Surname	Centre Number	Candidate Number
Other Names		0

GCSE

C400UB0-1

S19-C400UB0-1

BIOLOGY – Component 2
Applications in Biology

HIGHER TIER

FRIDAY, 7 JUNE 2019 – AFTERNOON

1 hour 15 minutes

C400UB01
01

	For Examiner's use only		
	Question	Maximum Mark	Mark Awarded
Section A	1.	15	
Section B	2.	11	
	3.	6	
	4.	7	
	5.	9	
	6.	12	
	Total	60	

ADDITIONAL MATERIALS

In addition to this examination paper you will require a calculator and a ruler.

A Resource Booklet for use with Section A.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

This paper is in 2 sections, **A** and **B**.

Section **A**: 15 marks. Read the article in the resource booklet carefully then answer **all** questions. You are advised to spend about 25 minutes on this section.

Section **B**: 45 marks. Answer **all** questions. You are advised to spend about 50 minutes on this section.

The number of marks is given in brackets at the end of each question or part-question.

The assessment of the quality of extended response (QER) will take place in question **3**.

Examiner only

SECTION A

Read the article in the resource booklet carefully and answer **all** *the questions that follow.*

1. *(a)* (i) State what is meant by biodiversity. [1]

.....

.....

(ii) Give **two** examples of why biodiversity is important to humans. [2]

.....

.....

(iii) Give an example of how biodiversity can be protected. [1]

.....

.....

(b) (i) Explain how algae provide energy for coral polyps. [2]

.....

.....

(ii) Suggest why corals can survive for a while after the algae have been expelled. [1]

.....

.....

(iii) Using information from the map, calculate the number of coral reefs in the Northern sector of the Queensland coast which were severely bleached in April 2016. [2]

Number of reefs = ...

Examiner only

(iv) Using the diagram and graph, suggest why coral bleaching has occurred more often since 2000 compared to before 1980. [3]

.....

.....

.....

.....

.....

.....

(v) Suggest why it is important that scientists monitor sea temperatures over a long period of time. [1]

.....

.....

(c) State what is meant by 'alien weeds' and explain why they 'blanketed the wetland and squeezed out native species'. [2]

.....

.....

.....

.....

C400UB01 03

15

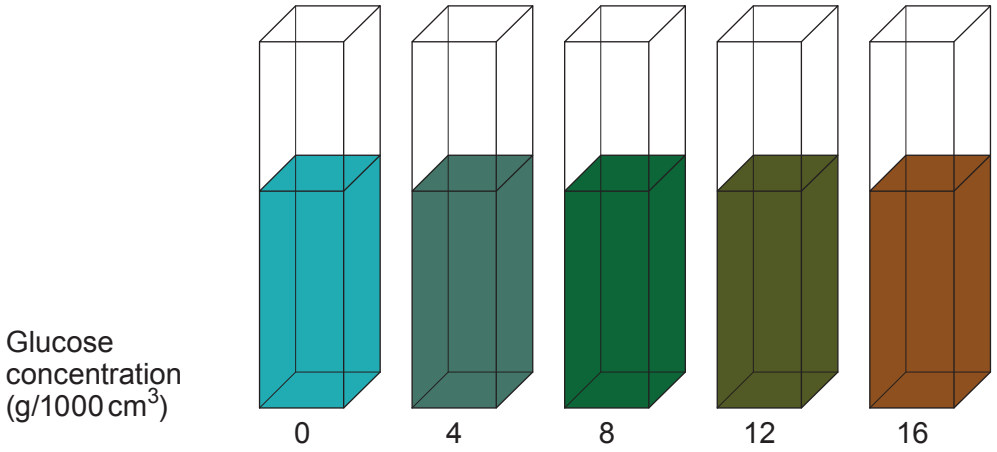
Examiner only

SECTION B

Answer **all** *questions.*

2. A group of students tested a range of glucose solutions of known concentrations using a laboratory test.

A photograph of their results is shown below:



(a) Describe how the students would have carried out the test for glucose. [2]

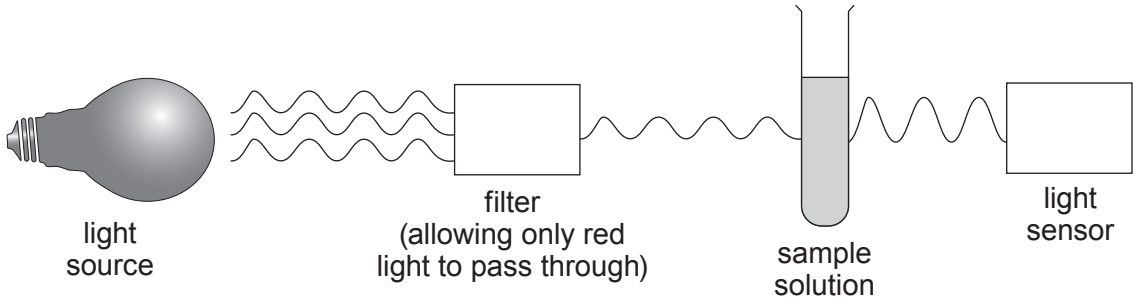
.....

.....

.....

.....

The students then used a colorimeter to measure the percentage of light at 600 nm (red light) that could pass through each of the known concentrations as shown below.

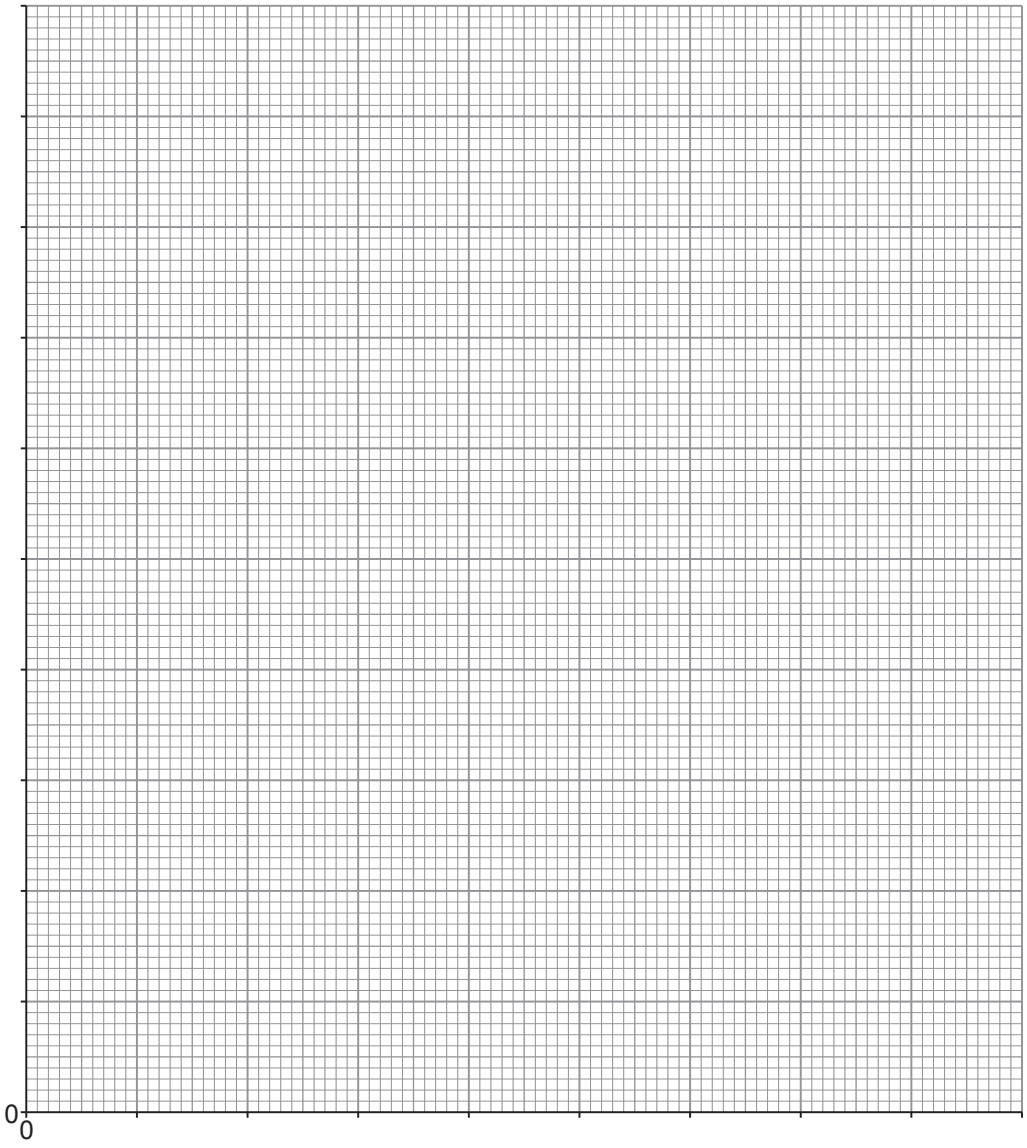


Examiner only

The results are shown below.

Glucose concentration ($g/1000\,cm^3$)	Percentage of light passing through the solution
0	100
4	38
8	22
12	14
16	9

(b) (i) Use the data in the table to draw a graph on the grid below. [5]



Examiner only

(ii) The students carried out the same test on a sample of an energy drink that had been diluted by a factor of ten.
The percentage of light passing through the sample of energy drink was 11%.

Using your graph, calculate the mass of glucose in a 500 cm^3 can of an energy drink. [3]

Mass of glucose in 500 cm^3 = ... g

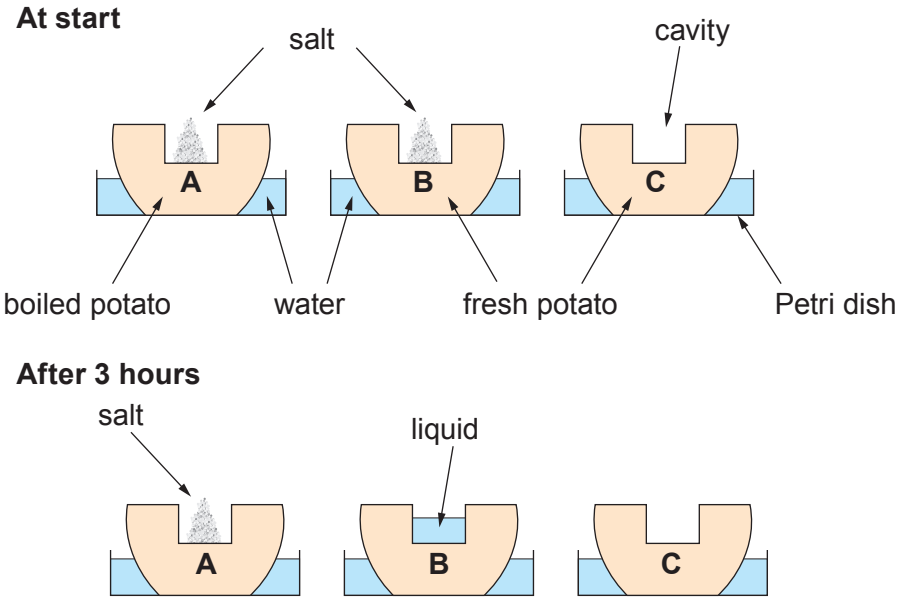
(iii) Name **one** non-communicable disease linked to high levels of sugar in the diet. [1]

.....

11

Examiner only

3. A class of students observed the following demonstration.
Three freshly peeled half-potatoes were placed in Petri dishes containing distilled water.
A cavity was cut into each potato half. Potato **A** had been placed in boiling water for a few minutes and allowed to cool before the start of the demonstration. An equal mass of salt was placed in the cavity of potato **A** and **B**, whilst the cavity in potato **C** was left empty. All three potatoes were then left for 3 hours.
A diagram of the demonstration is shown below.



Explain the results for potatoes **A**, **B** and **C**. [6 QER]

C400UB01
07

Examiner only

4. The article below was taken from a newspaper in 2014.

"The Manuka Honey Scandal: Manuka honey is ever more prized for its health benefits. But with more being sold than is actually produced, is there some dodgy dealing going on?"

The Independent 1/7/2014

According to data collected in 2014, approximately 1800 tonnes of Manuka honey was sold in the UK. However, production of genuine Manuka honey from New Zealand for the same year was estimated to be only 1700 tonnes.
Manuka honey is produced by honey bees *(Apis mellifera)* which forage on the Manuka tree *(Leptospermum scoparium)* in New Zealand. Manuka honey is an effective anti-microbial substance and is often sold at a price of over £100/kg.

The following test can be used to assess the effectiveness of anti-microbial substances in a school laboratory.

1. Use forceps to dip a filter paper disc in a solution of the substance being investigated.
2. Allow the filter paper disc to dry for five minutes.
3. Use forceps to place the filter paper disc on an agar plate already seeded with bacteria.
4. Label the agar plate and incubate for 3 days.
5. Observe the plates after 3 days.

(a) (i) State the purpose of basic aseptic techniques. [1]

.....

.....

(ii) Give **two** examples of basic aseptic techniques that should be used when following the method above. [2]

.....

.....

.....

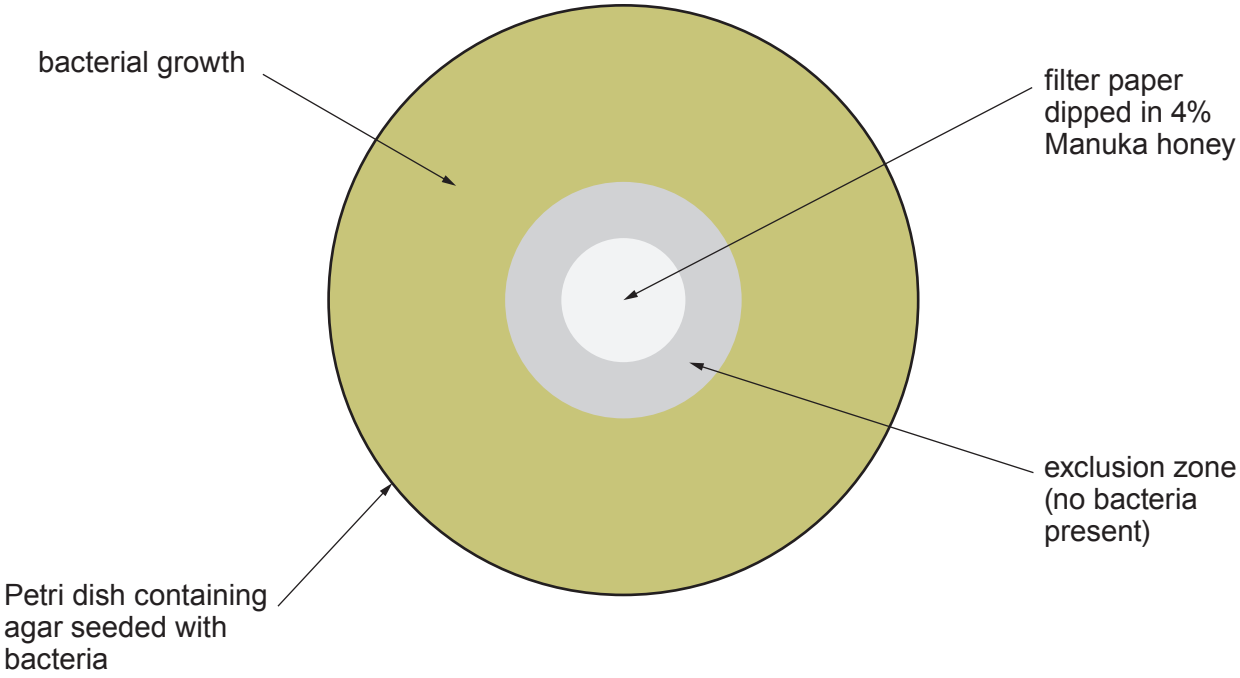
.....

(iii) State a suitable temperature to incubate the agar plates in a school laboratory. [1]

..... °C

Examiner only

The diagram below shows the result for an experiment testing a 4% concentration of Manuka honey.



(b) Explain why there are no bacteria present in the exclusion zone labelled on the agar plate above. [2]

.....

.....

(c) A study published in 2013 by the School of Veterinary Medicine at the University of Glasgow showed that Scottish heather honey was also an effective anti-microbial. Suggest **one** advantage of using Scottish heather honey as an anti-microbial substance compared to Manuka Honey from New Zealand. [1]

.....

.....

.....

.....

7

Examiner only

5. The photograph below shows a transverse section (T.S.) of a normal coronary artery.

(a) **Draw a low power plan** of the artery shown above in the space below and label **three** parts of the artery you can see in the photograph. [4]

Examiner only

(b) The actual length of the line **X – Y**, shown on the photograph, is 3200 µm. Calculate the magnification of the photograph. [3]

Magnification of photograph = × .....

(c) Suggest how the length of the line **X – Y,** would differ in an individual affected by cardiovascular disease and explain the difference. [2]

.....

.....

.....

.....

9

Examiner only

6. Black and white photographic film consists of a sheet of plastic coated with a mixture of gelatine, which is a protein, and silver halides. The gelatine holds the silver halides in place on the plastic sheet. If the photographic film is exposed to light the silver halides turn black in colour.
Trypsin is a protein digesting enzyme which is produced by the pancreas.

An experiment was carried out to investigate the effects of pH on the action of trypsin.
The following method was used:

1. Place 5 cm^3 of a solution of 5% trypsin in a test tube.
2. Add 5 cm^3 of a buffer solution of pH 6 to the test tube. (A buffer solution keeps the pH constant without interfering with the reaction).
3. Add exposed photographic film to the test tube.
4. Record the time taken for the photographic film to become clear.
5. Repeat steps 1-4 once more.
6. Repeat steps 1-5 using buffer solutions of pH 7, 8, 9 and 10.

The results of the experiment are shown in **table 1**.

Table 1

pH	Time taken for the photographic film to become clear (s)		
	Trial 1	Trial 2	Mean
6	No reaction	No reaction	No reaction
7	864	784	824
8	369	320	345
9	424	400	412
10	680	641	661

(a) In this investigation, state the:

(i) independent variable; [1]

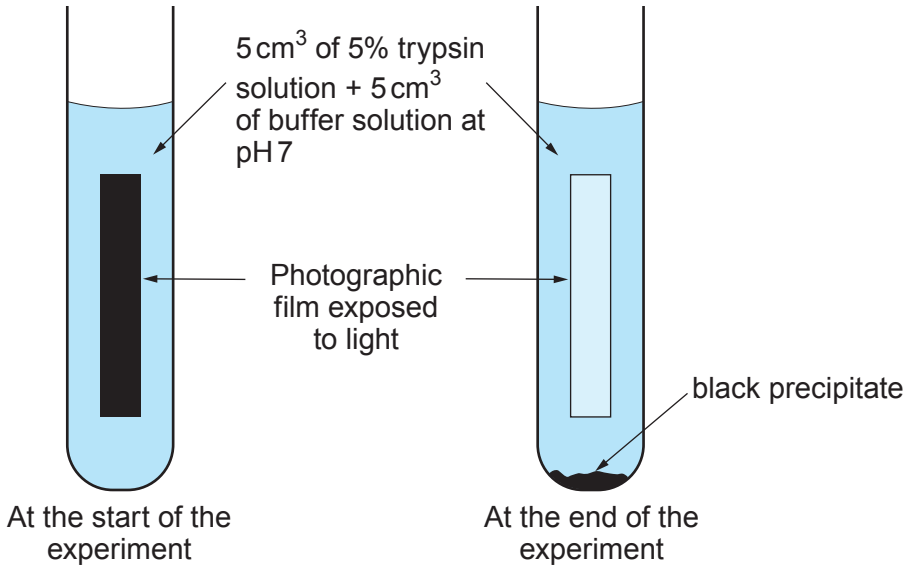
.....

(ii) dependent variable. [1]

.....

Examiner only

The diagram below shows one result for a tube at pH 7.



(b) (i) Explain why the photographic film became clear in the diagram above. [2]

.....

.....

.....

(ii) Explain why there was no reaction in the tubes at pH 6. [3]

.....

.....

.....

(c) Using the results from **table 1**, state the optimum pH for trypsin. [1]

.....

The experiment was repeated using buffer solutions with a pH of 7, 7.5, 8, 8.5 and 9. The results are shown in **table 2**.

Table 2

pH	Time taken for the photographic film to become clear (s)			
	Trial 1	Trial 2	Trial 3	Mean
7	768	834	784	795
7.5	341	432	362	378
8	305	379	341	342
8.5	319	324	408	350
9	504	499	414	472

Examiner only

(d) Using the results from both **tables 1** and **2**, suggest why the experiment was repeated and what conclusion can be drawn from both sets of results. [2]

.....

.....

.....

.....

(e) Suggest **one** source of inaccuracy in this investigation and an improvement. [2]

.....

.....

.....

.....

12

END OF PAPER

BLANK PAGE

GCSE

C400UB0-1A

S19-C400UB0-1A-R1

BIOLOGY – Component 2
Applications in Biology

HIGHER TIER

FRIDAY, 7 JUNE 2019 – AFTERNOON

RESOURCE BOOKLET
for use in Section A

Coral Bleaching and the Great Barrier Reef

A coral reef is an area of coral that lies beneath the surface of water. Coral reefs provide a habitat for a third of all marine biodiversity. They also provide coastal protection from big waves, storms and floods.

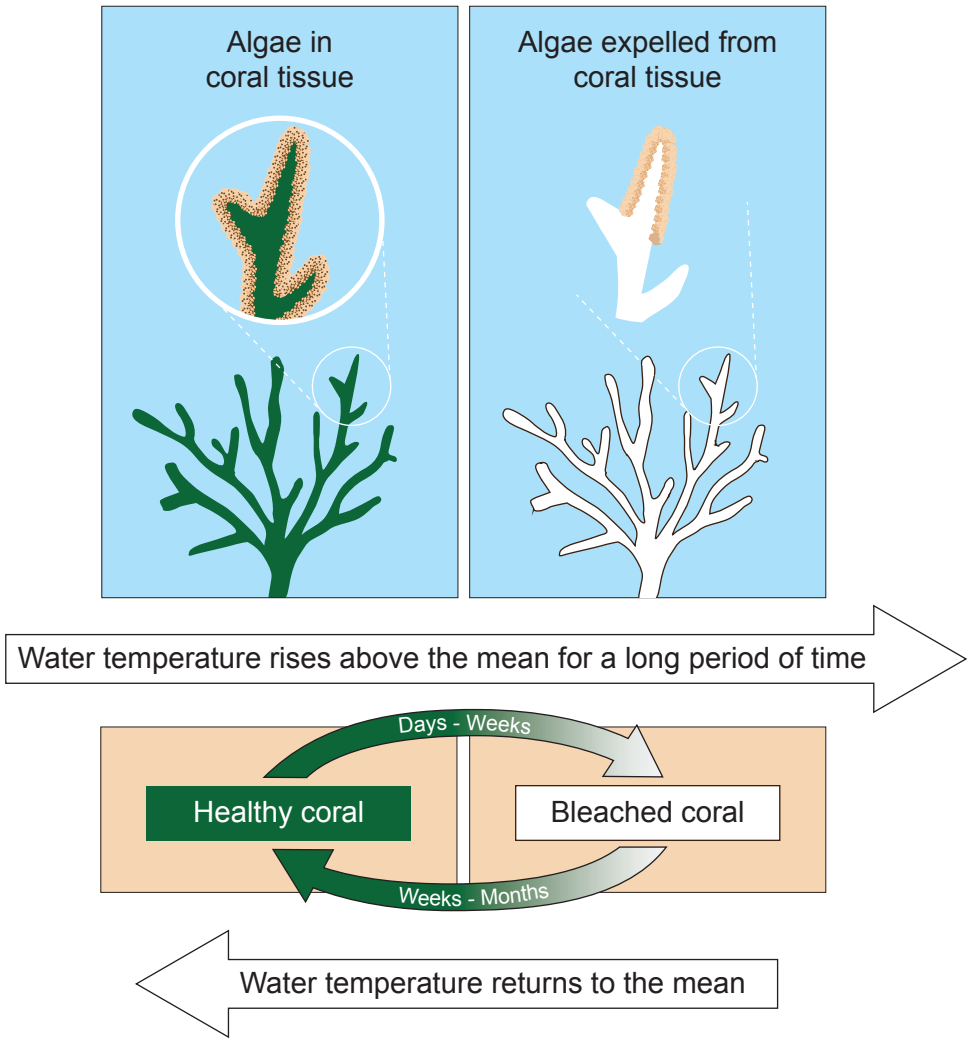
A coral reef is made up of many polyps. Polyps are sac-like animals each with a set of tentacles surrounding a central mouth opening. The polyps secrete a hard shell-like outer skeleton that over time forms the reef. Most corals obtain approximately 90% of their energy, from algae that live inside their tissues.

Coral bleaching occurs when coral polyps expel the algae that live inside their tissues. Bleached corals continue to live, but will soon starve unless they are re-colonised by algae. Before 1980 coral bleaching occurred once every 25-30 years. It now occurs approximately every six years.

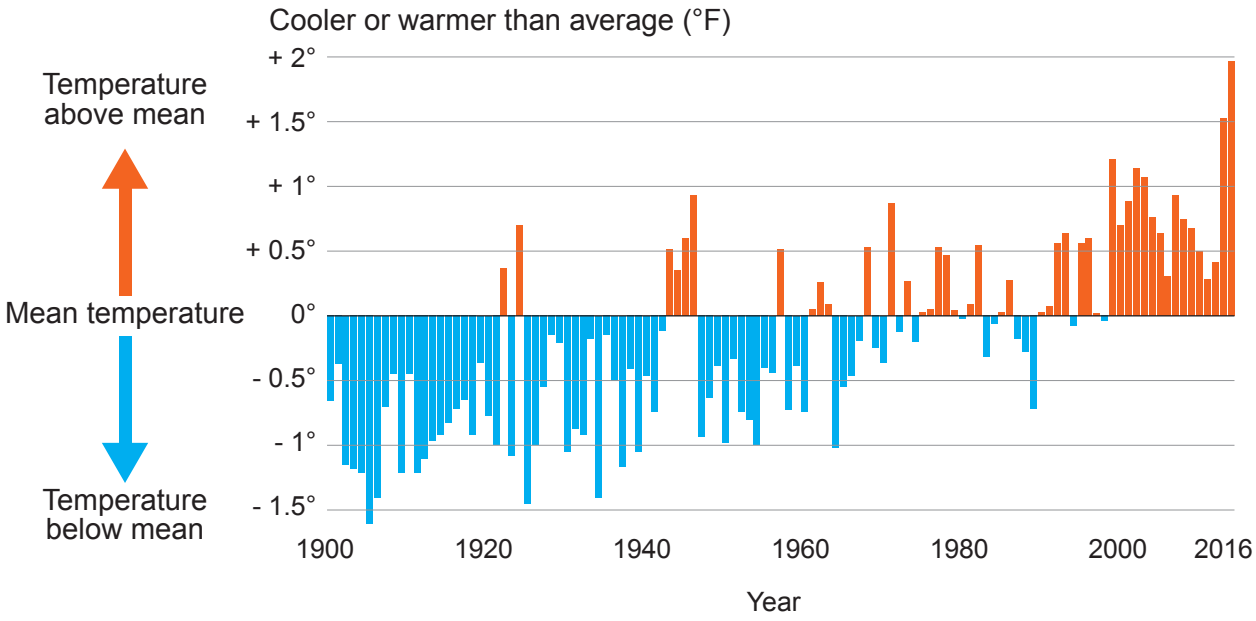
Coral bleaching may be caused by a number of factors such as:

- increased water temperatures
- increased sedimentation (silt from coastal run-off)
- bacterial infection
- ocean acidification due to increased atmospheric carbon dioxide levels
- pesticide run-off from farms
- fertiliser run-off from farms.

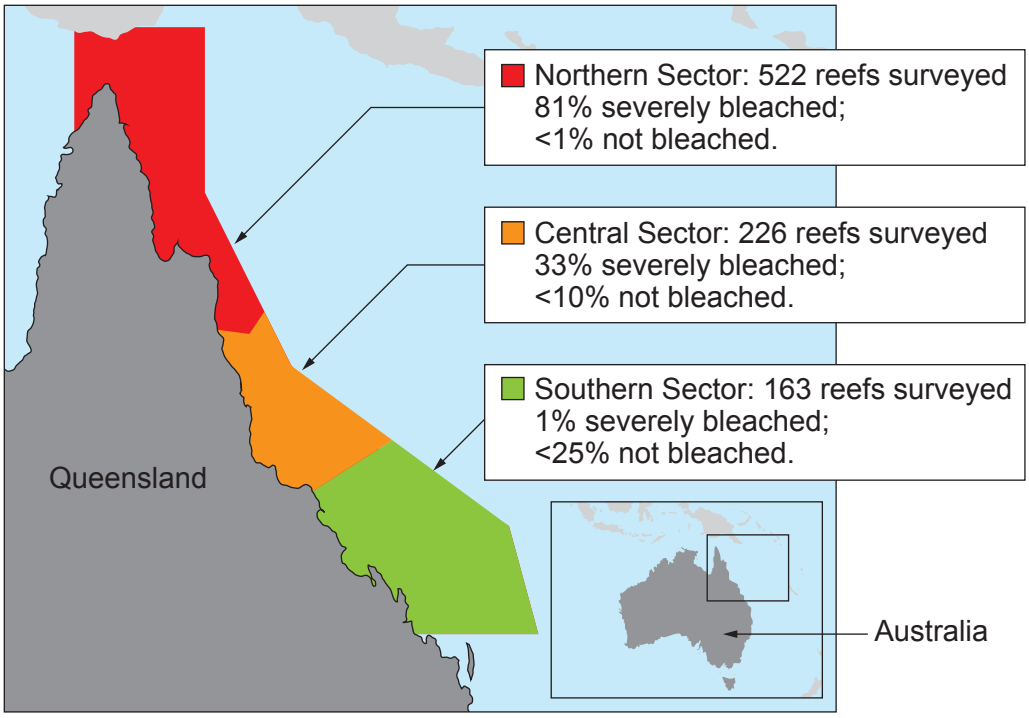
Diagram showing effects of changing sea temperature on coral.



Graph – Comparison of sea temperature in March around the Great Barrier Reef compared to the annual mean sea temperature from 1900 to 2016



The Great Barrier Reef is located 20 km off the Queensland coast of Australia. About 10 million tonnes of sediment from farms wash on to the reef each year. In recent years, efforts have been made to restore coastal wetlands because they filter out the sediments before they reach the sea.



Map – Great Barrier Reef showing results of aerial surveys for 911 reefs in April 2016.

One example of wetland restoration has been carried out at Mungalla Station, a cattle farm on the north-eastern Queensland coast. A section of the farm along the coast has been allowed to grow wild. Conservationists also removed a sea wall, built in the 1940s to stop the tide from coming in. Alien weeds, that had blanketed the wetlands and squeezed out native species, now could not tolerate the salinity of the incoming seawater and died. Water quality has improved because there are fewer bacteria feeding on the rotting weeds and so the oxygen content of the water has increased. Fish and crocodiles are now beginning to return to the wetlands of Mungalla station.