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ENVIRONMENTAL MANAGEMENT **0680/21**

Paper 2 Management in Context **October/November 2020**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Blank pages are indicated.

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[Turn over

world map showing the location of mainland United States of America, USA



Area of USA: 9.83 million km^2

Population of USA: 326 million (in 2018)

Children per woman: 1.87

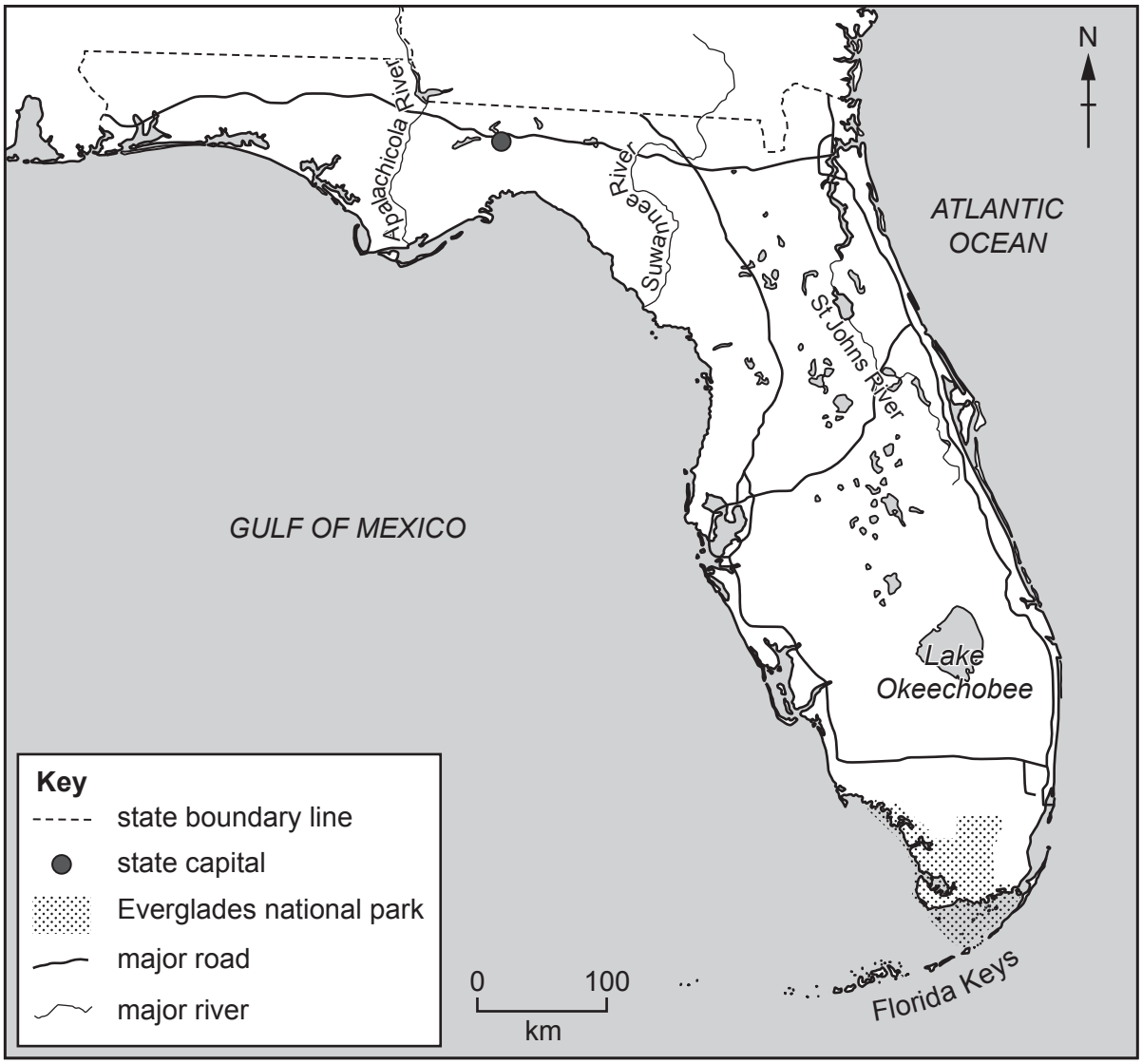
Life expectancy: 80 years

Currency: USD

Language: English and Spanish

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map of state of Florida



Climate of Florida: humid and subtropical in north, tropical in south

Terrain of Florida: low-lying with many lakes and rivers, hills in the north, wetlands in the Everglades, flat around the coastline with coral reefs and sandbars, a chain of islands in the south called the Florida Keys

Main economic activities of Florida: aircraft, electronic products, citrus fruit, tomatoes, phosphate for fertilisers, tourism

Florida is a state in the south-east of the USA. It has an area of 170 305 km^2, with 2 170 km of coastline. It is the third most populous state in the USA, with a population of 21.3 million in 2018. Florida has the highest percentage of people over 65 in the USA: 17% of the population of Florida are over 65. Tourism is the largest money-earning sector of Florida's economy. Florida is the largest producer of citrus fruit in the USA.

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1 (a) (i) Calculate the percentage of the total USA population that lived in Florida in 2018.

..... % [1]

(ii) The population of Florida is increasing.

Suggest **two** reasons why people migrate to Florida.

1 .....

.....

2 .....

.....

[2]

(b) The table shows climate data for a weather station in southern Florida.

month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
average rainfall / mm	52	38	52	52	76	104	90	137	170	125	58	56
average temperature / °C	21	21	23	25	27	28	29	29	28	27	24	22

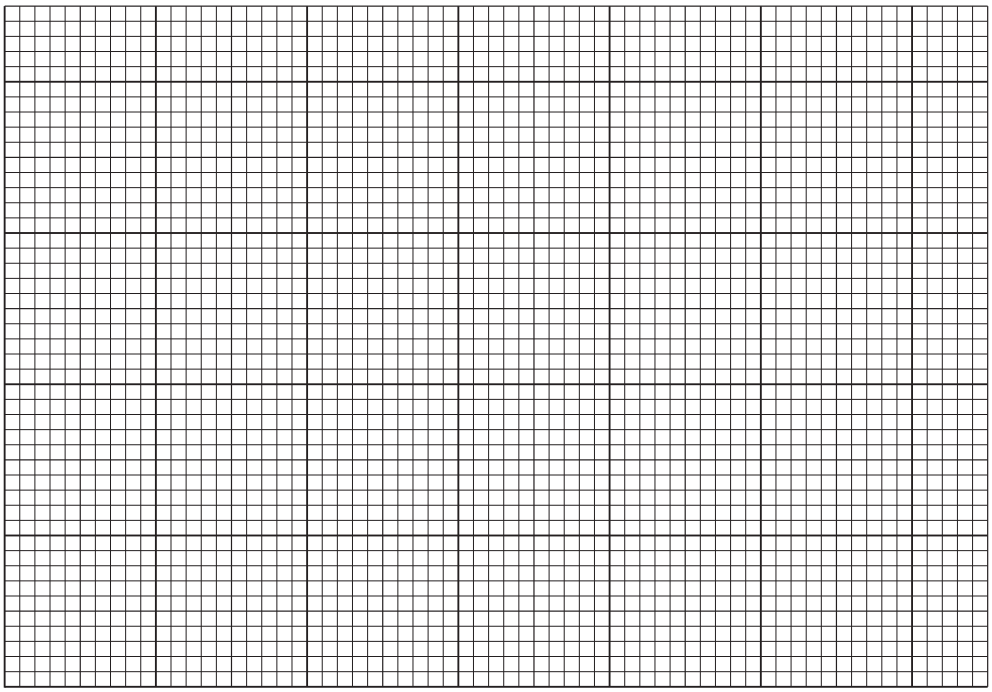
(i) The range of the monthly average temperature is the difference between the maximum value and the minimum value.

Calculate the range of the monthly average temperature for this weather station.

..... °C [1]

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(ii) Plot a bar chart of the average rainfall data.



[4]

(iii) Florida has a rainy season that includes tropical storms and hurricanes.

Use the climate data to suggest which months are in this rainy season.

from ..... to ..... [1]

(iv) In 2017, Hurricane Irma hit Florida.

The highest wind speed recorded when Hurricane Irma hit Florida was 210 km/h.

The table shows categories of hurricanes based on wind speed.

category of hurricane	wind speed in km/h
1	119–153
2	154–177
3	178–208
4	209–251
5	≥ 252

Determine the category of Hurricane Irma when it hit Florida.

..... [1]

(v) State the ocean surface temperature and ocean depth needed for a hurricane to form.

ocean surface temperature ..... °C

ocean depth ..... m
[2]

(vi) Hurricane Irma caused heavy rainfall, storm surges and flooding.

Suggest ways this affected the growing and exporting of Florida's citrus fruit.

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..... [4]

(vii) Approximately 6.3 million people were told to evacuate Florida before Hurricane Irma hit the state.

Suggest reasons why some people did **not** evacuate but decided to stay in their homes or in storm shelters.

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..... [3]

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(viii) Suggest why bottled water was supplied to people in Florida for several weeks after Hurricane Irma.

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..... [3]

(c) A report stated that 112.4 million tourists visited Florida in 2016 and 116.5 million tourists visited in 2017.

(i) Calculate the percentage increase in tourists visiting Florida from 2016 to 2017.

..... % [2]

(ii) After Hurricane Irma, there was a decrease in the number of tourists visiting Florida for several months.

Suggest reasons for this decrease in tourist numbers.

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..... [2]

(d) Many tourists enjoy the sandy coastal areas of the Florida Keys.

Most of the sand in these areas is imported into the Florida Keys because sand does not form naturally around this coastline.

The sand is extracted from quarries, riverbeds and marine areas around the world. It is then shipped to the USA and moved on land by trucks.

(i) State **two** factors that affect the decision to extract minerals such as sand.

1 .....

.....

2 .....

.....

[2]

(ii) Suggest **three** environmental impacts of extracting sand.

1 .....

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2 .....

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3 .....

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[3]

(iii) In some countries, sand is extracted unsustainably.

Explain what 'sand is extracted unsustainably' means.

.....

..... [1]

(iv) Sand is used in the building industry.

The demand for sand is increasing worldwide.

Suggest reasons for the increasing demand for sand.

.....

.....

.....

..... [2]

(e) A building company in Florida wants to build some new houses.

The company decides to use a questionnaire to find out local people's opinions on the new houses.

question	tick (✓) the relevant box		
1. What is your annual income?	< 50 000 USD	50 000 – 100 000 USD	> 100 000 USD
2. Do you want new houses being built near to where you live?	yes	no	undecided

(i) Suggest **one** other question the company can ask to find out people's opinions on building the new houses.

.....

..... [1]

(ii) Describe how the company can select people at random for the questionnaire.

.....

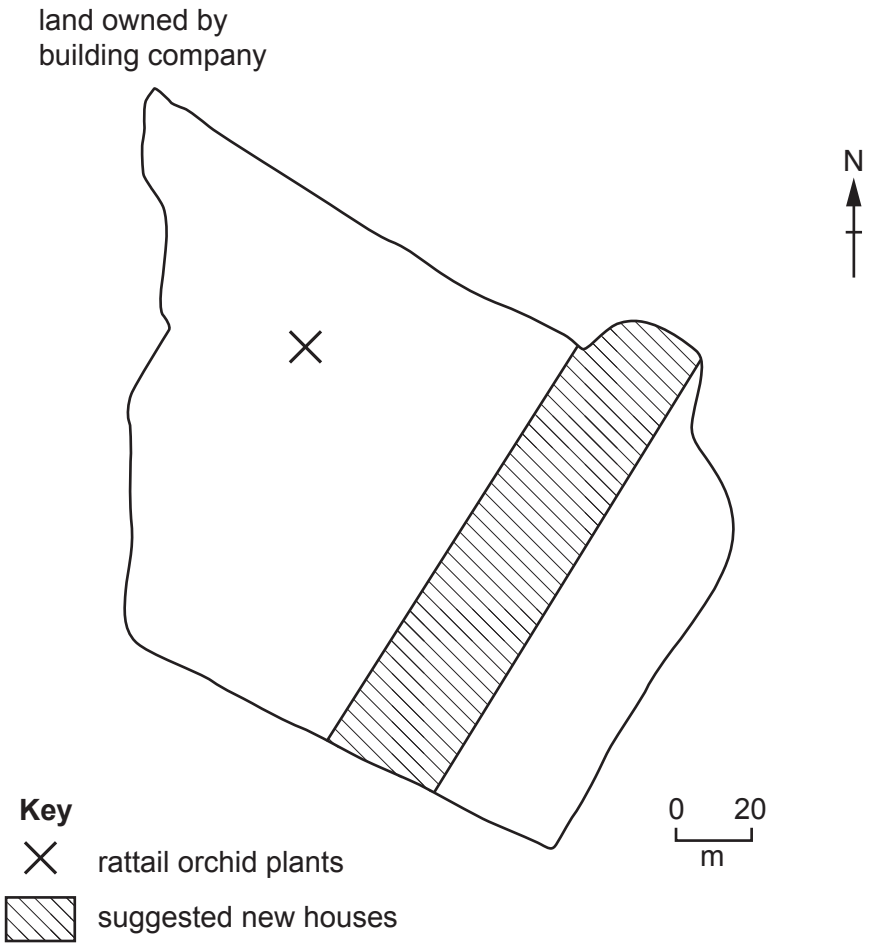
..... [1]

(iii) State **one** benefit of random sampling.

.....

..... [1]

(iv) The map shows the suggested location of the new houses and the location of an endangered plant species called the rattail orchid.



The local government says that the new houses **must** be a minimum distance of 80 m away from the rattail orchid plants.

Use the map to determine whether the building company can build at the suggested location.
Give a reason for your answer.

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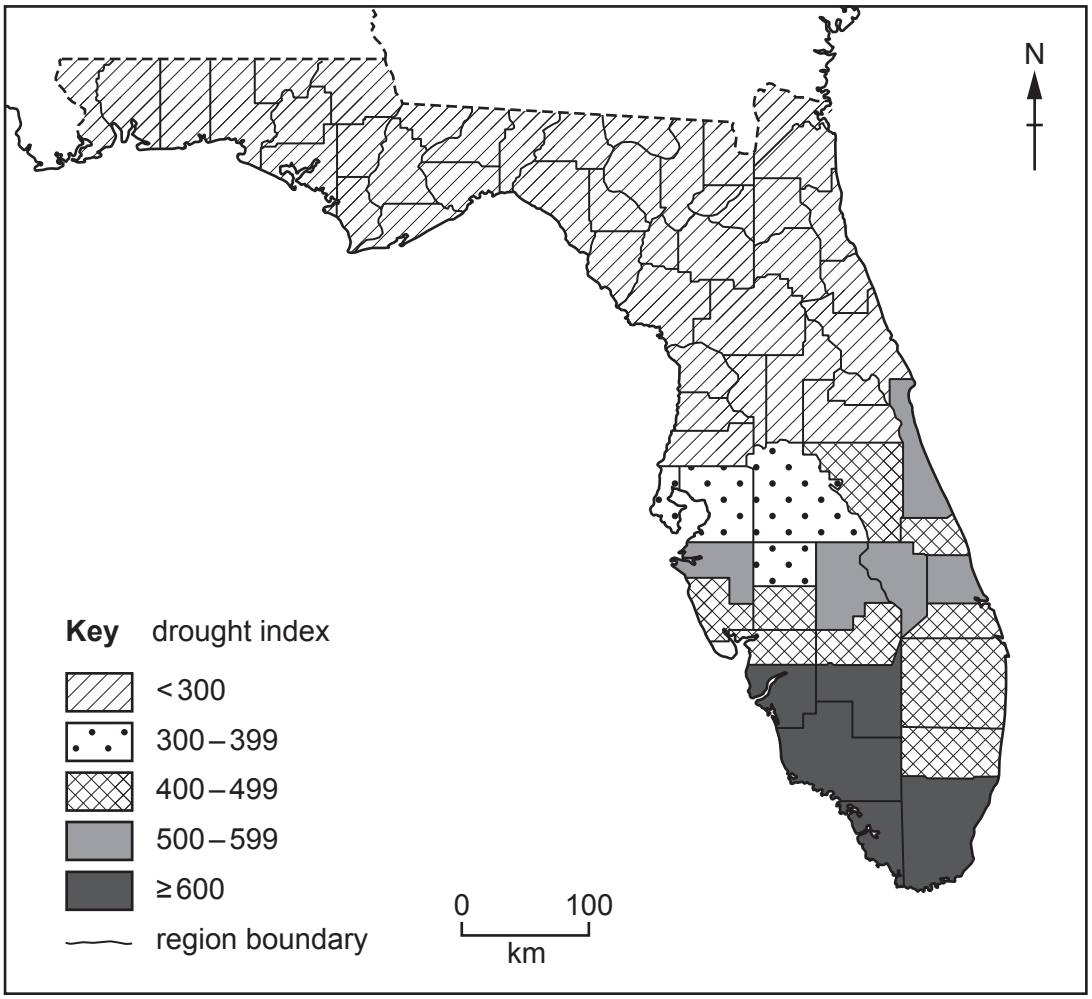
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..... [2]

(f) Florida can experience droughts.

The level of drought is measured using a drought index. This is a measurement of the dryness of the soil. When the drought index is equal to or greater than 500, people are not allowed to burn anything outdoors. This is called a 'burn ban'.

The map shows the drought index for each mainland region of Florida in April 2018.



(i) Use the map to determine how many mainland regions in Florida had a burn ban in April 2018.

..... [1]

(ii) Suggest reasons why a burn ban is introduced when there is a drought.

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..... [2]

(iii) Describe strategies, other than burn bans, for managing the impacts of drought.

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..... [3]

(iv) State **one** way human activities can increase the risk of drought.

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..... [1]

[Total: 46]

2 The Everglades is a sub-tropical wetland in the south of Florida.

The photograph shows this wetland area.



(a) The Everglades has decreased to less than half its original size as a result of agricultural development and urbanisation.

The Everglades ecosystem is home to many endangered species, including the manatee, a marine mammal.

(i) State the meaning of *ecosystem*.

.....

..... [1]

(ii) Describe **three** impacts of habitat loss on wetlands such as the Everglades.

1 .....

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2 .....

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3 .....

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[3]

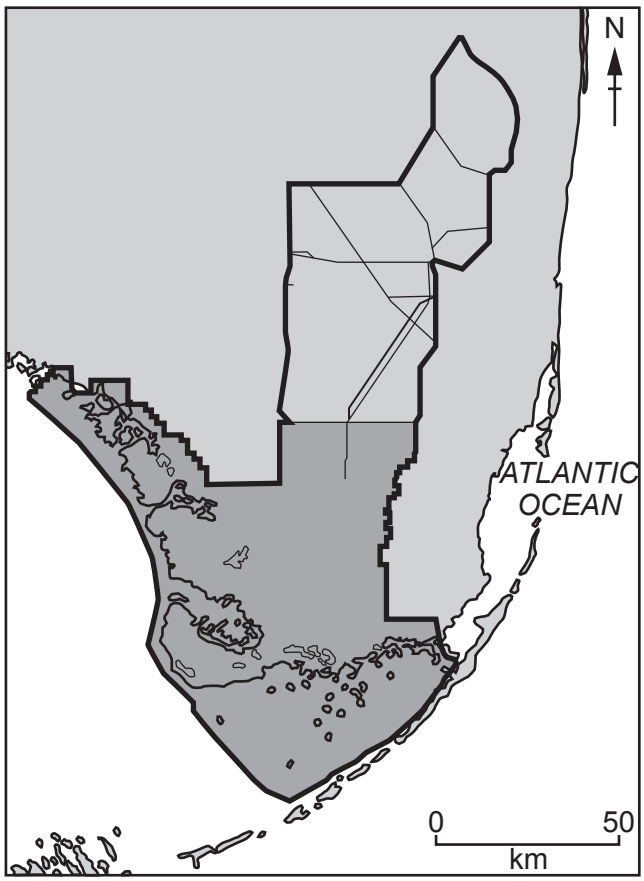
(b) A fact sheet shows information about the Everglades.

The Everglades

The Everglades is a popular tourist destination in Florida, with over 1 million visitors each year.

An environmental protection area has been established around the Everglades.

Part of this area was made a national park in 1947. The national park covers an area of 6 110 km^2.



Key

- Everglades protection area
- Everglades national park
- canal

All tourists can take a guided boat tour of the Everglades wetlands, but tourists must have a special permit to hire a boat without a guide.

Plant species that are not native to Florida are removed from the Everglades by controlled burning of land.

Signs encourage people to report sightings of injured wildlife such as manatees.



Do you think the strategies for protecting the Everglades are effective?

Use information from the fact sheet to support your answer.

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..... [5]

(c) The introduction of animal species from other parts of the world into the Everglades is a serious threat to the ecosystem.

These species are not native to Florida and are called invasive species.

Suggest ways that the people of Florida can prevent invasive animal species from reaching the Everglades.

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..... [2]

[Total: 11]

3 **(a)** Mercury is a toxic metal.

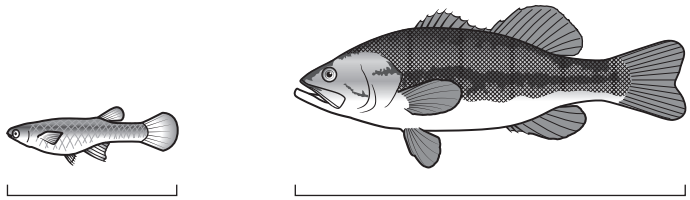
Mercury can enter an ecosystem from the atmosphere when waste is burned.

Suggest **one** reason why controlling the concentration of mercury in the atmosphere is a global concern.

.....

..... [1]

(b) A scientist investigated the concentration of mercury in the body tissue (flesh) of two different species of fish: the mosquitofish and the largemouth bass.



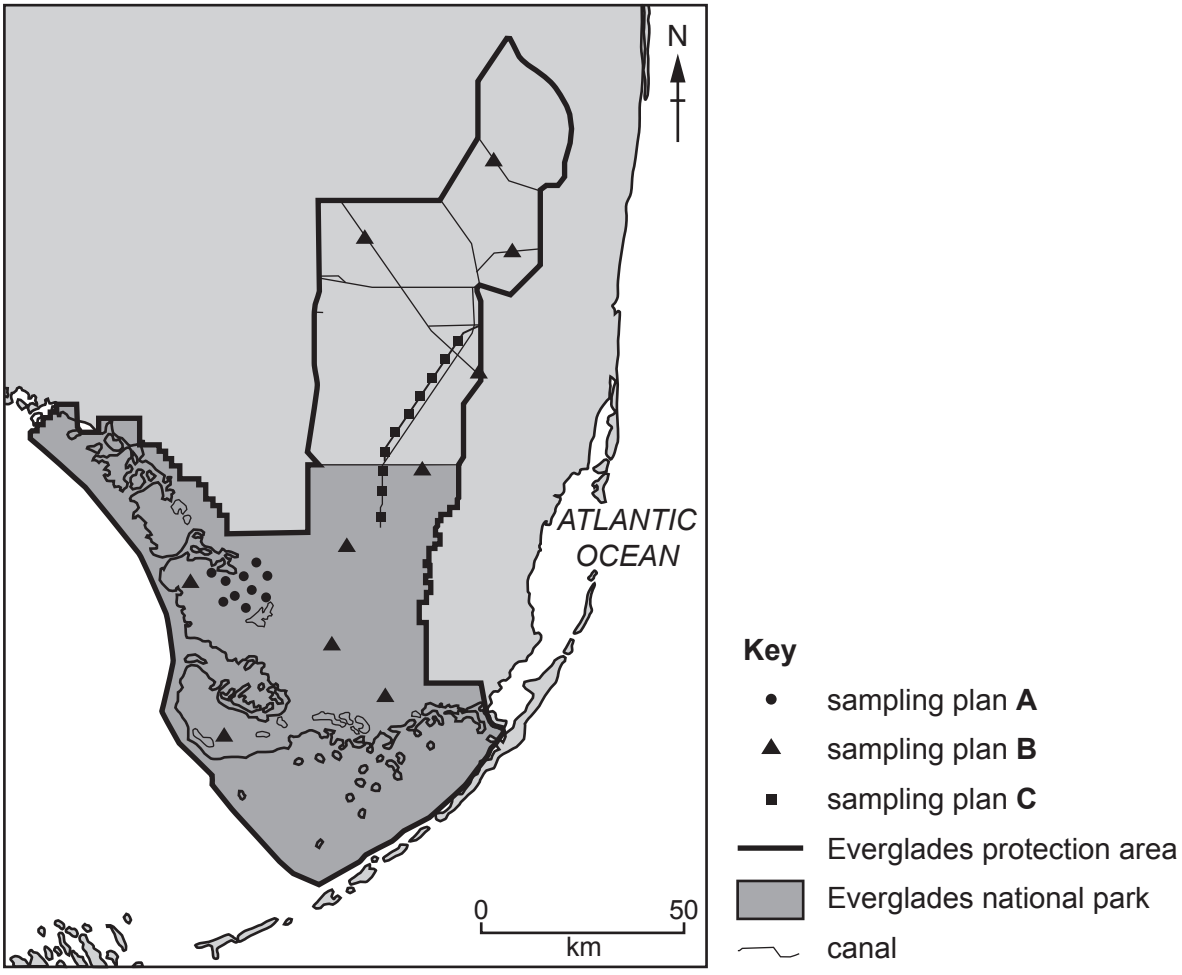
mosquitofish largemouth bass

The scientist:

- selected 10 different locations in the Everglades protection area
- collected 100 – 250 mosquitofish from each location
- collected 20 largemouth bass from each location
- measured the concentration of mercury in the flesh of the fish
- repeated the investigation every year for 10 years.

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The map shows the Everglades protection area.



The scientist had the choice of selecting the 10 locations using sampling plan **A**, **B** or **C**.

The scientist chose sampling plan **B**.

(i) Suggest why sampling plan **B** is better than sampling plans **A** and **C**.

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..... [3]

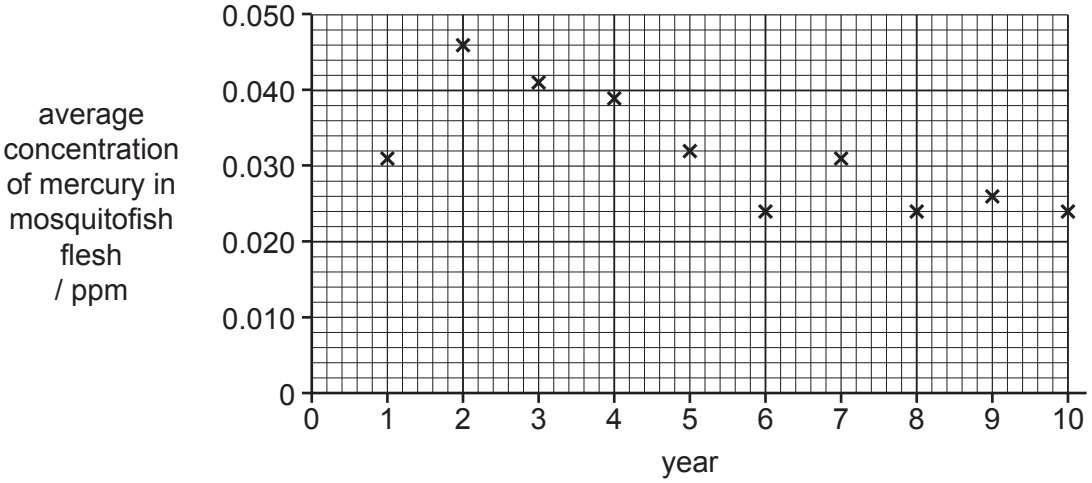
(ii) Suggest **one** reason why the scientist collected more mosquitofish than largemouth bass.

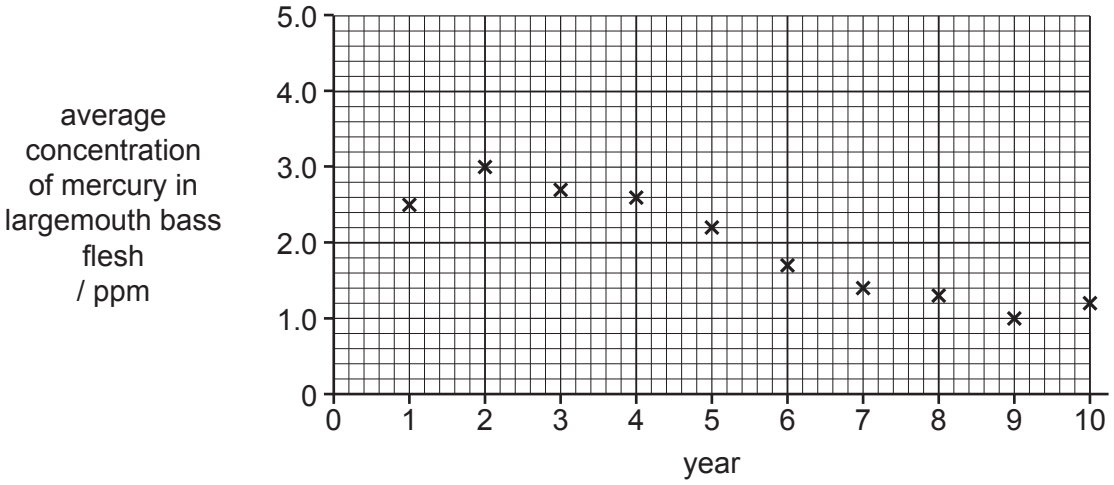
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..... [1]

(iii) The results of plan **B** are shown in the graphs.

The concentration of mercury is measured in parts per million (ppm).





Compare the trends in the results.

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..... [3]

(iv) Use the graphs to complete the table for year 1.

fish	average concentration of mercury in flesh / ppm	
	year 1	year 10
mosquitofish	.....	0.024
largemouth bass	.....	1.2

[2]

(v) The recommended safe limit for the consumption of fish flesh is a concentration of mercury of less than 1 ppm.

Discuss whether it is safe to eat mosquitofish and largemouth bass in year 10.

Give reasons for your point of view.

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..... [2]

(vi) An alternative method for investigating mercury levels in an ecosystem is to measure the mercury concentration in the water.

Suggest **one** advantage and **one** disadvantage of this method compared to analysing mercury concentration in fish flesh.

advantage .....

.....

disadvantage .....

.....

[2]

(c) (i) A food chain for organisms in the Everglades is shown.

algae → mosquito larvae → mosquitofish → sunfish → largemouth bass

State the number of trophic levels in this food chain.

..... [1]

(ii) The results in the largemouth bass graph in **(b)(iii)** are used as an indicator of human exposure to mercury. The results for the mosquitofish are **not** used.

Suggest reasons why.

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..... [2]

(iii) Explain why mosquitofish can be used to control the spread of malaria.

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..... [2]

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(d) The land around the Everglades is used for growing citrus fruit crops such as oranges.

Farmers use fertilisers on their crops. Overuse of fertilisers can lead to nutrient enrichment of water in rivers and lakes.

Describe how nutrient enrichment of water leads to the depletion of oxygen in rivers and lakes.

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..... [4]

[Total: 23]

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