidates performed well on this question.
- (ii) Some candidates misinterpreted the term urbanisation and discussed rural issues with water use, such as water used for crops and agriculture. Some answered in terms of water rather than focusing on the idea of ground water, which is the water that exists under the ground in the saturated zones beneath the Earth's surface. A minority of candidates discussed issues with accessing soil when buildings are on top and needed to refer to ground water or increased run-off. A significant number also discussed evaporation. A few answers suggested that evaporation occurs when cities have more buildings installed.
- (f) Two limitations were sometimes given, with 'time consuming' and 'labour intensive' being the most common responses. The idea that some bollworms might be missed due to their small size was given in stronger responses.
- (g) (i) Candidates generally showed a good understanding of the fact that field E was used to compare the effect with no insecticide. The term 'control' was not well known.
- (ii)(iii) Some candidates confused the range and mean and reversed answers for these two questions. A significant number of candidates were not able to calculate either answer.
 - (iv) Most candidates recognised that the effectiveness of the insecticide could result in poor plant growth rather than indicating that the soil was poor quality.
 - (v) The formula of the mineral ions was not well known, and candidates performed very poorly here.
 - (vi) Two components of soil other than mineral ions were usually stated. Occasionally, mineral ions was given by candidates who needed to take greater care to read the question carefully.
 - (vii) Very few candidates were able to correctly suggest why a biological control was used rather than an insecticide. Cost was often quoted but was not credited, as biological controls also need to be purchased.
 - (viii) Most candidates were able to state one benefit of a GM crop. Resistance to pests was a common correct answer. Some answers did not follow the rubric and gave more than one benefit.
- (h) (i) Good answers recognised that microplastics could be washed into water sources, be ingested by organisms and bioaccumulate. Many responses did not focus on the impacts of washing polyester textiles. Some candidates did not follow the rubric and gave more than three benefits.
- (ii) Many candidates recognised that the use of crude oil in making polyesters was a concern as fossil fuels are finite. A stated impact of fossil fuel combustion was sometimes suggested.

Question 2

- (a) (i) Occasionally, the tally was misquoted as 23.

- (ii) Weaker responses listed information that is in a disaster preparation plan rather than focusing on what the student would need to write a report on the impact of these earthquakes on people.
- (b) Candidates performed well on this question, appreciating that monitoring enables evacuations which reduce the impact of an earthquake.
- (c) (i) The number of international airports was usually correctly stated.
(ii) Many good answers could suggest why international agreement was necessary, such as 'due to international flights' or 'there are no boundaries in the atmosphere'.
- (d) The meaning of tsunami was known by many; some candidates described how a tsunami forms instead of what it is.
- (e) The stages in generating electricity were well known. If an error was made it was most often with the second stage.
- (f) Candidates showed a good understanding of the factors which affect the demand for electricity. This included reference to a growing population and availability of supply.
- (g) (i) The fossil fuel extracted by fracking was well known.
(ii) Sedimentary rock was stated by many but metamorphic and igneous were also seen.
(iii) The risk of earthquakes and risk of water contamination were frequently suggested.

Question 3

- (a) Weaker responses discussed the age of the tree rather than focusing on the cross section provided. There was some confusion about the width of the tree and the conditions which impact the variations in width.
- (b) (i) Many candidates made errors in this calculation, usually getting the start of the working out incorrect or not dividing. Many candidates did not give their answer to the nearest whole percent as required, 5567.
(ii) Good responses suggested the increase in global temperatures leading to drought conditions. Weaker answers focused on the increased number of wildfires, which did not address the question.
(iii) Most candidates were not able to plot the sectors of the pie chart in rank order, proceeding clockwise, starting from noon. Some correctly started their largest sector at noon, many did not. The plotting was often incorrect, and the key did not always match the sectors. The use of numbers in the key should be avoided.
(iv) Many candidates looked at the environmental effects rather than considering the key economic effects as required by the question. Common correct responses referred to a loss of tourism, a reduced income from wood trading and also infrastructure being destroyed.
- (c) 'May' was a common incorrect answer.
- (d) (i) Candidates showed a good understanding of the trends in the data shown in the graph.
(ii) Candidates were able to provide one suggestion and occasionally two. Good responses recognised that the data was only from one country and that the source was secondary and there was no information on how the data had been collected.
(iii) Good answers recognised that being close to the coast caused an increased risk of flooding. Very few candidates commented on the fact that it would be harder to import food if crops are destroyed.

Question 4

- (a) The topic of acid rain was an area for improvement amongst candidates.

- (b) (i)** The meaning of a temperature inversion was poorly expressed. Weaker answers repeated the question with 'it is when temperature is inverted.'
- (ii)** The trapping of pollutants under the temperature inversion was not well known.
- (c) (i)** Candidates generally referred to human factors which had created poor air quality. At times these were the same point phrased in different ways.
- (ii)** The majority of candidates noted that there were only six monitoring stations and needed to develop their ideas further to gain full credit. A few candidates were able to provide more than one reason.