UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

ENVIRONMENTAL MANAGEMENT **5014/22**

Alternative to Coursework **October/November 2012**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Calculator
Ruler

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Study the appropriate source materials (on pages 2 and 3 of this question paper) before you start to write your answers.
Credit will be given for appropriate selection and use of data in your answers and for relevant interpretation of these data. Suggestions for data sources are given in some questions.
You may use the source data to draw diagrams and graphs or to do calculations to illustrate your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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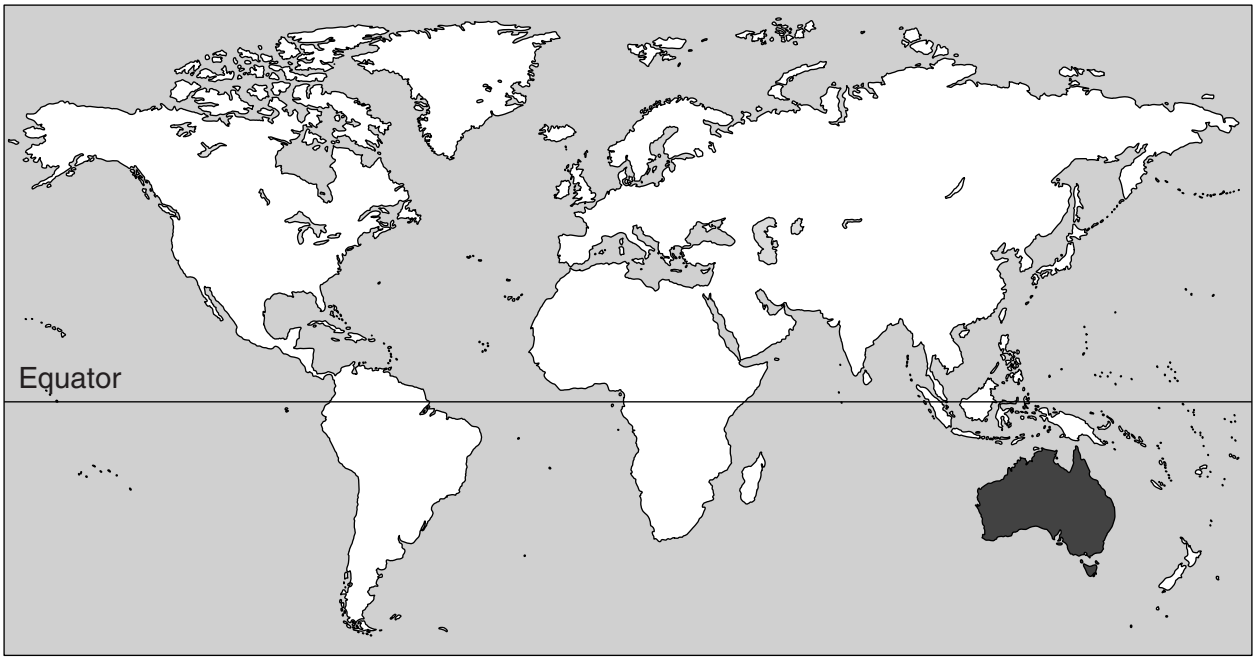
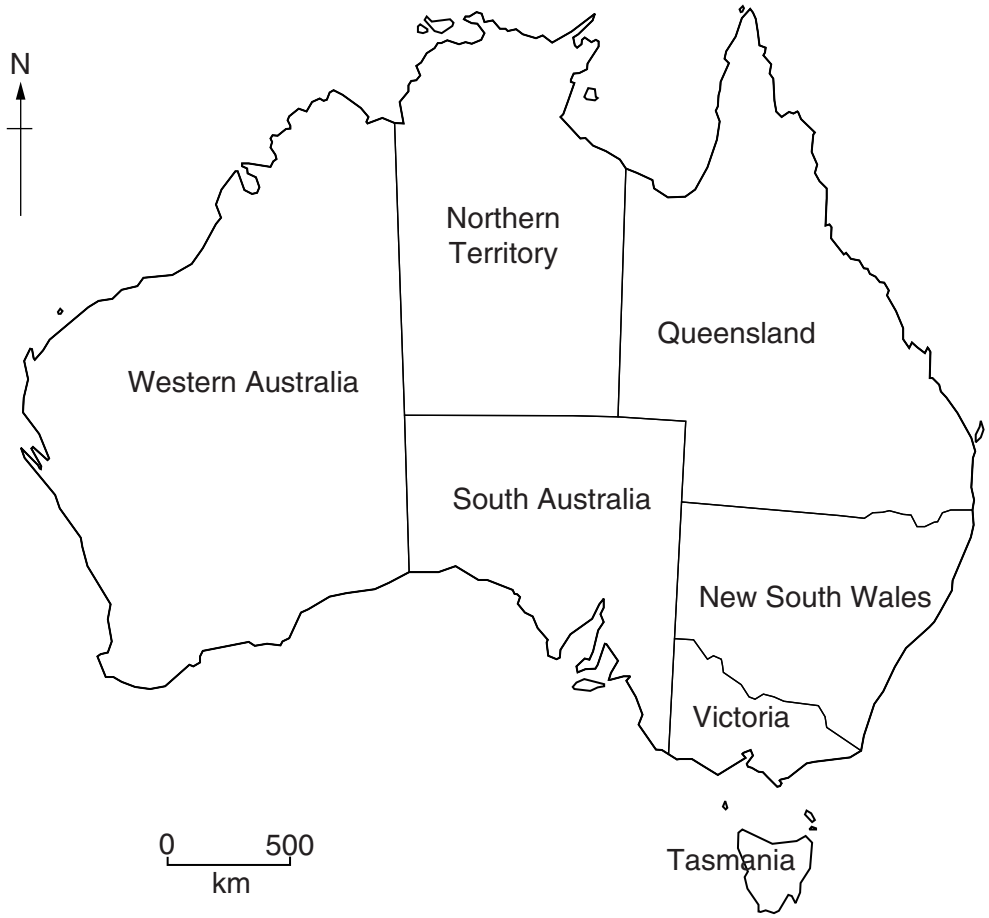
1	
2	
3	
Total	

This document consists of **16** printed pages.

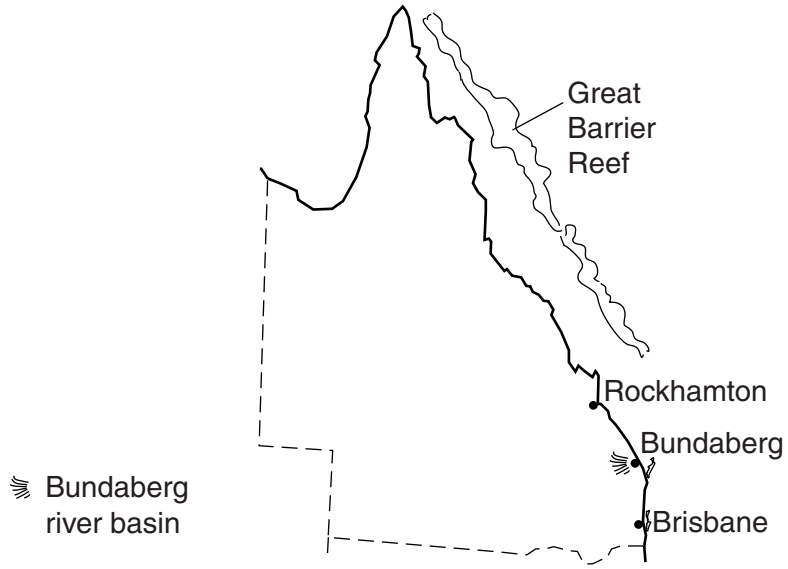
World map showing the location of Australia



Map of Australia with states



Map of Queensland



Area of Australia: over 7 600 000 sq km
Population: 22.5 million
Children per woman: 1.78
Life expectancy: 81 years
Currency: Australian Dollar (1.10 AUD = 1US$)
Language: English and over 150 Aboriginal languages
Climate of Queensland: wet tropical along the northern and eastern coasts, semi-desert and desert further into the interior
Terrain of Queensland: fertile coastal lowlands, low desert plateau in the interior
Main exports of Australia: coal, iron ore, gold, meat, wool, alumina, wheat and machinery

Australia is an island continent with a large desert interior. Australia has extensive natural resources, although most of the population live close to the east coast, especially towards the south. Queensland is one of the states: it has an area of nearly 2 million square kilometres and a population of 4.5 million. Queensland has extensive irrigated agricultural areas as well as large coalfields. The coal is mined for domestic power generation and for export, particularly to China.

[Turn over

1 **(a)** **(i)** Calculate the percentage of the total Australian population that live in Queensland.

.....[1]

(ii) Suggest the advantages to Queensland and Australia of having large coalfields.

Queensland .....

.....

Australia .....

.....[2]

(b) The table shows data for a weather station in northern Queensland.

month	average daily temperature / °C	average monthly rainfall / mm	average number of wet days per month
January	28	277	15
February	28	285	12
March	27	183	10
April	25	84	6
May	23	33	5
June	21	36	4
July	20	15	3
August	21	15	3
September	23	18	2
October	25	33	4
November	27	48	5
December	28	137	12

(i) Which is the coolest month of the year?

.....[1]

(ii) Which is the driest time of the year?

.....[1]

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(iii) The northern and eastern parts of Queensland are often hit by cyclones between December and March. In December 2010 much of Queensland suffered its worst floods for 100 years.

The table below shows data for the weather station in northern Queensland for four different months. In the column labelled **month**, write December 2010 in the row with the correct data for December 2010.

month	average daily temperature / °C	monthly rainfall / mm	number of wet days
.....	28	137	12
.....	20	15	3
.....	27	209	22
.....	28	150	13

[1]

(iv) Suggest how the worst flooding in 100 years could have affected the mining and exporting of coal.

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.....[3]

(c) The Authorities in Queensland are keen to develop a new opencast coal mine. One possible location for the mine is shown below.

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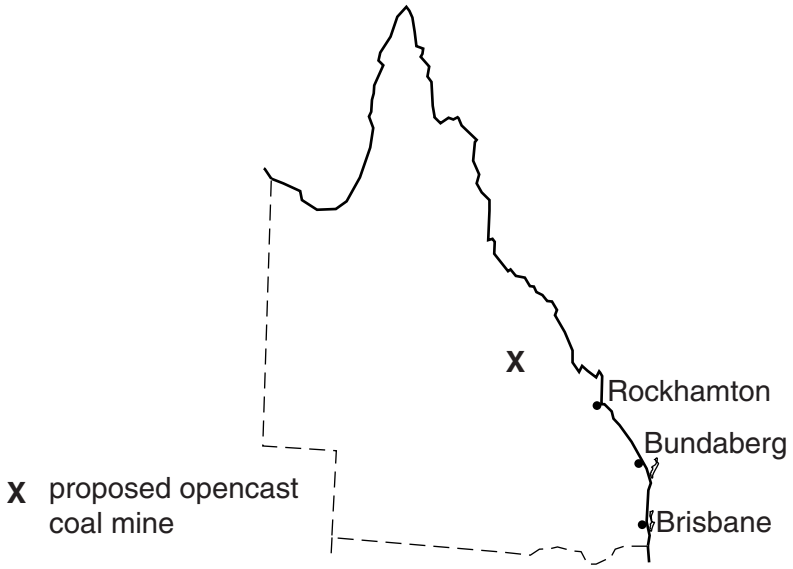

Local people were asked to fill in a questionnaire by the authorities to find out their views about the proposed development of the new opencast coal mine. The results are shown below.

	percentage responses to questionnaire		
	Yes	**No**	**Do not know**
1. Do you expect more local people to be employed by the mining project?	42	46	12
2. Do you think the mining project will improve the transport links in the area?	60	25	15
3. Have you any worries about the environmental impact of the mining project?	35	55	10

(i) Describe how the information for the questionnaire might have been gathered.

.....

.....

.....

..... [2]

(ii) Explain how the information from this questionnaire survey was processed.

.....

.....[1]

(iii) Suggest why the majority of local people had no worries about the environmental impact of the mining project.

.....

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.....

.....[2]

(d) (i) Crops have been grown, using irrigation, for many years in the Bundaberg river basin. As a result salinisation is now a big problem in parts of the river basin.

When asked to describe the process of salinisation, one student answered with this list of statements.

A Irrigation water soaks into the soil to great depth.

B Water and salts are drawn up to the surface.

C Water evaporates from the field.

D Salts dissolve in the water at great depth.

E Salt remains at the surface and kills plant roots.

The student has written the correct statements but they have been presented in the wrong order.

The correct order is

1st	2nd	3rd	4th	5th .....**E**.....

[2]

(ii) Explain how a high salt concentration can kill plants.

.....

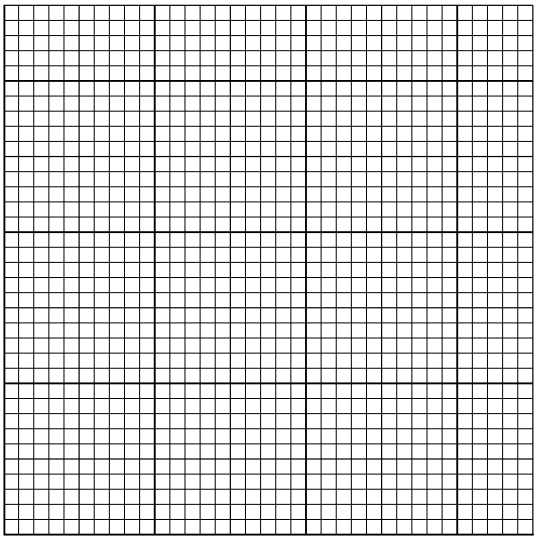
.....[1]

[Turn over

(e) A farmer in this region kept a record of the total yield of maize from some irrigated fields over six years. The data are shown in the table.

year	yield/tonnes per hectare
2003	9.8
2004	9.8
2005	9.5
2006	9.3
2007	9.1
2008	8.9

(i) Draw a graph of the values shown in the table.



[4]

(ii) Suggest a likely yield for 2009.

.....[1]

(iii) Farmers add fertilisers to irrigated fields to increase yields. They carefully calculate the amount of fertiliser that needs to be added so that the greatest amount of the applied fertiliser is absorbed by the crop.

For economic reasons it is important for farmers to calculate carefully the amount of fertiliser to be added. Explain why.

.....

.....

.....[2]

(iv) Some parts of the lower river basin already have an increased concentration of nitrates and phosphates, even though the farmers have carefully calculated the amounts of fertilisers being added.

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Describe how the increased concentration of nitrates and phosphates can change the plant and animal populations in the river.

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.....[4]

For Examiner's Use

2 **(a)** The Great Barrier Reef is the largest coral reef system in the world. It provides a habitat for many species. Its biodiversity is high and it is a protected world heritage site.

(i) What does the term *biodiversity* mean?

.....

.....[1]

(ii) For many years the reef has been commercially valuable for fishing and tourism.

Recent surveys of the reef have found

- the Queensland sawfish is now an endangered species
- three fish species are close to being endangered
- fewer fish are being caught
- the fish being caught are smaller

In 2004 the government declared one third of the reef area as a 'no catch' ('no fish') zone.

Describe how a researcher could carry out a new survey to find out if fish populations in the no catch zone are recovering.

.....

.....

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.....

.....[4]

(iii) Explain the advantages of the no catch zone to the people of Queensland and Australia.

1. Queensland .....

.....

2. Australia .....

.....[2]

(iv) The remaining two thirds of the reef can still be fished commercially, but only with restrictions to prevent overfishing.

State two restrictions and explain how they help prevent overfishing.

1. restriction .....

explanation .....

.....

2. restriction .....

explanation .....

.....[4]

(b) Coral reefs are made of living animals called polyps. They make calcium skeletons. The colonies of polyps form hard coral structures. The polyps provide a home for photosynthetic algae which produce a range of colours. If sea-water becomes too hot the algae die, so that the coral loses its colour and looks white. This process is called coral bleaching.

Some scientists think that coral bleaching occurs due to natural changes in the Earth's climate. Other scientists think that human activity is to blame.

(i) Suggest one human activity which could lead to coral bleaching and explain how it happens.

activity .....

explanation .....

.....[2]

(ii) Coral bleaching events can be recorded from satellites as well as from direct surface observations of reefs.

Suggest one advantage of using satellites for recording bleaching events.

.....

.....[1]

(iii) The photosynthetic algae usually start to re-colonise the coral polyps when the sea-water cools again. However, if the sea-water remains too hot for too long then the algae cannot return, so the coral polyps die. The whole coral reef dies.

Describe the relationship that exists between the coral polyp and the algae.

.....

.....

.....[2]

(c) A typical food chain for the water around a coral reef is shown below. Phytoplankton consists of photosynthetic algae that float in the water.

phytoplankton → zooplankton → reef worms → parrot fish → reef shark

(i) If the phytoplankton die because the sea-water becomes too hot, what happens to reef worms? Give a reason for your answer.

.....

.....

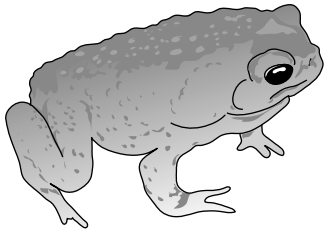
.....[2]

(ii) In an area where fishing is allowed large numbers of parrot fish are caught. What might happen to the populations of reef worms and reef sharks when this happens?

reef worms .....

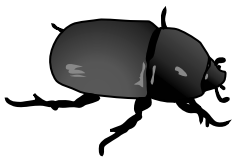
reef sharks .....[2]

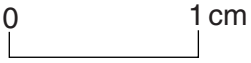
3 **(a)** The cane toad was introduced from South America into the sugar cane fields of Queensland in 1935 to control cane beetles.



Fact sheet about cane toads

- eat many species of invertebrates
- cannot climb like native frogs
- produce a powerful poison





Fact sheet about cane beetles

- adults mate in the soil
- larvae only live in soil for 10 weeks
- adults live and feed on sugar cane leaves

(i) The cane toad failed to control the cane beetle. Suggest an explanation for this.

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.....[3]

(ii) The cane toad population increased dramatically and the toad is now a big pest in Queensland. A student wanted to know more about the population of cane toads in a sugar cane plantation. The student:

- selected 10 sample points in a field using a map
- spent five minutes at each site counting toads and recording the numbers in a tally chart
- repeated the count on five days
- recorded the results in a table

day	**total number of cane toads counted from all 10 sample points**
1	23
2	15
3	18
4	12
5	22
total	.....

Complete the table. [1]

(iii) Calculate the average number of toads counted per day.

Space for working.

.....[1]

(b) The student decided to carry out the same survey in two other sugar cane plantations. The student recorded his survey in a notebook.

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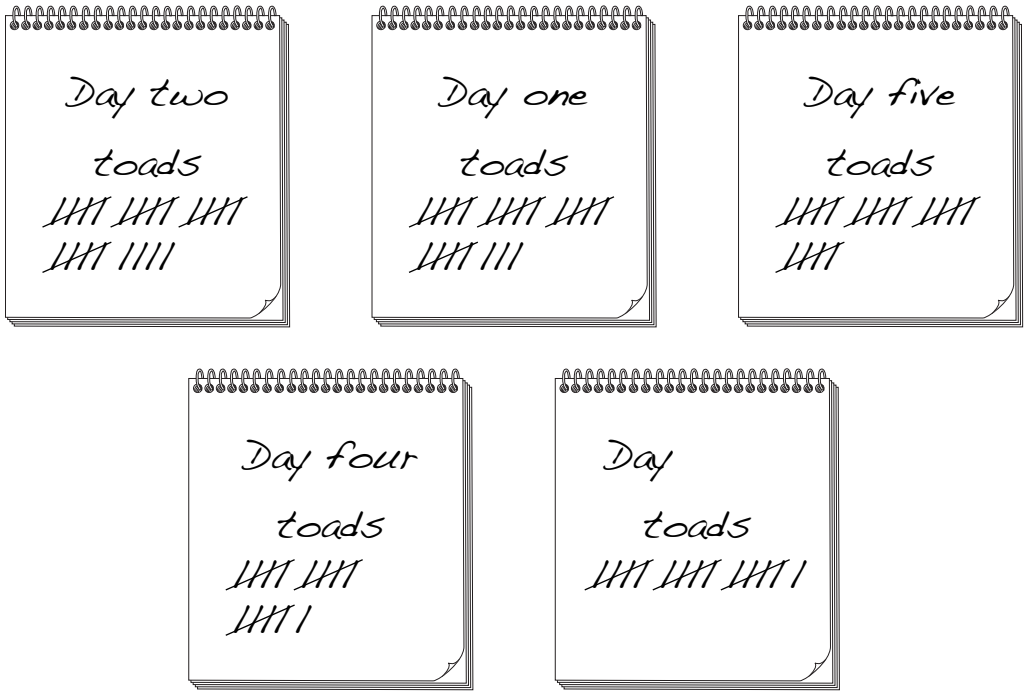

(i) Draw a table in the space below and rearrange the student's findings in the best way.

[3]

(ii) Look at the diagram which gives life cycle information about cane toads.

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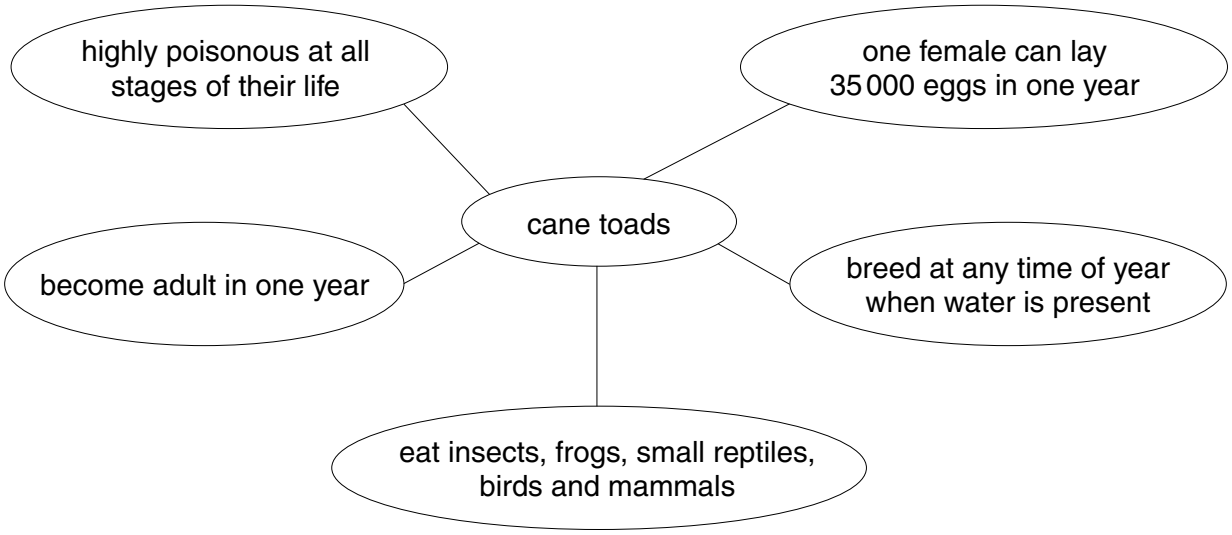

Explain why the cane toad has become a serious pest in Queensland.

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.....[4]