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ENVIRONMENTAL MANAGEMENT

Paper 0680/12
Theory

Key messages

- Candidates should read the questions with care, taking time to study command words and words which indicate the context of the question. Command words such as 'describe' and 'explain' have specific meanings which candidates need to respond to. Where the command word is 'describe', candidates should not spend time giving explanations, as these will not be credited.
- Candidates should be encouraged to attempt all questions in the paper as they may gain partial credit even if full marks are not awarded.
- In the six-mark, level of response question candidates should look broadly at the given topic. The use of appropriate examples to support their views is beneficial.

General comments

Candidates generally demonstrated a broad range of knowledge with few questions unanswered, although sometimes the responses were not contextualised to the question posed, for example, the impact of fish farming on the ecosystem, rather than merely the benefits of fish farming.

Candidates are expected to apply their knowledge to unfamiliar situations. This was done with varying levels of success. For example, most were able to suggest reasons for reduced oil usage in Norway but were more challenged by the potential impacts of global warming on the incidence and location of tropical cyclones. The majority of candidates were also able to use the soil triangle diagram to determine a soil type by using the worked example as a guide.

Candidates displayed confidence in completing the mathematical questions in the paper and were generally able to form valid conclusions. Graph drawing is generally good.

Comments on specific questions

Section A

Question 1

(a) The majority of candidates were confident in identifying the two igneous rocks from the list provided.

(b) A second question relating to rock type, the majority of candidates were able to interpret the diagram and provide the correct identities for the rock types.

(c) Few candidates were successful in gaining two marks. Whilst many understood that crystal size is affected by the rate of cooling, there was some confusion about which condition causes larger crystals.

Question 2

(a) (i) A question requiring candidates to interpret data from a graph. A high proportion of candidates were successful in calculating the increase in fertiliser use.

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(ii) Providing a detailed comparison between the use of fertiliser in two regions proved to be more challenging. Whilst the majority selected the data relating to the correct two regions, there was significant variance in terminology used to describe the changes. Some descriptions used inappropriate terminology, such as 'exponential' instead of 'increasing rapidly'. Candidate responses would benefit from improved organisation to clearly state the comparisons made. Common errors were comparisons of short time periods rather than the range expected.

(b) Many candidates were confident in naming a sustainable strategy for use in agriculture. Some candidates had difficulty in describing how the strategy was sustainable.

Question 3

(a) This question required candidates to interpret the changes in incidence of malaria over time. Most showed a basic knowledge of world geography appropriate to the demands of the syllabus. Some did not state clearly that it was the distribution, and not necessarily the number of cases that had reduced. Some explained why there was a reduction e.g., use of medicines, less stagnant water etc. which was not required in this question.

(b) (i) Candidates were required to identify potential benefits and limitations of using antimalarial drugs. Some candidates confused the use of antimalarial drugs with vaccination. Similarly, some confused the use of medicinal drugs with addiction problems. The majority of responses were able to articulate at least one correct concept.

(ii) The majority of candidates were able to name an alternative strategy for controlling malaria although not all responses provided a sufficient detailed description of how this would enable control.

Section B

Question 4

(a) (i) Candidates demonstrated good knowledge of the components of soils, successfully identifying the missing components from the statements.

(ii) This question proved to be more challenging, fewer candidates were able to give the mineral components in correct size order.

(b) (i) This question tested the candidate's ability to use their knowledge in a less familiar context, but with a worked example to assist them in interpreting the diagram. Most candidates successfully identified the correct soil type.

(ii) A range of percentages were credited provided they were appropriate to the correct zone. Some responses did not gain the second mark as their percentage figures, whilst in the correct zone, did not add up to 100%.

(c) A range of strategies were credited for this question provided they were relevant to the scenario shown in the question. Common responses included the need to provide vegetation cover or the use of windbreaks. Crop rotation was not credited within this scenario.

Question 5

(a) (i) Whilst the term sustainable is commonly cited in both questions and responses, many candidates had difficulty in defining the term in relation to fisheries. Marks were awarded for the concept of fishing to meet the needs of the present and also for not impacting the needs of future generations. This was expressed in a variety of ways, often referencing the prevention of overfishing.

(ii) More able candidates were able to explain why sustainable fisheries were important to humans, namely the opportunity to provide food supplies in the future and the impact on future income.

(b) (i) While most candidates attempted the question and gained some credit, some responses provided insufficient detail relating to the trends involved. It is expected that candidates do not reference the

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data on a year-by-year basis. The correct citing of data was credited if it clearly related to the trends.

(ii) This question required candidates to complete a percentage increase calculation. Credit was given for the determination of the correct data for the calculation even if the subsequent method used was incorrect or inaccurate. Some candidates did not give their final answer to a whole number.

(c) (i) Using the information in the question, candidates were required to provide an explanation regarding the lack of suitability of toothfish for fish farming. Those that simply re-stated this information did not provide sufficient additional information to provide an explanation. Suitable responses included the fact that the time taken to mature means that production is not economic and their need for deep water means that the cost of building suitable enclosures would be too expensive or complicated.

(ii) Many candidates failed to appreciate the focus of the question which limited credit-worthy answers to the impact on the ecosystem. Some responses confused fish farming with fishing and therefore did not address the question. Strong responses included the reduced pressure on wild fish stocks and the reduction of damage to the seabed. This was often balanced with the risks of pollution through the waste of fish farms and the impact that accidental escape of farmed fish would have on the wild population.

Question 6

(a) (i) Using the world map, candidates were required to suggest why tropical cyclones often form near the Cape Verde islands. The strongest candidates successfully achieved full marks, typically identifying the location, the impact of ocean depth and ocean surface temperature as the main factors.

(ii) Another question requiring candidates to apply their knowledge to a new scenario. Generally stronger candidates cited issues such as the rise in sea level increasing the risk for cyclones. Many also identified that there may be changes in ocean currents which may mean a change in the number of cyclones and also a change in the areas where they may occur. The command word 'explain' meant that only those providing suitable reasons were credited.

(b) A three-mark question using existing knowledge, many identified the risk of flooding and two relevant factors relating to the water-related disease. There was some confusion between the conditions/issues impacting malaria and those for cholera.

(c) The command word 'state' requires a less detailed response from candidates. There were a few examples of impacts that were not directly related to people so did not answer the question posed. Common correct responses included the loss of homes, the impact on jobs and the shortage of food that may result.

Question 7

(a) Four marks were available for this graph-based question. In this question candidates were required to draw a line graph and draw a straight line between each point. While the majority of candidates drew the correct type of graph, there were issues with the use of an appropriate scale and most notably drawing a 'line of best fit' rather than drawing a line between each point as instructed. In a few cases candidates omitted to label the axes or failed to allow for the missing data for the year 2000.

(b) Those who were successful in drawing the line graph were typically successful in calculating the data for the year 2000. Where candidates had plotted their data inaccurately, examiners used their graph to calculate the answer. In a few cases, whilst stating a correct answer, responses failed to show how they had determined their answer on the graph.

(c) (i) In this question, many candidates had difficulty in articulating why the graph used information on annual percentage change as the comparison. The strongest candidates understood that this allowed for a comparison for different size countries at different stages of development.

(ii) Although set within the context of Norway, it is not expected that the candidate would have specific knowledge of this country and therefore were able to gain credit for any reasonable suggestion for

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strategies. Most identified the opportunities that switching from fossil fuelled cars to electric cars would have to reduce emissions, with some also identifying the impact transport policies and taxation/incentives would have on making changes to oil use.

Question 8

(a) (i) This question used a diagram to present information in a slightly different format, a variation on the familiar pie chart. While this was challenging to some candidates, most were able to calculate the percentage of the Earth's water that is fresh water.

(ii) Slightly more challenging, most still understood that this proportion was present in the atmosphere although they used a range of ways of describing it.

(iii) Not all candidates understood that the reasons for the data being estimates was due to the fluctuations in the water cycle and also the difficulty in measuring gaseous water accurately.

(b) Generally well answered, most candidates were able to name at least one additional source of fresh water that is used by people.

(c) The final question of this paper requires a longer response and allows candidates to draw together much of their knowledge of environmental management in their answer. This six-mark level of response question looks at the quality of the overall response. Strong responses address the question presented, look at both sides of the argument and come to a clear conclusion. These arguments are often supported with specific examples linked to the scenario presented. Overall, there was evidence of effective planning with some good examples where candidates were able to present both pros and cons to the stated view. Many responses discussed at length the impact of hydro-electric dams - both the energy security it would bring but also the need to relocate others and the loss of their livelihoods. There were relatively few responses which provided a limited list of simple statements.

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ENVIRONMENTAL MANAGEMENT

Paper 0680/22
Management in Context

Key messages

- Candidates should read each question carefully to make sure they answer the question asked. For instance, when plotting graphs, check whether the type of graph, line or bar, is specified.
- When answering with bullet points, answers should be sufficiently detailed to gain credit and not be just one or two words.
- Show working when completing calculations especially when more than one mark is available for the answer as partial credit may be awarded even if an error is made.
- Candidates should look at the command word, mark allocation and the number of answer lines provided for a question before starting to write a response as they indicate the level of detail required in the response.

General comments

This paper requires candidates to consider environmental issues and methods of gathering and interpreting data in the context of one country. Many candidates understood and made good use of the source material and their written responses were clearly expressed. The mathematical and graphical questions proved demanding for some candidates.

Comments on specific questions

Question 1

(a) (i) Many candidates were able to describe the high density of population in the northeast of New Providence and the low population density in the rest of the island. Some candidates confused northeast and northwest. Others used left, right and downwards. Candidates should understand and use of the north arrow on maps to describe distributions.

(ii) Most candidates were able to suggest at least one reason for the population distribution on New Providence. The most common suggestion was the availability of jobs in the area with a high population density. Other suggestions referred to the availability of shops and services in areas of low and high population distribution. A minority of candidates mentioned rural-to-urban migration in their responses.

(b) Most candidates were able to correctly calculate the number of people living on New Providence as 272 637. Some gave an answer to one or more decimal places. These answers were not credited, neither was rounding up to 272 638.

(c) (i) This question produced some excellent responses. Three ideas such as very similar percentages of males and females, population increases from age range 0 to 24, population decreases from age range 50, gained full credit. Some candidates did not refer to ages in their responses. There were some vague answers about young dependants, old dependants, working age, young people and old people. These needed to be related to the population pyramid to gain credit, for example about 70% of the population are working age (15 to 64).

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(ii) Nearly all candidates correctly suggested at least two reasons why people migrate to The Bahamas. The most common reasons were for employment, education and healthcare. Natural disasters and wars were also suggested. Some candidates suggested 'push and pull factors' as a reason, however, named examples were needed to gain credit.

(d) (i) Many candidates did not know that an aquifer is the water source located in underground rocks.

(ii) 'Other' was a key word in this question. Many candidates gained full credit for answers that included lakes, reservoirs, rain water harvesting and the desalination of ocean water. Rivers, wells, aquifers, ground water and water barges were not credited.

(iii) This question required candidates to describe the benefits and limitations of using water barges to meet the demand for fresh water. The majority of responses described large volumes of water that could be transported by large barges as a benefit. These responses went on to describe at least one limitation. The most common limitations described were the slow speed of water transport, the expenses involved building or maintaining the barges, the use of fossil fuels, the possibility of water loss or contamination when there were storms or collisions at sea. Some candidates stated that the barges could only supply places on the coast so the water would have to be transported to a site where there were pipelines for distribution or road tankers.

Question 2

(a) (i) Most candidates constructed a food chain with the phytoplankton, shrimp, flamingo and vulture in the correct order. Some candidates linked the organisms with arrows that pointed the wrong way. A minority put the organisms in the wrong order.

(ii) There were many detailed answers explaining why the energy in the body of the flamingo is dependent on chlorophyll. These included how chlorophyll in the phytoplankton absorbs light energy from the Sun for photosynthesis. These answers went on to explain that photosynthesis is the process that uses sunlight, water, and carbon dioxide to form glucose and oxygen. Glucose contains chemical energy that is passed along the food chain to shrimps and then flamingos. Some candidates showed good understanding of the 10% rule that when energy is passed in an ecosystem from one trophic level to the next, only 10% of the energy is passed on. The other 90% is used for a variety of processes including movement and growth or is lost to the environment as heat.

(b) (i) Most candidates suggested appropriate strategies to protect the Caribbean flamingos on Inagua Island. The most common responses were making the island a national park or biosphere reserve, having captive breeding on the island, introducing laws to control vultures and poaching and limiting the number of visitors and tourists. Other strategies included regulating shrimp fishing so the flamingos had enough food, and patrols to make sure that laws to protect flamingos and their chicks were obeyed.

(ii) The responses to this question, requiring the description of a method for estimating the population of Caribbean flamingos on Inagua Island were variable. The stronger responses described putting a grid on a map of the island to divide it into large quadrats (e.g. 100×100 m). Then, counting the flamingos in each quadrat and recording the number in a table. They then stated that the method would be repeated and an average obtained. The average could be used with the area of the quadrat and the area of the island to estimate the population. Other responses mentioned systematic sampling, satellites, drones, aerial surveys and cameras but without a clear method. Flamingos were often observed, estimated and checked when they needed to be counted. A minority of candidates described capturing flamingos in pitfall traps.

(c) (i) Some candidates recognised that there was an inverse relationship between the salinity of the lake and rainfall over the 12-month period shown on the graph and selected appropriate data as supporting evidence. Others described the relationship as, either salinity increases as rainfall decreases, or salinity decreases as rainfall increases. These candidates often selected the data showing the opposite as evidence. Some candidates misread the graph axes. Very few candidates wrote about rainfall diluting the salt concentration in the water in the lake.

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(ii) Many candidates were able to suggest that if the temperature is high the salinity of the lake increases because there is more evaporation. Some wrote about temperature, rainfall and salinity with no mention of evaporation.

Question 3

(a) Most candidates suggested at least two reasons why the person thinks that oil processing should be encouraged in The Bahamas. Reasons credited included providing employment, the importance of processed oil as one of The Bahamas main exports, contributing to the economy and providing money to develop infrastructure.

(b) (i) Most candidates gained some credit for reference to either the formation of oil taking millions of years or the process needing heat and pressure. Some candidates confused the formation of oil with the formation of coal. These candidates often described oil being formed after peat as a result of more heat and pressure. Other common errors were describing the extraction of oil, the fractional distillation of oil and fracking oil from shale.

(ii) The majority of candidates correctly named coal as one other fossil fuel. A few named natural gas.

(c) Nearly all candidates gained partial credit for explaining how oil is used to generate electricity. The strongest responses described how oil is burned to boil water, thereby producing steam. The steam turns a turbine which turns a generator converting kinetic energy to electricity. The most common mistakes were describing vapour or oil being used to turn the turbine and generator. A minority of candidates wrote about burning oil to power engines, the uses of oil in factories or the use of oil as a lubricant.

(d) (i) Most candidates identified two possible causes of marine oil pollution in The Bahamas. The most common causes were leaks or spills from oil tankers, ships, pipelines, oil storage tanks and oil rigs. A minority of candidates wrote about the possible effects of oil pollution on ecosystems in The Bahamas.

(ii) Most candidates gained partial credit for describing the impact of oil pollution on the coral reefs in The Bahamas. Many described how oil covers the surface of the ocean preventing light from reaching the coral and stopping photosynthesis. These candidates often had a good understanding of the effect of oil on ocean food chains. Few candidates mentioned that oil was toxic or stopped filter feeding.

(iii) Many candidates gained full credit for stating three strategies used to minimise the impacts of oil spills. The most common strategies were burning the oil and the use of booms, detergents and skimmers. Transporting oil in tankers with double hulls and reference to The International Convention for the Prevention of Pollution from Ships (MARPOL) were also credited.

(e) (i) Most candidates correctly described the error in the data as the tally for question three as there were only 19 responses when there should have been 20. Some candidates wrongly described the error as the absence of data in the ‘do not know’ column of question one. Others gave answers not related to the data in the table. A minority of candidates stated that ‘no’ and ‘do not know’ had the same meaning.

(ii) Many candidates partially agreed to the question; to what extent do you agree with the government’s conclusion, that people in The Bahamas are not concerned about oil processing in The Bahamas?’. These candidates wrote that, although more people indicated that they were not worried in question two, the same number indicated, in question three, that they would like oil processing in The Bahamas to stop. Some candidates gave a view on oil processing in The Bahamas that was not linked to the questionnaire. Others gave their personal view about oil processing in The Bahamas.

(iii) Most candidates gained some credit for suggesting three ways that the survey can be improved. These candidates suggested that more people should be asked and that more questions, or different types of questions, should be included in the questionnaire. Some responses suggested that the questionnaire should be given to people living on all the islands in The Bahamas. Others suggested that different age groups or genders should be included in the survey. A number of candidates wrote that ‘do not know’ should not be included in questionnaires.

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Question 4

(a) The responses to this question, requiring an explanation of two other strategies the government can use to manage the harvest of spiny lobster, were variable. The stronger responses showed a sound understanding of two strategies, naming and explaining them. For instance, a fishing quota would limit the number of spiny lobsters that can be caught which would prevent overfishing of lobsters. Weaker answers described strategies without explaining them, confused strategies and explanations, or repeated some of the information provided in the question.

(b) (i) Many candidates correctly calculated the mean (average) number of lionfish per hectare for 2016 as 238. Some incorrectly gave the answer as 237 or 237.6.

(ii) The strongest responses explained that the mean (average) number of lionfish in 2014 is calculated using data for only two of the areas because the very large number of lionfish, 615, recorded in area 2 was anomalous.

(iii) Most candidates plotted the data correctly as a bar chart with bars of equal width that fitted onto the grid. Very few candidates plotted line graphs. Many did not fully label both axes. Candidates who used the scale of 5 small squares = 50 lionfish per hectare on the *y*-axis and labelled the axis 'the mean number of lionfish per hectare' or 'the average number of lionfish per hectare' usually gained full credit. A common error was interpreting 'between 2012 and 2020' as only plotting two of the bars, those for 2012 and 2020.

(iv) Most candidates suggested that the carrying capacity for the lionfish population had been reached and lack of food as two reasons why scientists do not expect the lionfish population to increase greatly after 2020. Other reasons suggested were disease, water pollution and climate change.

(c) Describing the benefits and limitations of training sharks to prey on lionfish to control the population was challenging for many candidates. The most common benefit was that training sharks to feed on lionfish was a biological control. Responses were stronger on describing limitations, with candidates writing about the training being difficult, expensive, very dangerous for the diver, and a method that could take a long time. Some candidates described the effect on the ecosystem, or food chain, of sharks feeding on lionfish. Others were concerned that lionfish would become an endangered species or that the sharks feeding on them would reduce catches for the fishing industry in The Bahamas. Many candidates did not realise the significance of the information in Question 4(b) that lionfish are not native to the Atlantic Ocean and are eating small fish, shrimp and young spiny lobsters. These candidates did not appreciate the effect the lionfish are having on the ecosystem and that they are a threat to biodiversity.

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