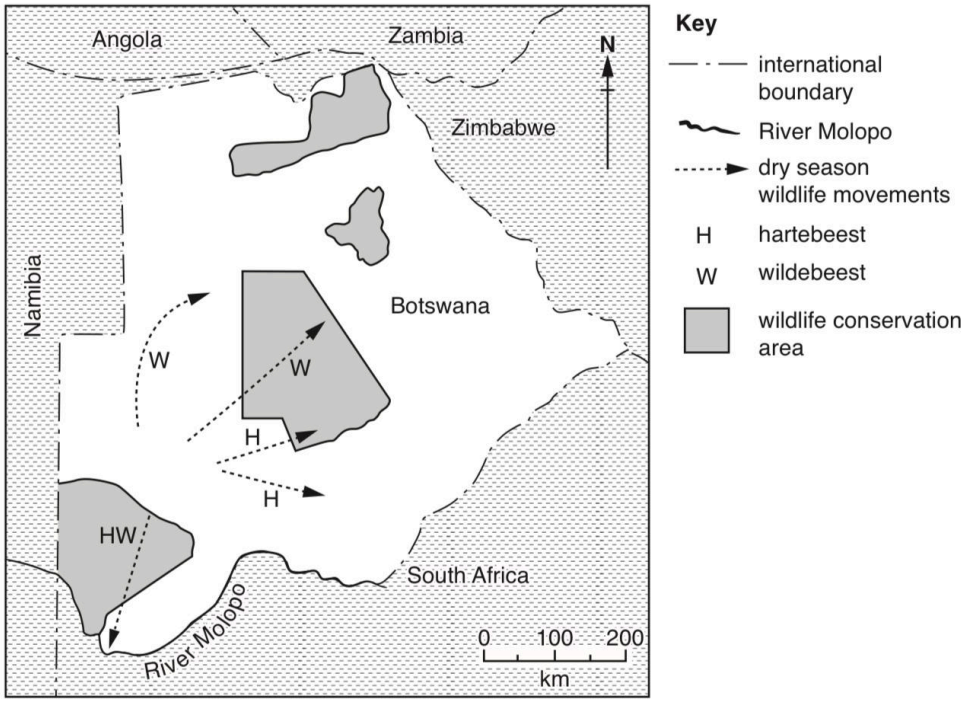
4 The map shows wildlife conservation areas in Botswana and the dry season migrations of some animals.



(a) (i) State one way in which migrations of hartebeest differ from those of wildebeest.

.....

.....[1]

(ii) Circle the distance that the hartebeest and wildebeest migrate in the dry season to the River Molopo.

140 km 170 km 200 km 230 km [1]

(iii) Use the map to suggest why some animals move to the southern border of Botswana in the dry season.

.....

.....[1]

(b) The table shows strategies for setting up conservation areas in Botswana and Namibia.

	country	
	Botswana	**Namibia**
strategy	move local people away from their homes to another area	make local people responsible for the well-being of wildlife on their land and allow them to use the wildlife sustainably

(i) The Botswana government is moving San people away from the lands where they have lived for thousands of years. Many of the San are hunter-gatherers.

Explain why some people think that this forced movement will:

- destroy the way of life of the San people
- make them dependent on others for their needs
- lead them to have health problems.

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.....[4]

(ii) Suggest why the strategy used by the Namibian government could benefit both the people and the wildlife that share the same land.

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.....[3]

Section B

Answer **both** questions.

5 **(a)** The table shows the percentage of the Earth's land surface covered by some biomes.

biome name	percentage of Earth's land surface
desert	19
tundra	11
taiga	17
temperate forest	8
savanna	10
tropical rainforest	13

(i) State the biome which covers the largest area of the Earth's land surface.

.....[1]

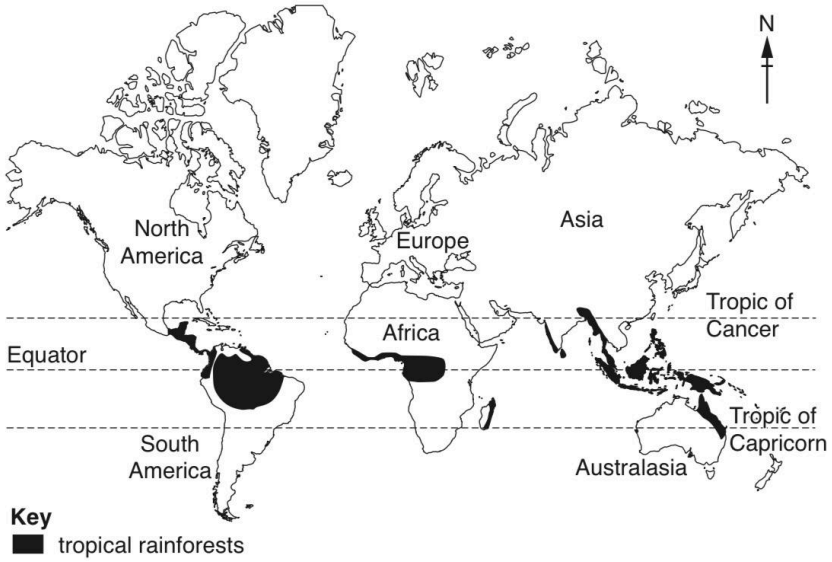
(ii) Calculate how much more of the Earth's land surface is covered by the taiga biome than the tundra biome.

.....% [1]

(iii) Calculate the total percentage of the Earth's land surface covered by the taiga, temperate forest and tropical rainforest combined.

.....% [1]

The map shows the distribution of tropical rainforest.



(b) Describe the distribution of tropical rainforest as shown on the map.

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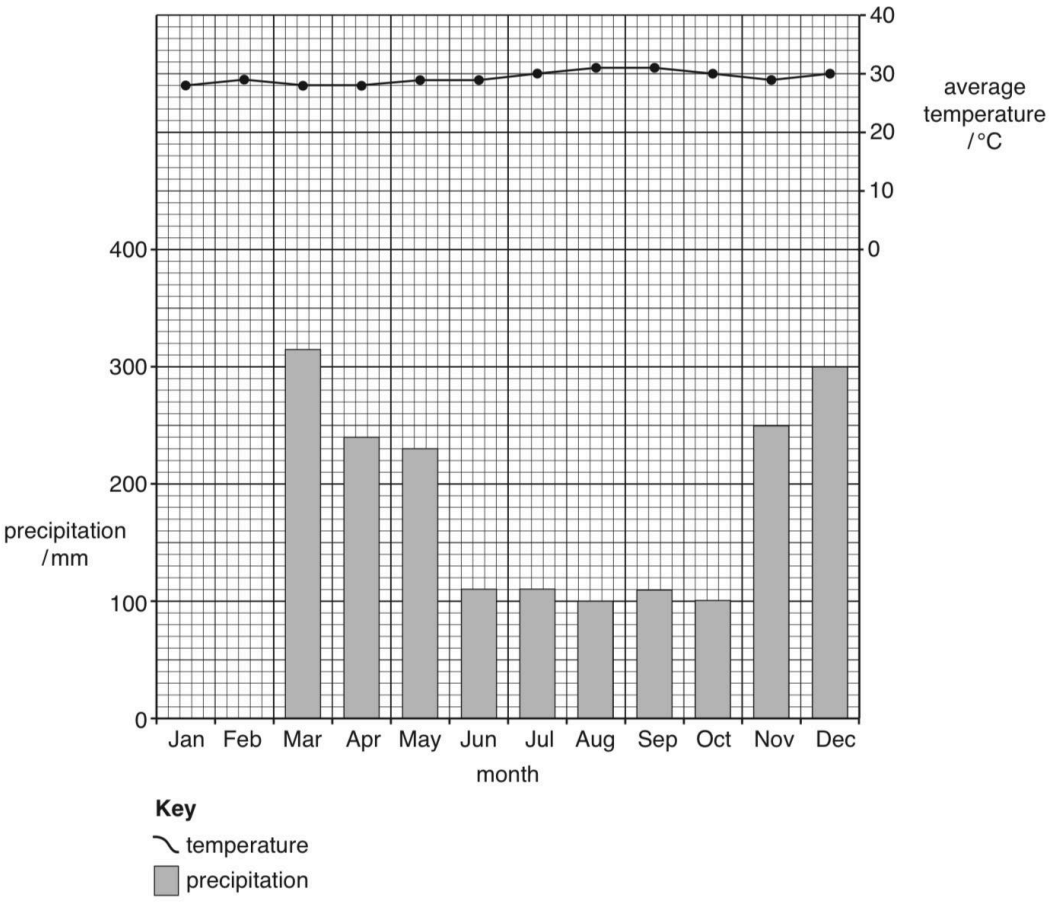
.....[3]

(c) The graph and table show climate information for a weather station in Brazil which has an equatorial climate.

(i) Using the information in the table, complete the rainfall graph for January and February. [2]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
average temperature /°C	28	29	28	28	29	29	30	31	31	30	29	30
precipitation /mm	380	310	315	240	230	110	110	100	110	100	250	300



(ii) Using the climate graph and the information in the table, describe the pattern of rainfall throughout the year.

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.....

.....[2]

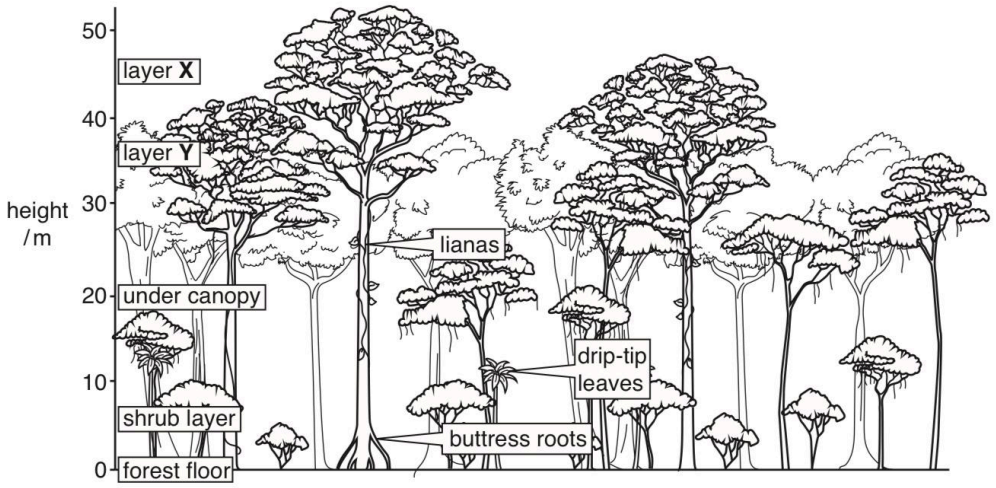
(iii) State a month with the highest average temperature.

.....[1]

(iv) Calculate the annual average temperature range.

.....°C [1]

(d) The diagram shows the layers of the tropical rainforest vegetation.



(i) State the name of the layer at:

X .....

Y .....

[2]

(ii) Estimate the height of the tallest tree shown in the diagram.

.....m [1]

(iii) Explain why rainforest trees have:

buttress roots

.....

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.....

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drip-tip leaves.

.....

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[4]

(e) Many areas of tropical rainforest are being cleared.

State **three** causes of deforestation in tropical rainforests.

1 .....

2 .....

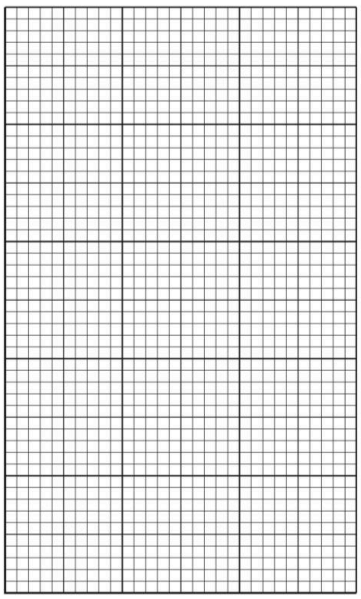
3 .....

[3]

(f) The table shows information about rainforests in Borneo.

year	percentage of land covered by rainforest
2010	44
2020 (predicted)	33

(i) Draw a bar graph to show this information.



[3]

(ii) Calculate the predicted decrease in the percentage of land covered by rainforest in Borneo between 2010 and 2020.

.....[1]

(iii) Suggest the impacts on local people of deforestation of the tropical rainforest.

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.....[4]

(g) Sustainable harvesting of hardwood trees can be a solution to tropical rainforest destruction. Do you agree or disagree with this statement? Give reasons for your answer.

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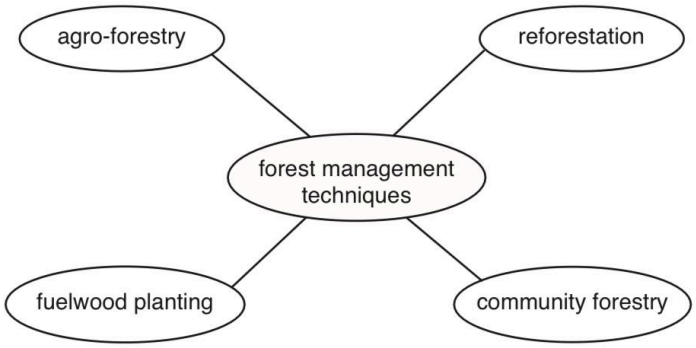
.....[4]

(h) The diagram shows forest management techniques.

Choose **two** and suggest how they could improve the sustainable management of forests.



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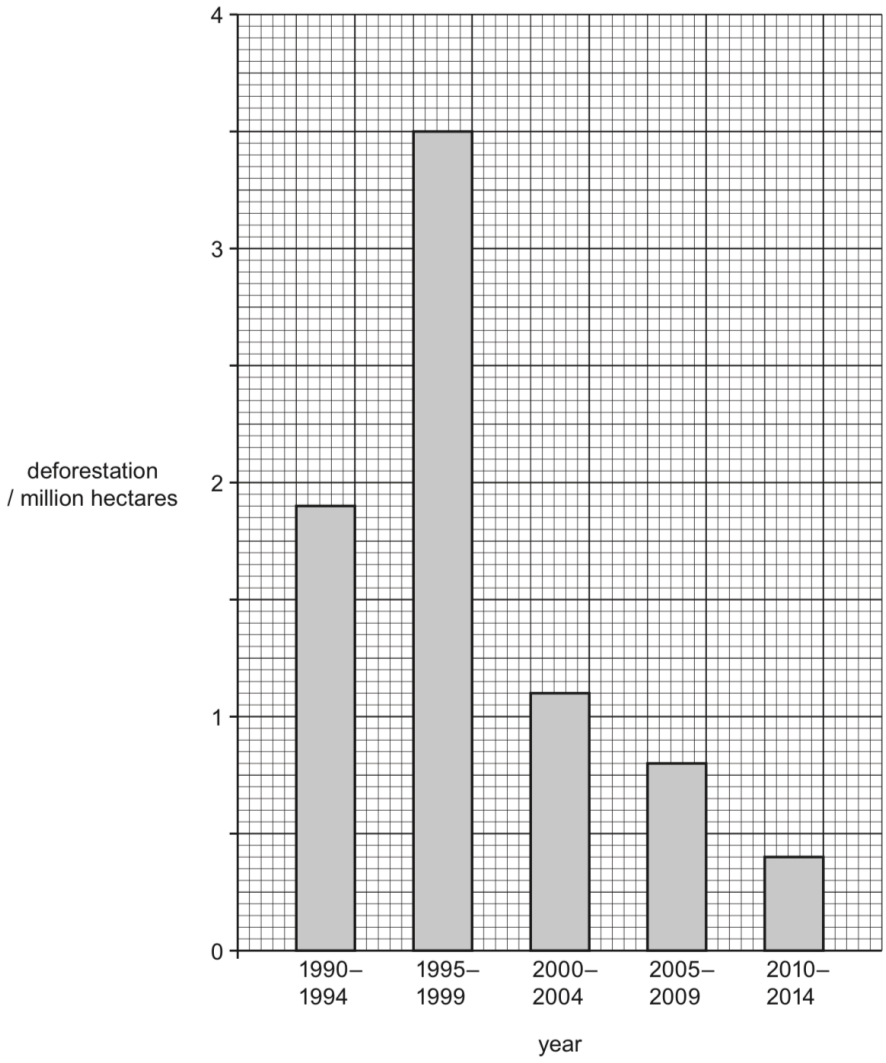
.....[6]

6 The bar chart shows deforestation rates in Indonesia between 1990 and 2014.



(a) Describe the changes in deforestation rates in Indonesia shown on the bar chart.

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..... [3]

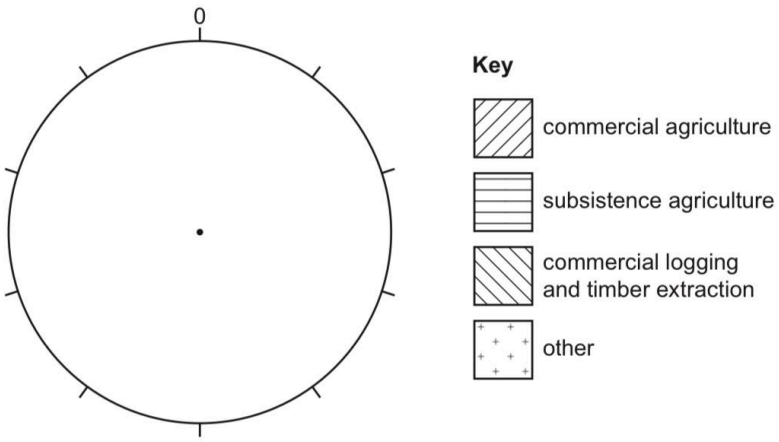
(b) The table shows the reasons for deforestation in Indonesia.

reason for deforestation	percentage of forest cleared
commercial agriculture	42
subsistence agriculture	34
commercial logging and timber extraction	19
other	5

(i) Complete the pie chart to show the reasons for deforestation in Indonesia.

Use the key provided.

reasons for deforestation in Indonesia



[3]

(ii) Define the terms *commercial agriculture* and *subsistence agriculture*.

commercial agriculture .....

.....

subsistence agriculture .....

.....

[2]

(iii) Suggest **one** reason for deforestation other than agriculture, commercial logging and timber extraction.

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..... [1]

(iv) Explain why some people want to stop further deforestation.

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..... [4]

(c) The diagram shows a wetland food chain.

algae → mosquito larvae → small fish → large fish → heron

(i) State the producer and tertiary consumer in the food chain.

producer .....

tertiary consumer .....

[1]

(ii) Complete the pyramid of energy for this food chain. The bar for algae has been completed for you.

[2]

(iii) Describe the process of photosynthesis.

.....

.....

.....

..... [2]

(d) The table shows the percentage rate of loss of wetlands between 1900 and 2010 for a country.

period	percentage loss of inland wetlands per year	percentage loss of coastal wetlands per year
1900–1940	0.85	0.39
1941–1974	1.48	1.73
1975–1990	1.63	1.44
1991–2010	0.48	0.85

Compare the percentage rate of loss of inland wetlands with that of coastal wetlands between 1900 and 2010.

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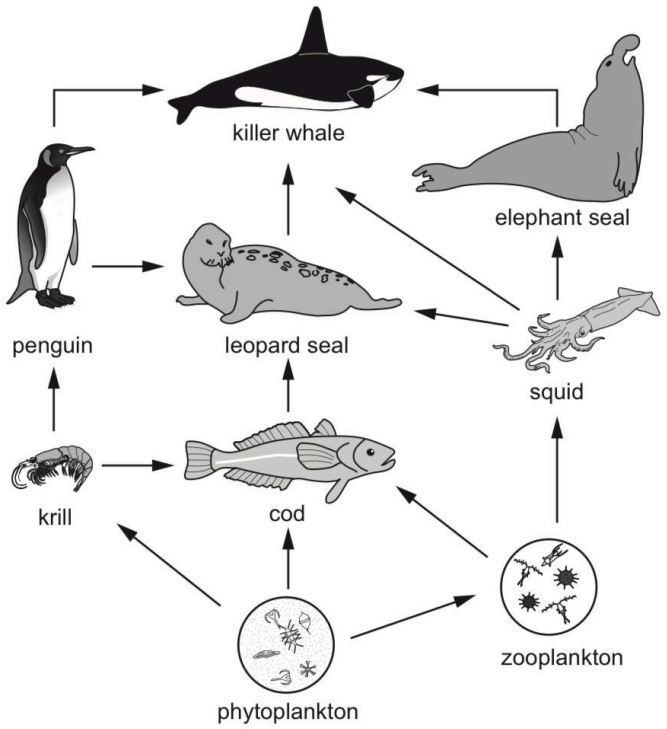
..... [2]

[Total: 20]

7 The diagram shows part of a food web in an ocean.



not to scale

(a) (i) Name a secondary consumer shown on this food web.

..... [1]

(ii) Use the food web to complete this food chain.

..... → **krill** → ..... → .....

[2]

(iii) Describe the impacts on this food web if the cod population decreases.

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..... [4]

(iv) Explain how energy is lost between trophic levels in a food chain.

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..... [2]

(b) Humans catch and eat cod.

Describe strategies to ensure a sustainable supply of cod as a food source for humans.

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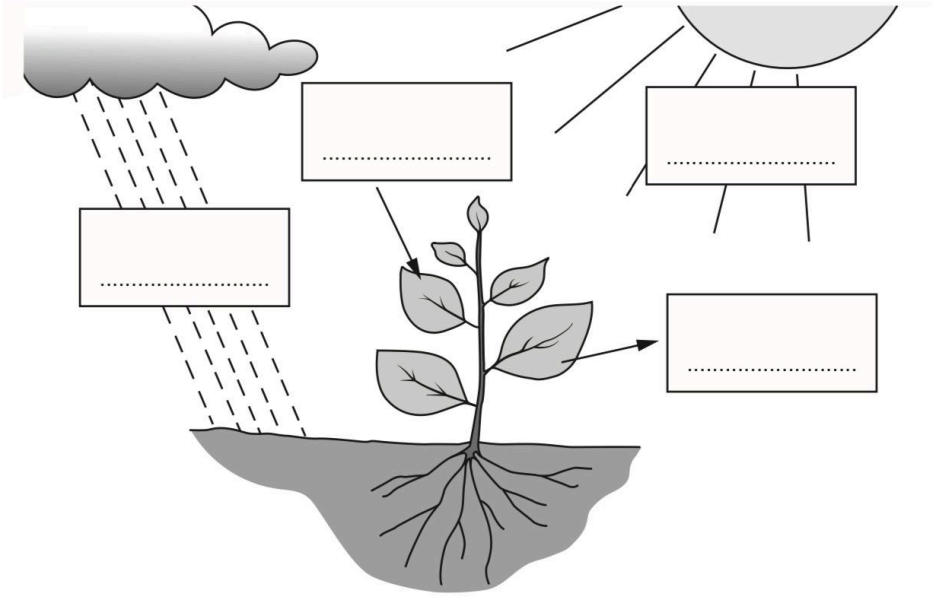
..... [4]

[Total: 13]

Section A

1 Green plants produce glucose by a process called photosynthesis.

The diagram shows the process of photosynthesis. The diagram is **not** complete.



(a) Complete the diagram by adding the words to the boxes.

carbon dioxide oxygen sunlight water [2]

(b) State the name of the green pigment in the leaves of green plants.

..... [1]

(c) State the name of the process in plants that **uses** glucose.

..... [1]

(d) Explain why crop yield increases when plants are grown in greenhouses.

.....

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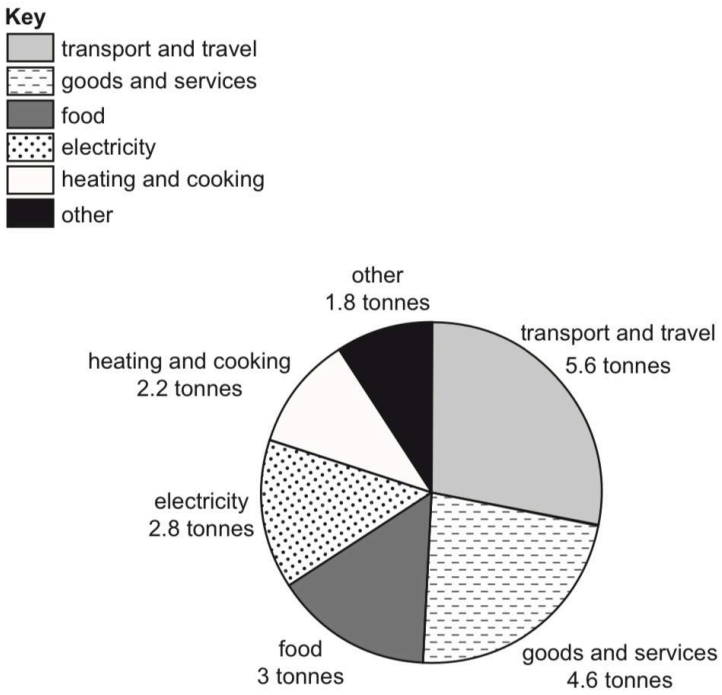
..... [2]

[Total: 6]

3 **(a)** The pie chart shows the annual carbon footprint for the average U.S. citizen by sector.



(i) State which sector makes the largest contribution to the annual carbon footprint.

..... [1]

(ii) Calculate the total annual carbon footprint in tonnes for the average U.S. citizen.

..... tonnes [1]

(iii) Calculate the percentage contribution of the electricity sector.

..... % [1]

(b) Suggest strategies that individuals can use to reduce their carbon footprints.

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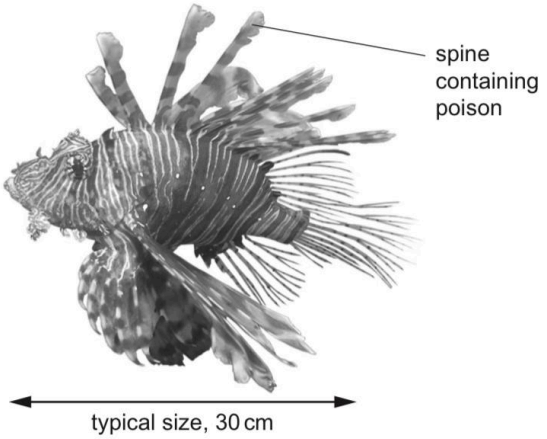
..... [2]

[Total: 5]

6 The fact sheet contains information about lionfish.

Lionfish fact sheet



Lionfish are native to the Indian Ocean.

Lionfish contain a poison in their spines which is a defence against any predators. Lionfish can eat any animal smaller than them. They have a large appetite.

Lionfish are sometimes kept as pets. In 1990, some pet lionfish in the USA were released into the Atlantic Ocean. Female lionfish can lay as many as 20 000 eggs every four days. The lionfish population in this area increased rapidly.

Scientists are concerned about the impact of lionfish on the ecosystem of the area.

(a) Explain why scientists are concerned about the impact of lionfish on the ecosystem of the area.

Use the fact sheet to support your answer.

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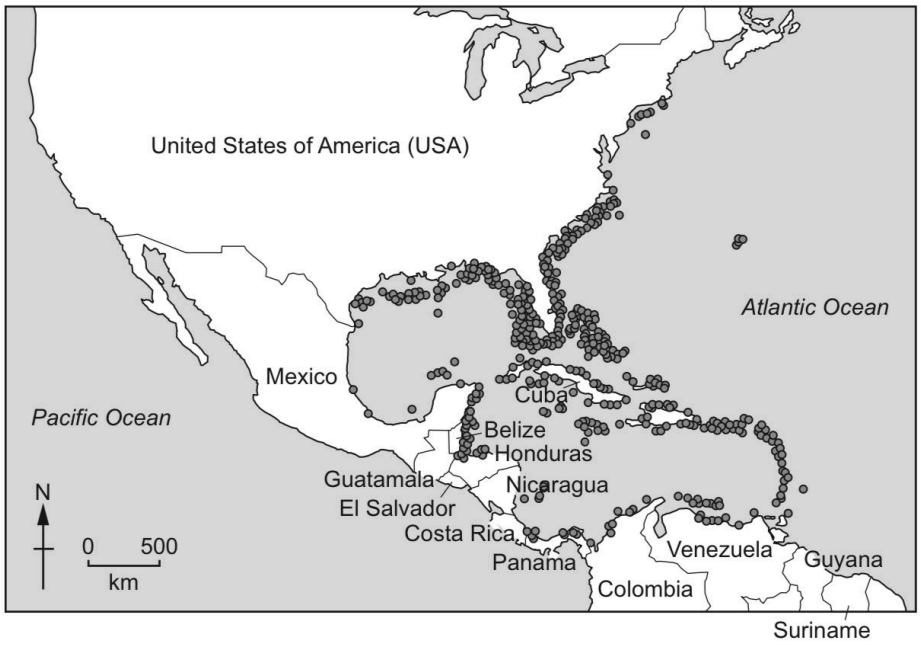
..... [4]

(b) The map shows the distribution of lionfish in the Atlantic Ocean in 2017.



Describe the distribution of lionfish shown on the map.

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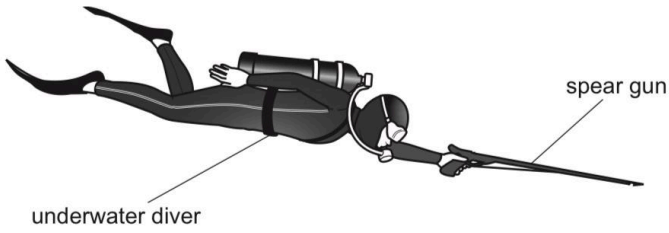
..... [3]

(c) Underwater divers are encouraged to spear the lionfish when they see them.



Suggest why spearfishing is a more environmentally friendly method of control compared with using a net.

.....

.....

.....

..... [2]

[Total: 9]

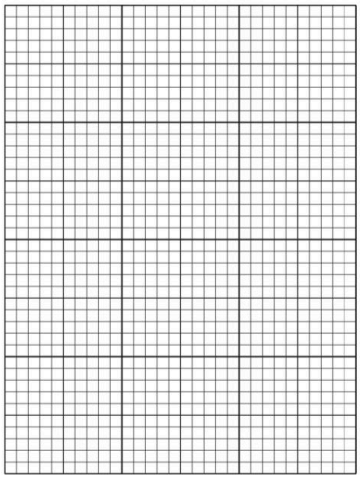
8 The northern white rhinoceros is an endangered species of animal.

The table shows population data about this rhinoceros.

year	wild population	captive population	total population
1939	2500	8	2508
1959	2000	7	2007
1979	500	15	515
1999	.....	11	41
2019	0	2	2

(a) (i) Complete the table for the **wild** population in 1999. [1]

(ii) Plot a bar chart for the **captive** population between 1939 and 2019.



[4]

(iii) Suggest why keeping the northern white rhinoceros in captivity has **not** increased its population.

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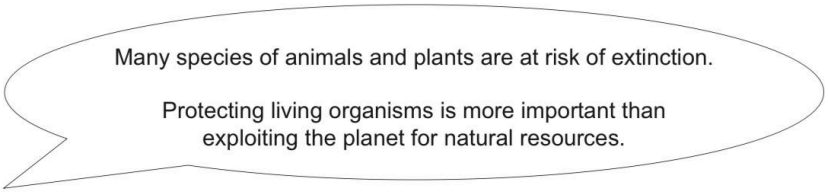
..... [2]

(b) A scientist says:



To what extent do you agree with this statement? Give reasons for your answer.

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..... [6]

[Total: 13]

3 The photograph shows part of a forest.

(a) Describe the activity that has happened in this part of the forest.

..... [1]

(b) Explain why there is a risk of soil erosion in this part of the forest.

.....

.....

.....

..... [2]

(c) State **two** reasons, other than soil erosion, why forests need to be conserved.

1 .....

2 .....

[2]

[Total: 5]

8 A newspaper article said:

Tree species threatened with extinction

Scientific research reports that 30% of the world's tree species are threatened with extinction in the wild.

17 500 tree species are threatened with extinction.

The threats include:

- forest clearance for crops (affecting 29% of species)
- logging (27%)
- clearance for livestock grazing or farming (14%)
- clearance for development (13%)
- fire (13%)
- other (4%).

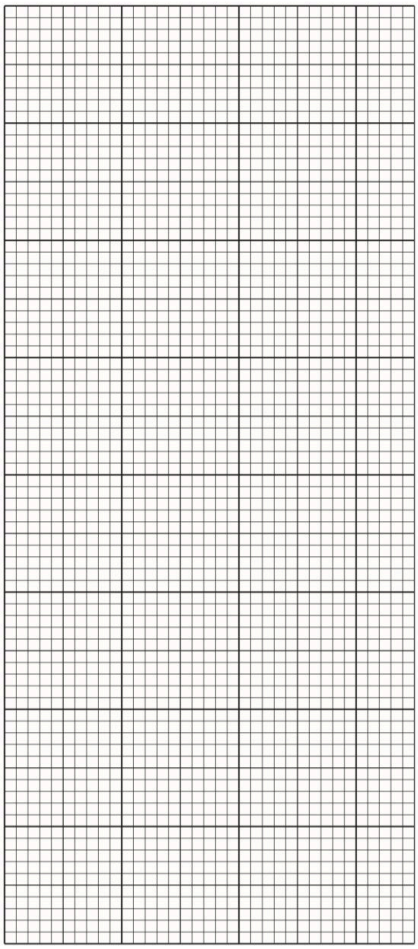
Scientists demand that action is taken to prevent the extinction of these species.

(a) (i) Calculate the number of tree species in the world.

number of tree species = ... [1]

(ii) Draw a bar chart to show the threats to tree species.

Use the information in the article.



[4]

(iii) 4% of tree species are threatened with extinction for other reasons.

Suggest **two** of these other threats.

1 .....

.....

2 .....

.....

[2]

(b) Extractive reserves and seed banks are two ways to reduce the threat of extinction of these tree species.

Explain how these methods reduce the threat of extinction.

extractive reserves .....

.....

.....

.....

seed banks .....

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.....

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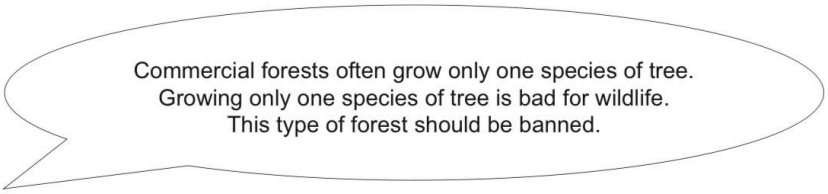
[4]

(c) A student says:



To what extent do you agree with this statement?

Give reasons for your answer.

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..... [6]

[Total: 17]