Surname	Centre Number	Candidate Number
Other Names		0

GCSE

C400U20-1

S19-C400U20-1

BIOLOGY – Component 2
Applications in Biology

FOUNDATION TIER

FRIDAY, 7 JUNE 2019 – AFTERNOON

1 hour 15 minutes

C400U201
01

	For Examiner's use only		
	Question	**Maximum Mark**	**Mark Awarded**
Section A	**1.**	**7**	
	2.	**10**	
	3.	**10**	
	4.	**10**	
	5.	**8**	
Section B	**6.**	**15**	
	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 B.

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

Section **B**: 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.

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 ***5(b)***.

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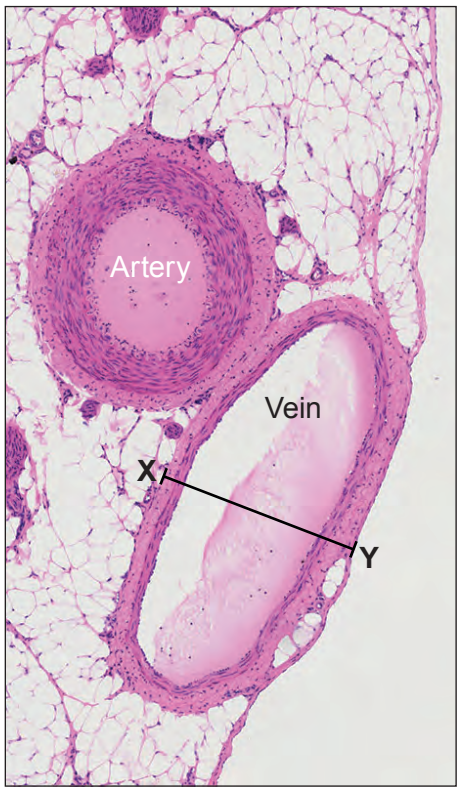
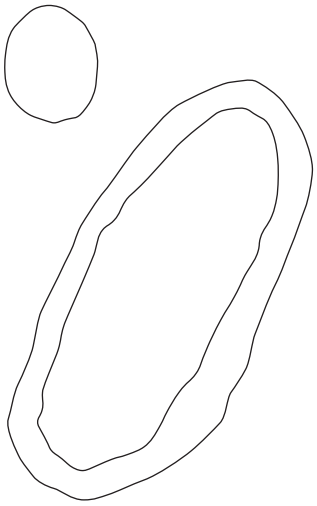
SECTION A

Answer **all** *questions.*

1. The photograph below shows a cross section through an artery and a vein taken through a microscope.



(a) (i) **Complete the plan drawing below** by completing the wall of the artery. The vein has been done for you. [1]



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(ii) Explain how the structure of the artery, as shown in the photograph, is adapted for its function in the circulatory system. [2]

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(iii) State the name of the structures inside the veins, **not shown** in the photograph, which enable veins to function in the circulatory system. [1]

.....

(b) (i) Measure the width of the vein along the line **X** – **Y** in the photograph. [1]

..... mm

(ii) The actual width of the vein shown in the photograph is 0.4 mm. Using this and your measurement for **X** – **Y**, calculate the magnification of the photograph. [2]

Magnification of the photograph = × .....

7

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03

2. *(a)* Some students extracted DNA from a sample of living plant cells.

The flow diagram summarises the method the students used.

Stage **1**

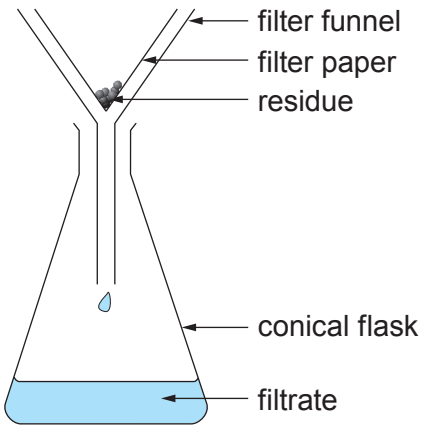
Select a sample of living plant material and break down the cells and tissues in the sample.

Stage **2**

Add an extraction liquid to extract the DNA in the sample.

Stage **3**

Filter the sample



Stage **4**

Add ethanol to the filtrate and observe the result.

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(i) Describe a method they could use in stage **1** to break down the cells of the plant material and state why this would be necessary. [2]

.....

.....

.....

(ii) State what is added to a solution of salt to make up the extraction liquid used in stage **2**. [1]

.....

(iii) State the purpose of filtering the sample in stage **3**. [1]

.....

(iv) The photograph shows the result observed by the students after ethanol was added to the filtrate.

I. **Draw an arrow** to label the DNA on the photograph. [1]

II. Explain why it was important that when the ethanol was added to the filtrate, the mixture was not stirred. [1]

.....

.....

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(b) Explain why DNA can be obtained from white blood cells but not from red blood cells. [2]

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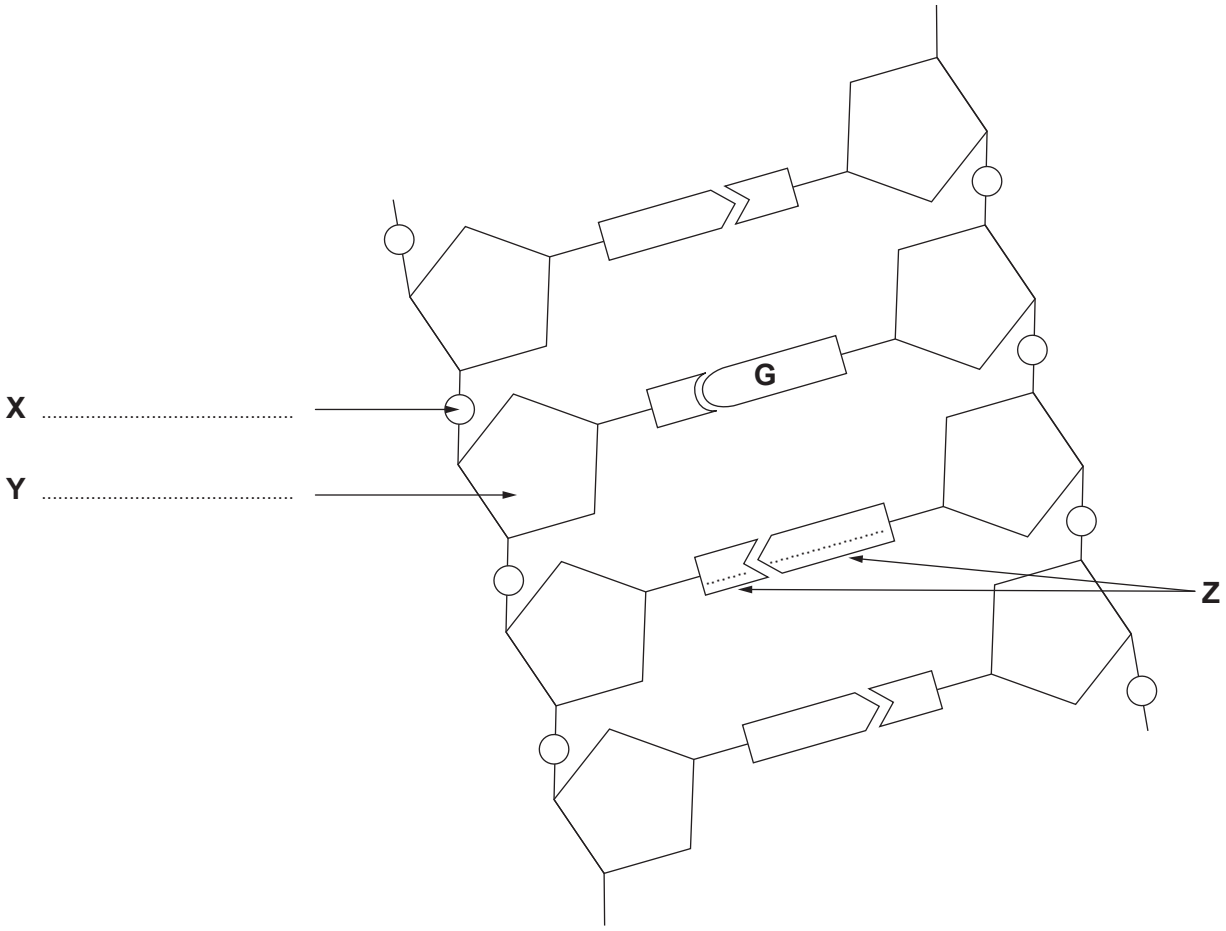
.....

.....

.....

(c) The diagram shows a section of DNA.

Label X and **Y** on the diagram and **add the letter names** to the diagram for the **two** bases labelled **Z**. [2]



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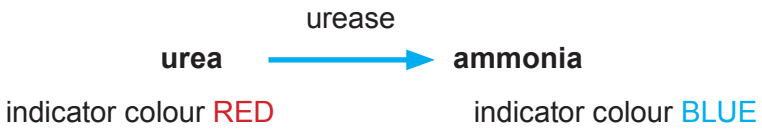
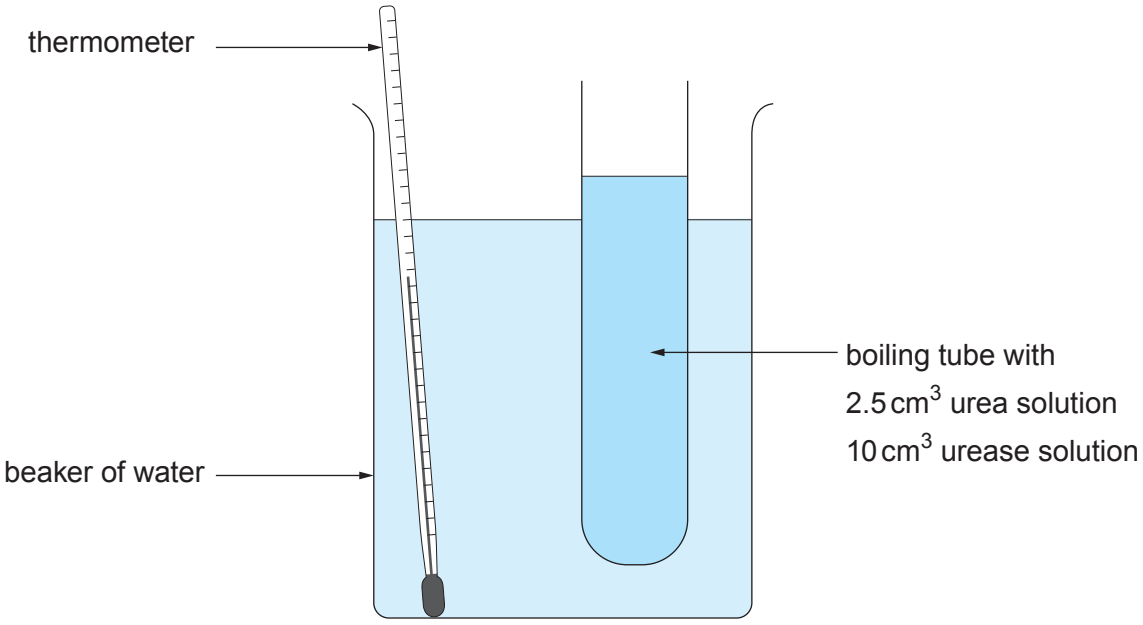
3. Decomposers in the soil produce the enzyme urease and cause decay. Urease breaks down urea to ammonia. An indicator solution can be used to show this.



Some students investigated the effect of temperature on the activity of urease, using the apparatus shown in the diagram, at a range of temperatures between 30 °C and 70 °C.

They added red indicator solution and recorded the time taken for the colour to become blue. From this they were able to calculate the rate of urease activity.



(a) State the name of the laboratory apparatus used by the students to measure the time taken, in seconds, for the indicator to change colour. [1]

.....

(b) The results of the investigation are shown in the table below.

Temperature(°C)	Rate of activity of urease (a.u.)
30	38
40	65
50	90
60	99
65	42
70	12

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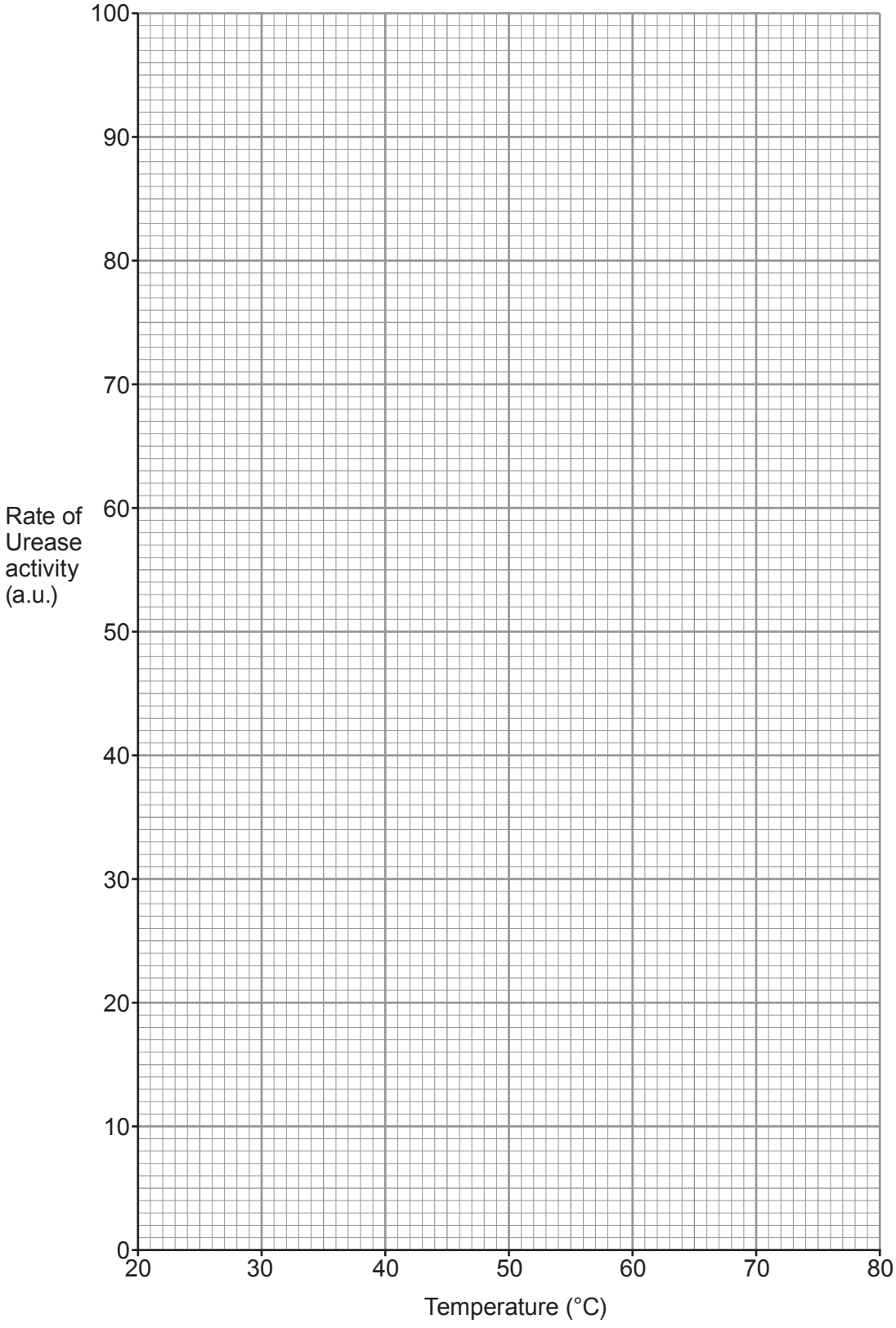
(i) Draw a graph of the results on the grid below by:

I. plotting the results; [2]

II. joining your plots with a suitable line. [1]



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Use your graph to answer the questions.

(ii) Describe the effect of increasing temperature on the activity of urease. [1]

.....

.....

(iii) State the optimum temperature for urease and explain your answer. [2]

.....

.....

(iv) State **one** way in which the students could have improved their investigation to make sure it was a fair test. [1]

.....

.....

(c) (i) Describe **one** way in which the students could increase the strength of the evidence in their results. [1]

.....

.....

(ii) Suggest **one** improvement they could make to enable them to control the independent variable in the investigation more effectively. [1]

.....

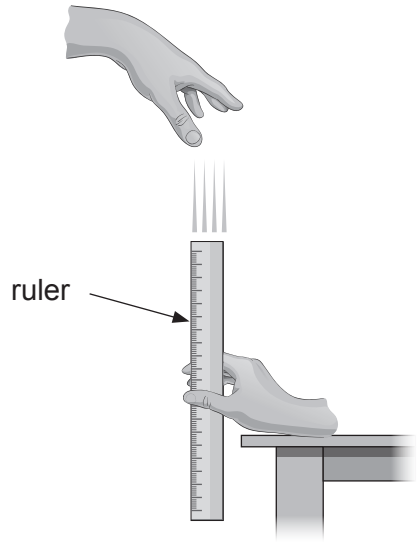
.....

10

Examiner only

4. For her school project, Sonja investigated reaction times in a group of 16-year-old students using a 30 cm ruler. She thought their reactions would become better with practice.

She asked each of them to place their right forearm on a table in a quiet room as shown in the diagram. They placed their fingers and thumbs a short distance away from the ruler which she was holding.



When Sonja dropped the ruler, the student's task was to catch it as quickly as possible. She noted the point where the student caught the ruler to **the nearest centimetre**, (the catching distance).

The shorter the catching distance the shorter the reaction time would be.

(a) State the hypothesis that Sonja was testing in her investigation. [1]

.....

.....

Examiner only

(b) Suggest the number of students Sonja should involve in her investigation and how many attempts at the task each student should have, giving reasons. [2]

(i) Number of students .....

Reason .....

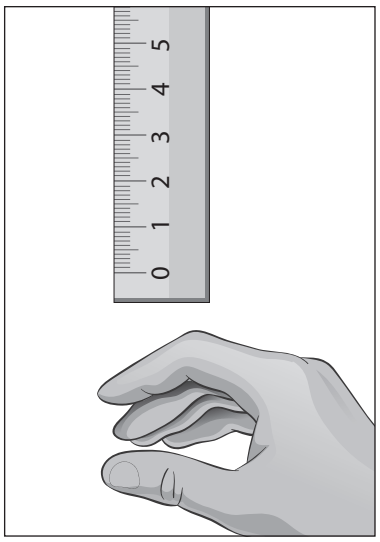
.....

(ii) Number of attempts at the task .....

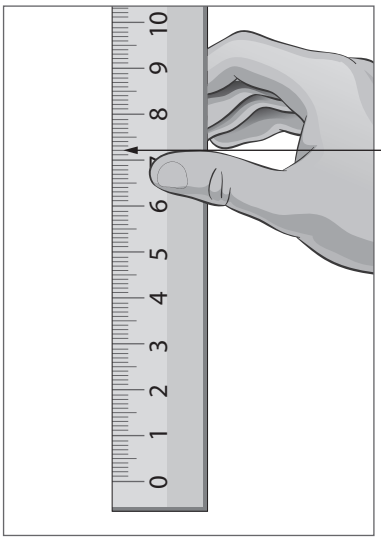
Reason .....

.....

(c) The diagrams show an attempt by one student.



BEFORE ruler was dropped



AFTER ruler was caught

(i) State the catching distance, shown in the photograph. [1]

..... cm

(ii) Give **one** source of error in the way Sonja used the ruler for her measurements. [1]

.....

.....

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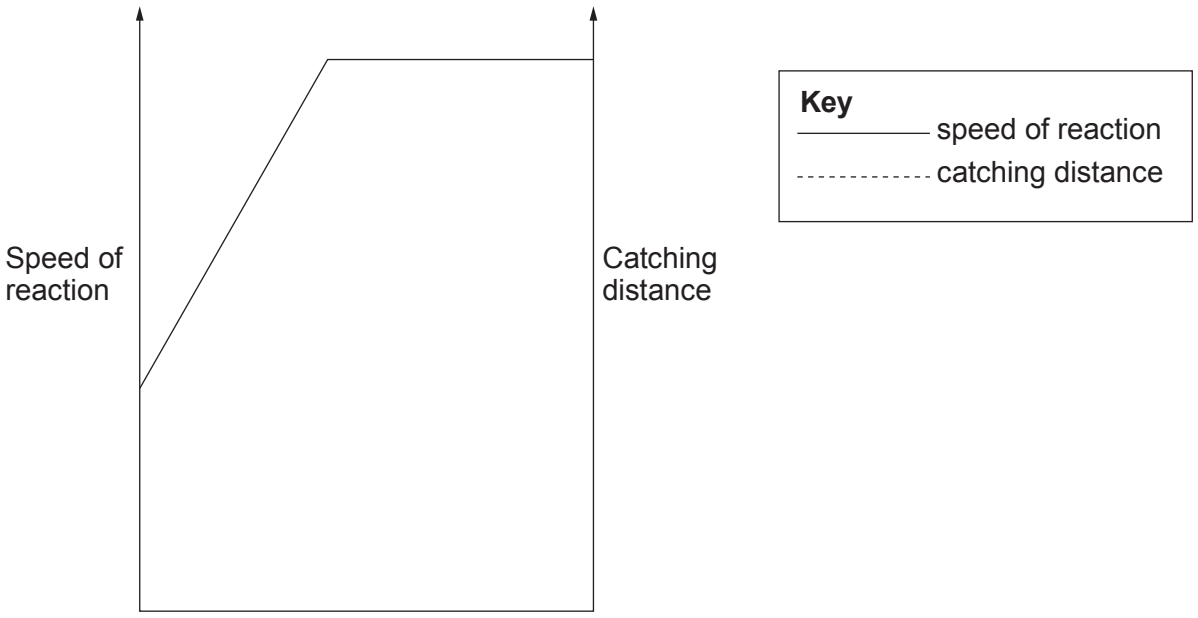
(d) The sketch graph below shows the results for a similar investigation of reaction time, carried out by sports scientists with students aged 19 – 25.



(i) **Complete the sketch graph by** adding a dashed line, as shown in the key, for the *catching distance* in the investigation. [1]

(ii) Evaluate whether these results support Sonja's hypothesis. Explain your answer. [2]

.....

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(e) The fastest reactions in the human body are reflexes. State **one** property of reflexes, *other than speed* and give **one** example of a reflex action. [2]

Property .....

Example .....

10

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5. Sea holly *(Eryngium maritimum)* grows in coastal areas and on beaches in many areas of the UK. Insects feed on nectar from its flowers and like many other coastal species, the sharp spines and thick leaf cuticles deter herbivores.

Iqbal investigated the abundance of sea holly on a beach. He compared an exposed area of the beach with a sheltered area, both of which measured 45 m × 40 m.

(a) Iqbal carried out a risk assessment of this investigation before he began the work.

Complete the table below to identify **one** of the hazards which he should take into account. [2]

Hazard	Risk	Control measure
.....	.....	.....

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(b) Describe how he could carry out his investigation using 1 m^2 quadrats. [6 QER]

8

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SECTION B

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

6. *(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]

.....

.....

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.....

(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]

.....

.....

.....

.....

15

END OF PAPER

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S19-C400U20-1A-R1

BIOLOGY – Component 2
Applications in Biology

FOUNDATION TIER

FRIDAY, 7 JUNE 2019 – AFTERNOON

RESOURCE BOOKLET
for use in Section B

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.

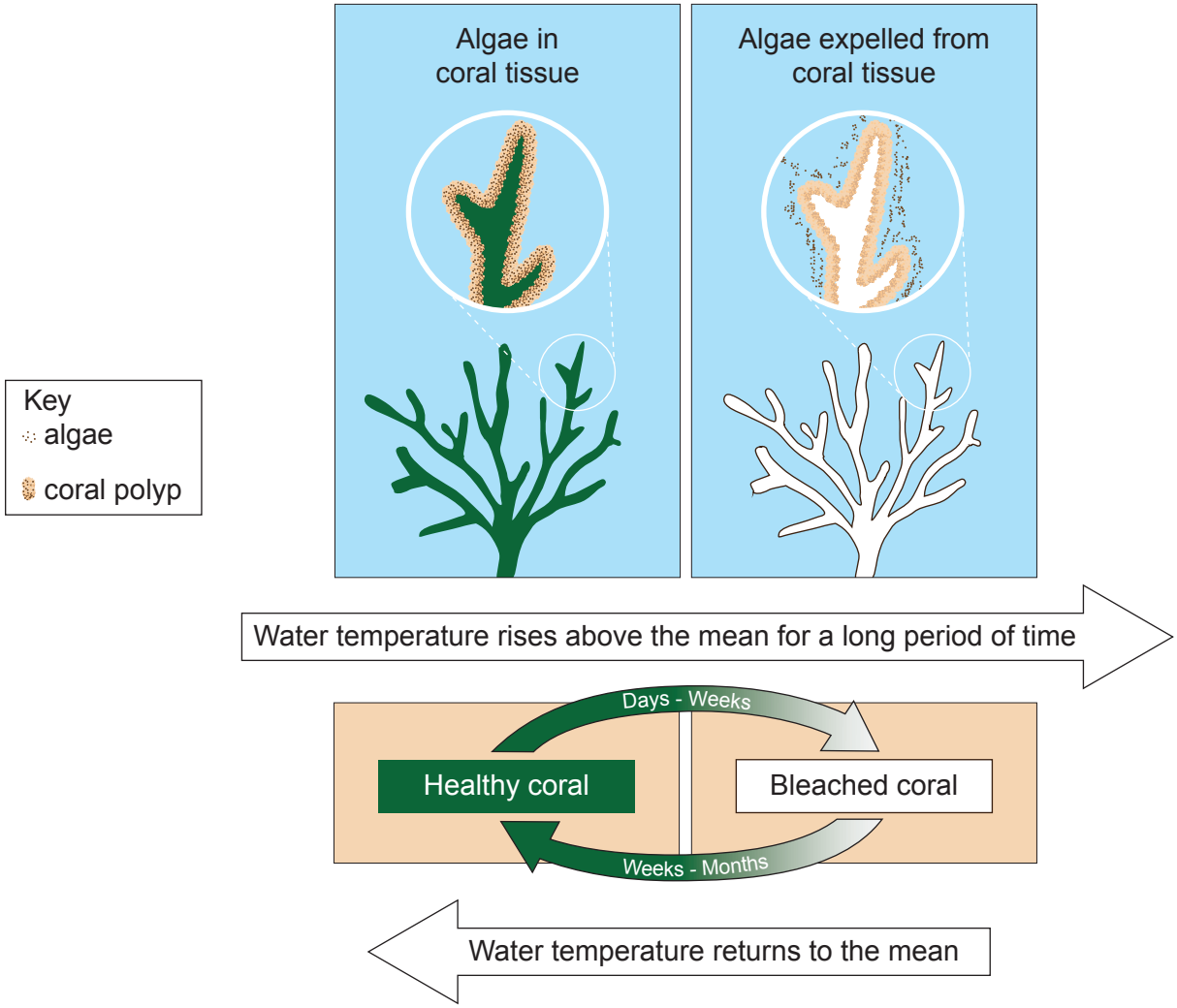
A coral reef is made up of many polyps. Polyps are sac-like animals each with a set of tentacles surrounding a central mouth opening. The polyps secrete a hard shell-like outer skeleton that over time forms the reef. Most corals obtain approximately 90% of their energy, from algae that live inside their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

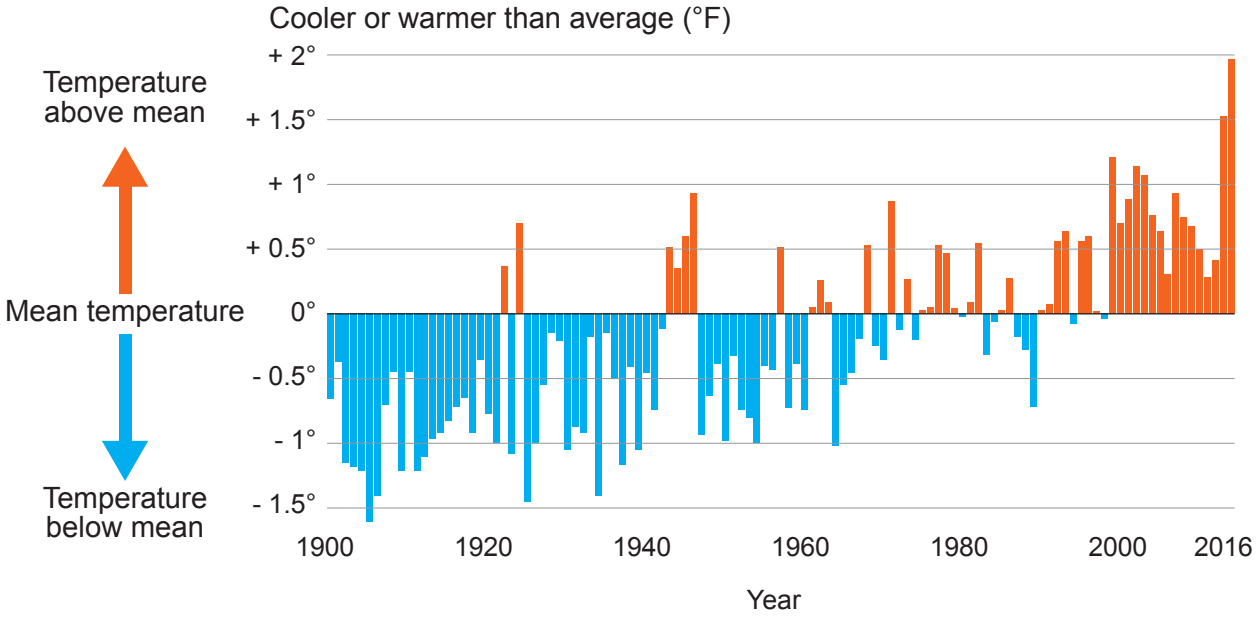
Coral bleaching may be caused by a number of factors such as:

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

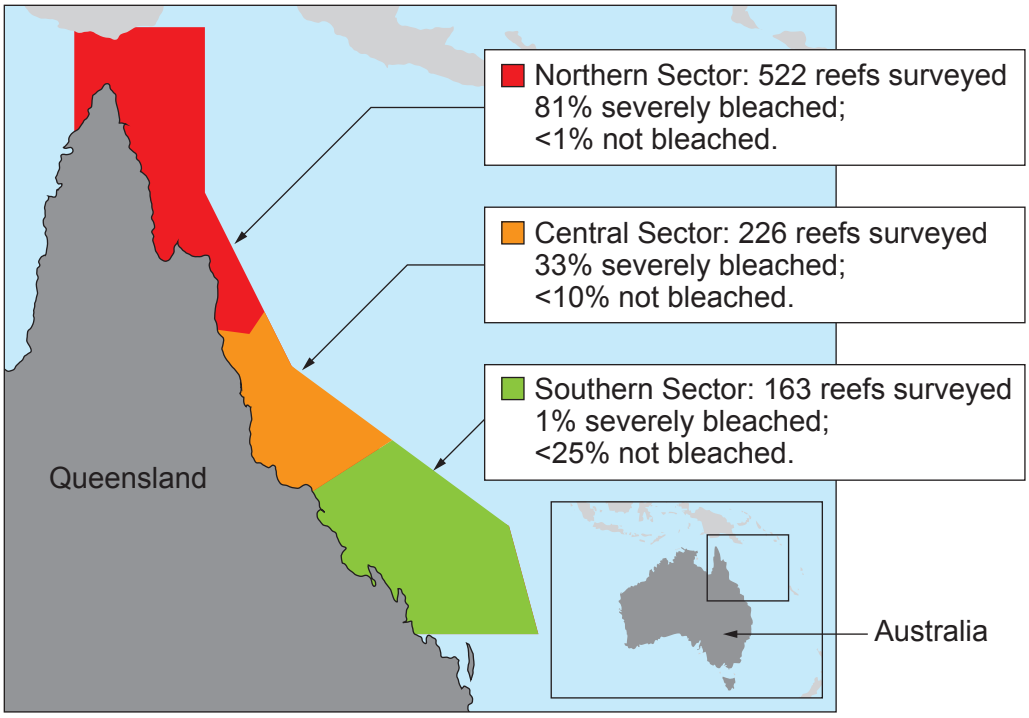
Diagram showing effects of changing sea temperature on coral.



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.