Surname	Centre Number	Candidate Number
Other Names		0

GCSE

3400U10-1

S19-3400U10-1

BIOLOGY – Unit 1:
Cells, Organ Systems and Ecosystems

FOUNDATION TIER

FRIDAY, 7 JUNE 2019 – AFTERNOON

1 hour 45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**11**	
2.	**7**	
3.	**9**	
4.	**11**	
5.	**8**	
6.	**14**	
7.	**11**	
8.	**9**	
Total	**80**	

3400U101
01

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid.

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. If you run out of space, use the additional page at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

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

Question **5***(b)* is a quality of extended response (QER) question where your writing skills will be assessed.

JUN193400U10101

Examiner only

Answer **all** *questions.*

1. *(a)* Complete the sentences below which describe how the bodies of animals and plants are built up and organised. [3]

Use words from the list below.

membranes organisms cells proteins organs

Similar ..... are grouped together to form tissues.

Different types of tissues make up ..... which are organised into systems.

The systems work together in ..... such as animals and plants.

(b) Animals and plants have specialised cells.

(i) Identify the scientific term for the process which occurs in organisms resulting in cells becoming specialised. Choose your answer from the list. [1]

A division

B diffusion

C differentiation

D diversification

Answer ☐

(ii) Explain how and why specialised cells are beneficial to organisms. [2]

.....

.....

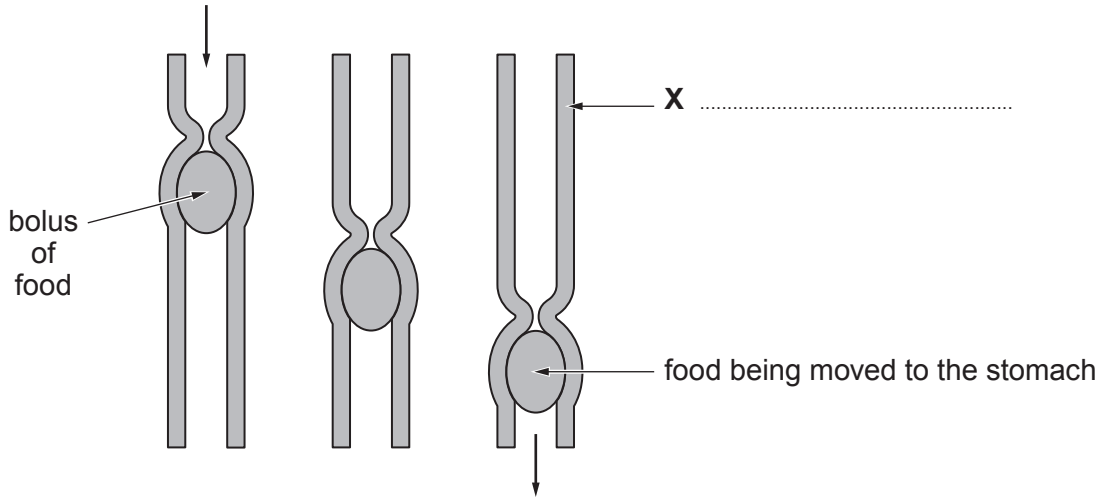
.....

.....

Examiner only

(c) The diagram shows the process of peristalsis in the human body.

Some food has just been swallowed.



(i) Label structure **X** on the diagram. [1]

(ii) State the name of the system in the human body to which structure **X** belongs. [1]

.....

(iii) Name the specialised cells in the walls of structure **X** which enable peristalsis to occur.
Describe how they cause the food to be moved during peristalsis. [3]

.....

.....

.....

.....

.....

.....

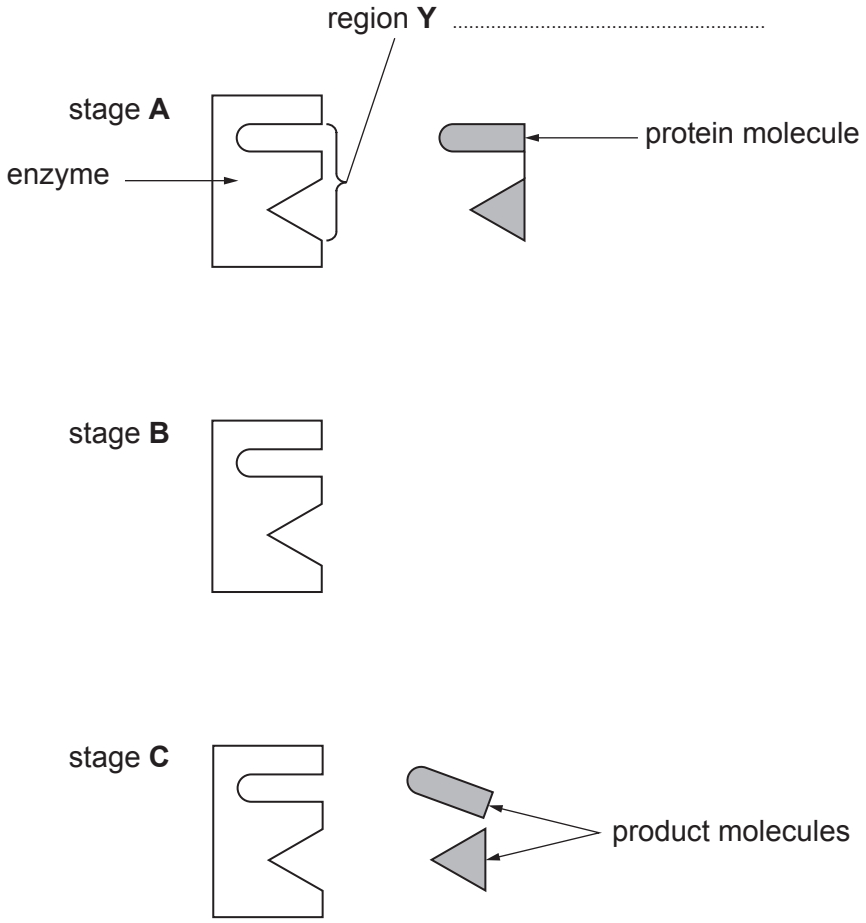
3400U101 03

11

Examiner only

2. The lock and key model is used to explain how enzymes work. It was first suggested in 1894 by Emile Fischer.

The diagrams below show stages in the action of an enzyme which digests protein molecules.



(a) (i) **Label** region **Y** on the diagram. [1]

(ii) **Complete the diagram** to show what occurs at stage **B**. [1]

Examiner only

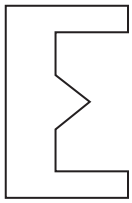
(b) (i) State the name of the **type** of enzyme shown in stage **A**. [1]

.....

(ii) State the name of the product molecules shown in stage **C**. [1]

.....

(c) The diagram below shows the same enzyme but it has been denatured.



(i) Explain why this denatured enzyme would not function. [2]

.....

.....

.....

.....

(ii) Suggest how the enzyme molecule shown could have become denatured. [1]

.....

.....

7

3400U101 05

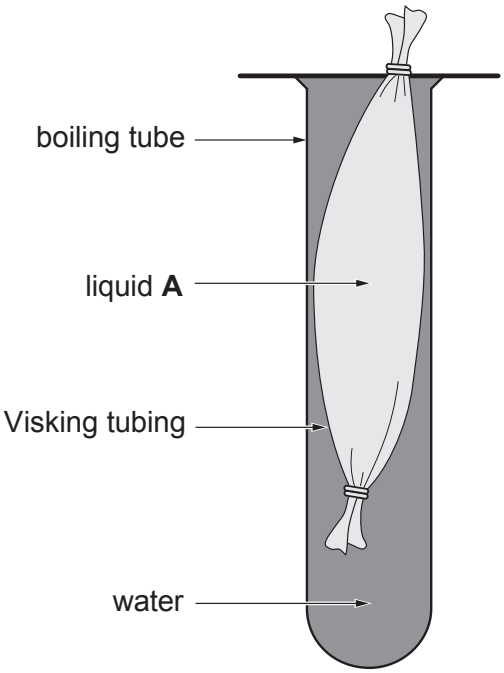
Examiner only

3. The cell membrane controls which substances enter and leave the cell. Visking tubing can be used as a model of the cell membrane.

The diagram shows the apparatus used at the start of an investigation using Visking tubing.

The contents of liquid **A** were tested for glucose and starch at the start of the investigation.

Liquid **A** and the water in the boiling tube were tested for glucose and starch at 30 minutes.



(a) (i) Complete the table below to show the results of tests made on liquid **A** at the **start of the investigation**. [2]

Test	Colour change	Conclusion
Benedict's reagent to test for glucose	blue to	glucose present
Iodine solution to test for starch	brown to	starch present

(ii) Describe how you would test the water in the boiling tube for the presence of glucose using Benedict's reagent.

(You do not need to describe the result) [1]

.....

.....

Examiner only

(b) The table below shows the results for tests carried out on liquid **A** and the water in the boiling tube at 30 minutes.

Results at 30 minutes

	Test for glucose	Test for starch
liquid **A**	glucose present	starch present
water in boiling tube	glucose present	no starch present

Explain why, at 30 minutes, glucose molecules are present in the water in the boiling tube but starch molecules are not. [3]

.....

.....

.....

.....

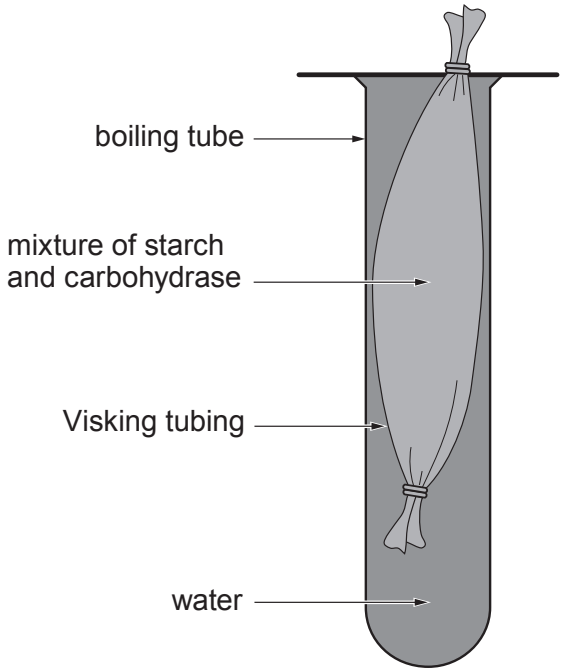
.....

.....

3400U101 07

Examiner only

(c) In a similar investigation, the Visking tubing contained **only** starch and the enzyme carbohydrase, as shown below.



The water in the boiling tube was tested at 30 minutes for the presence of glucose using Benedict's reagent.

Describe the result you would expect to observe. Explain your answer. [3]

.....

.....

.....

.....

.....

.....

9

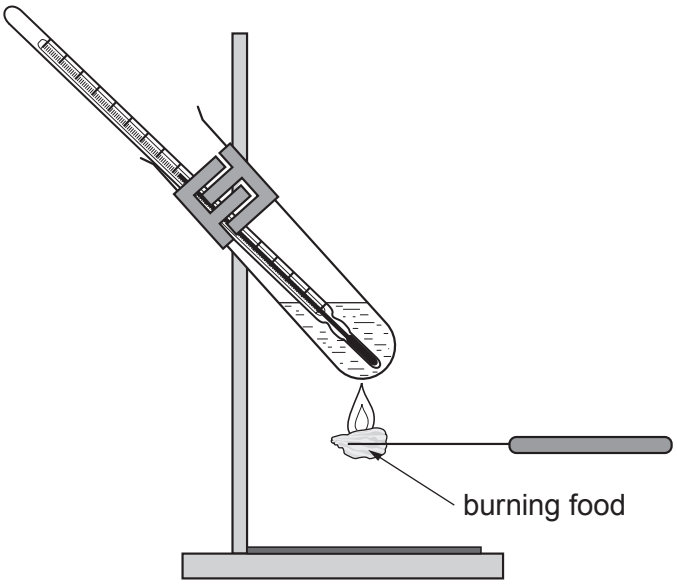
BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Examiner only

4. *(a)* The apparatus shown in the diagram below can be used to compare the energy content of different foods.

The energy content of the food is released when it is burned and this causes the water to increase in temperature.



You are asked to use the apparatus to compare the energy content of different pasta types of known mass.

(i) The table below shows part of the risk assessment for this investigation.

Complete the table. [2]

Hazard	Risk	Control measure
Apparatus is hot	....	....

(ii) For this investigation, state:

I. the apparatus you would use to find the mass of the pasta; [1]

.....

Examiner only

II. **two** factors which you would keep constant throughout the investigation to ensure fair testing; [2]

.....

.....

III. how you would work out the increase in the temperature of the water. [2]

.....

.....

.....

.....

(iii) Explain why it is important to burn each piece of pasta completely. [1]

.....

.....

(b) The table shows some results from an investigation.

Pasta type	Total mass of pasta burned (g)	Total energy released from pasta (J)	Energy released in Joules per gram (J/g)
plain	9	293.4	32.6
wholewheat	10	282.0	28.2
green	9	252.0	.....

(i) Calculate the energy released in Joules per gram for green pasta. **Write your answer in the table.** [2]

Space for working.

(ii) From these results, state which type of pasta has the highest energy content. Give the reason for your answer. [1]

Type of pasta .....

Reason .....

3400U101 11

11

Examiner only

5. *(a)* Complete the word equation for aerobic respiration in a human. [2]

Glucose + ... ⟶ Carbon dioxide + ... + Energy

(b) The table shows the gases present in inspired air (air breathed in) and expired air (air breathed out).

Gas	Inspired air (%)	Expired air (%)
oxygen	21.00	16.00
carbon dioxide	0.04	4.00
nitrogen	78.00	78.00
water vapour	varies	saturated

Compare the composition of inspired air with expired air **for each of the four gases** in the table. Explain why the differences occur. [6 QER]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

8

Examiner only

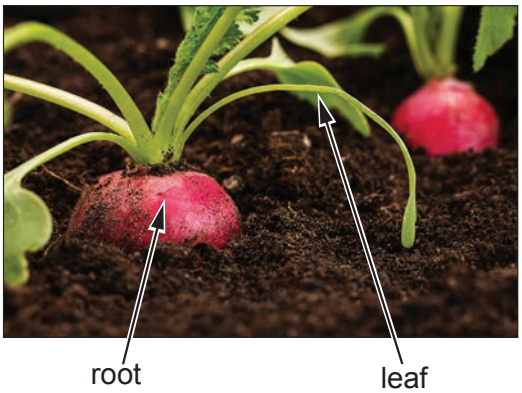
6. Radish is a salad vegetable. The plants are grown in large quantities in greenhouses by commercial producers.

It is important that photosynthesis occurs at a high rate in the leaves of the plants to give the largest possible crop.

Photosynthesis requires carbon dioxide, water and light and produces glucose and oxygen.

Commercial greenhouse

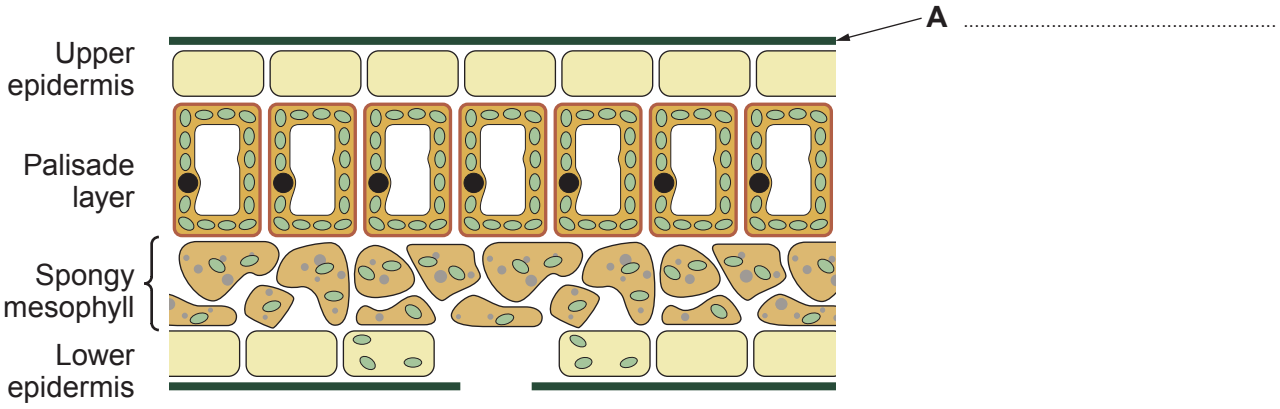
Radish plants



(a) (i) The root of the radish contains stored starch. State the name of the molecules which are converted into starch. [1]

.....

The diagram below shows a section through a leaf of a plant such as radish.



(ii) I. **Label** structure **A** on the diagram. [1]

II. Explain why **most** photosynthesis occurs in the cells of the palisade layer. [3]

.....

.....

.....

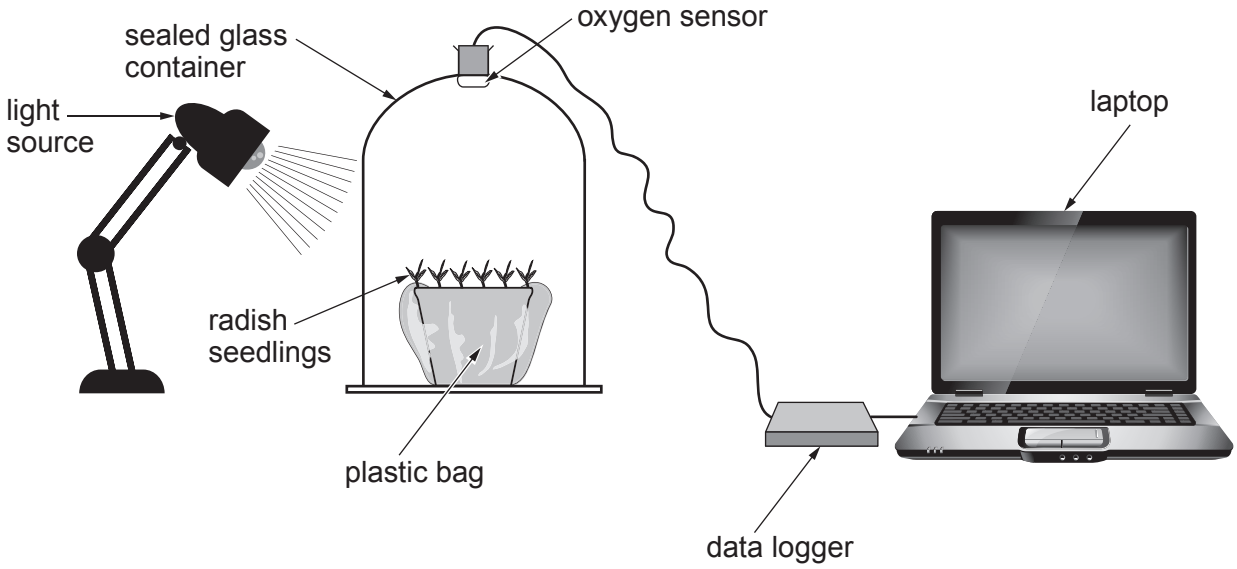
.....

.....

.....

Examiner only

(b) Robert, a commercial radish grower, investigated the effects of temperature on the growth of radish seedlings. He used a range of temperatures and used the apparatus shown below to measure oxygen production. From this he calculated the mean rate of photosynthesis at each temperature.



The results of his investigation are shown on the graph and in the table.

Temperature (°C)	Rate of photosynthesis (a.u.)
5	*Values shown on the graph*
10	
20	
25	51
30	60
35	64
40	59
45	24
55	15

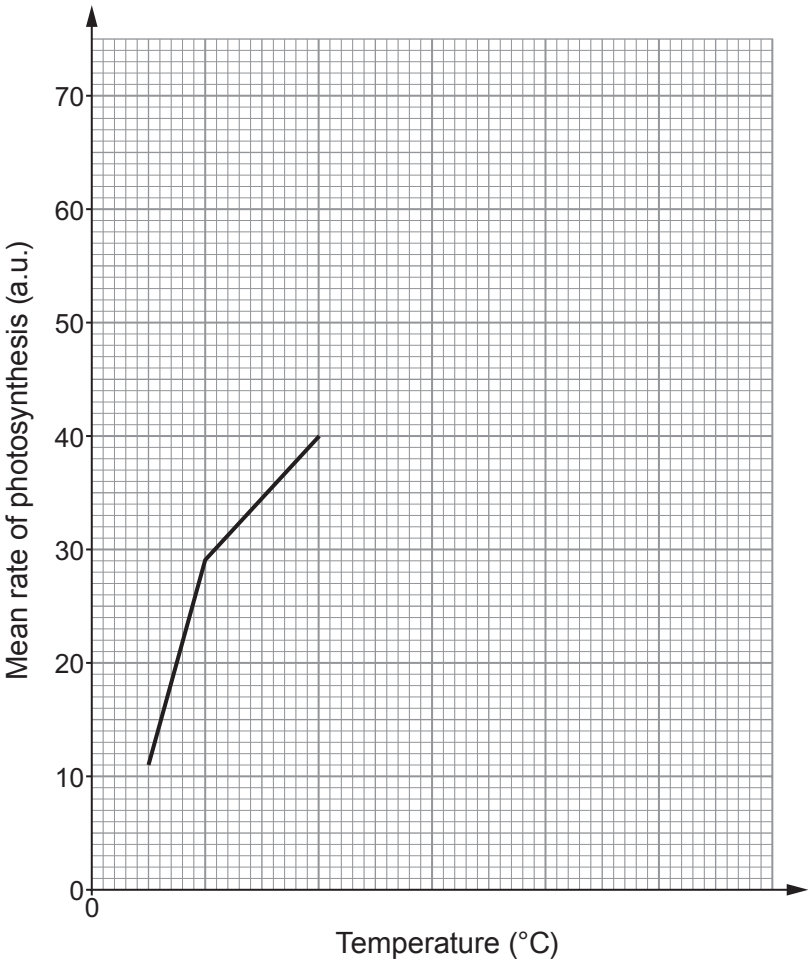
(i) Complete the graph of results by: [4]

I. adding the scale for temperature;

II. plotting the values from 25°C - 55°C;

III. joining the plots with a ruler to complete the line

Examiner only



(ii) From the graph,

I. Describe how the increase in temperature affects the rate of photosynthesis. [2]

.....

.....

.....

.....

II. Calculate the difference in the rate of photosynthesis between 5°C and 20°C. [1]

Difference = ... a.u.

Examiner only

(iii) I. From these results state the optimum temperature for Robert to use for growing radish plants and explain your answer. [1]

.....

.....

II. How could Robert improve his investigation so that the optimum temperature could be identified more accurately? [1]

.....

.....

14

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Examiner only

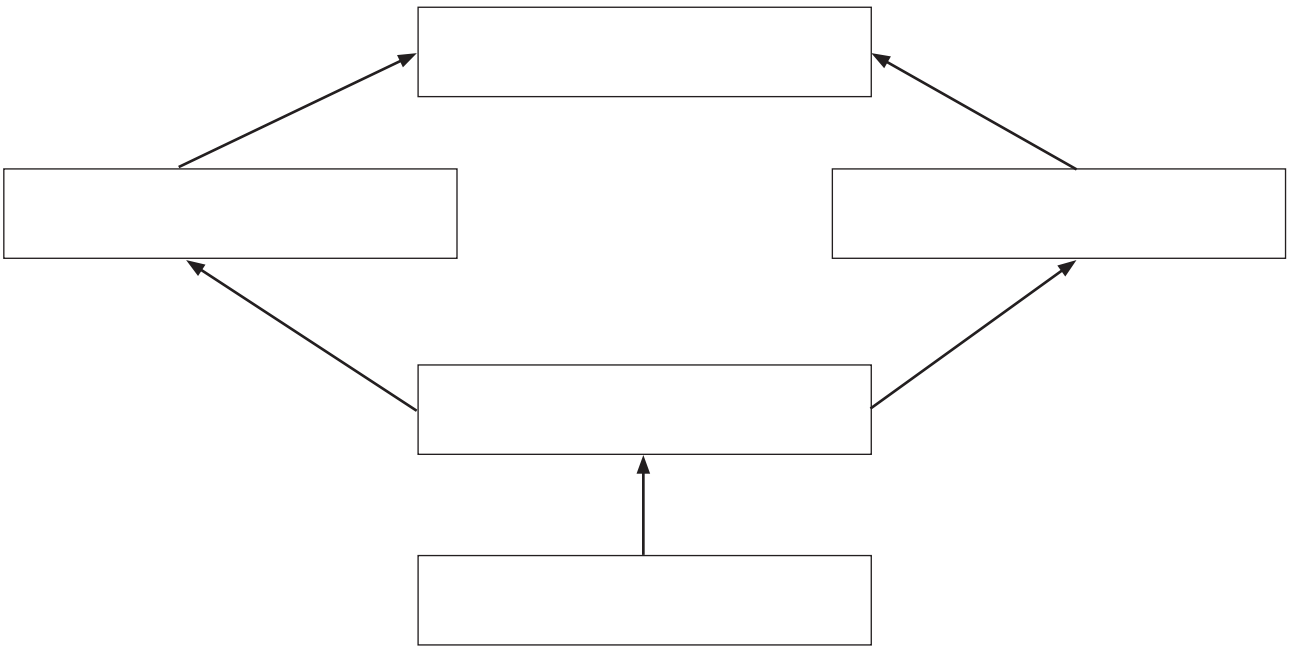
7. Killer whales *(Orcinus orca)* feed on thousands of large fish and squid. These large fish and squid feed on hundreds of small fish. Small fish feed on tiny organisms called plankton.

In 2016, a dead killer whale was found washed up on an island off the West Coast of Scotland. Tests revealed the whale contained one of the highest levels of PCBs (polychlorinated biphenyls) ever recorded. Levels of PCBs are measured in milligrams per kilogram of fat in an animal's body. Scientists believe that the threshold where PCBs can cause harm to killer whales is 30 mg / kg of fat. The level of PCB in the dead whale was 957 mg / kg of fat.

During the last century, PCBs were widely used in plastics, electrical goods and cement. PCBs were banned in the 1970s. It is estimated that there are a million tonnes of PCB-contaminated material waiting to be disposed of in Europe. PCBs are released into the environment from decomposing products that have not been disposed of properly. Plankton absorb PCBs that are washed into the oceans.

There are only eight resident killer whales remaining in UK waters. Scientists have not observed any offspring being born to the resident killer whales in the 25 years they have been studying them.

(a) (i) Complete the simple food web below to show the feeding relationships of a killer whale. [3]



(ii) State the term used to describe the feeding stage of killer whales. [1]

.....

Examiner only

(b) Calculate how many times greater the level of PCBs was in the dead killer whale's body when compared to the threshold where PCBs cause harm. [1]

Times greater = ...

(c) Suggest the name of a group of micro-organisms responsible for releasing PCBs into the environment. [1]

.....

(d) Explain how the PCBs led to the death of the killer whale. [2]

.....

.....

.....

.....

(e) Apart from causing death, describe another effect of PCBs on killer whales in UK waters. Give evidence to support your answer. [2]

.....

.....

.....

.....

(f) Suggest why PCBs are still present in UK waters even though they have been banned since the 1970s. [1]

.....

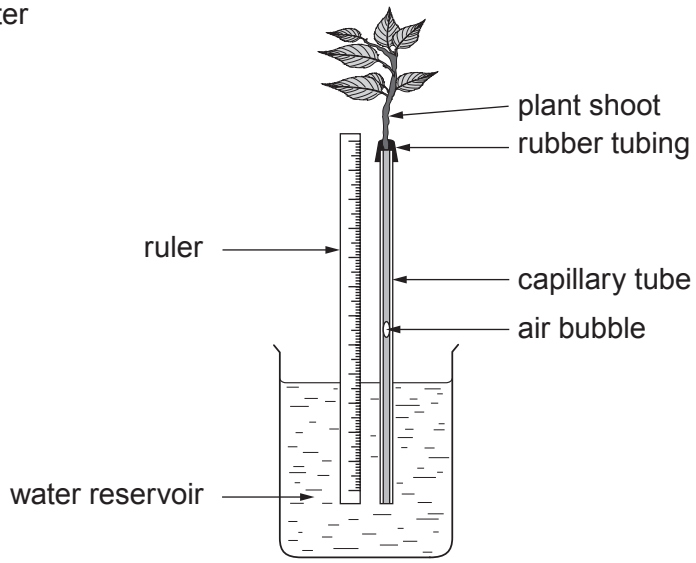
.....

11

Examiner only

8. Students used a simple potometer as shown below to compare the rate of transpiration in shoots from a beech tree *(Fagus sylvatica)* and a bay tree *(Laurus nobilis)*.

A simple potometer



(a) State the name of the tissue that transports water in plants. [1]

.....

(b) State **two** uses of water in plants. [2]

.....

.....

(c) (i) When the beech tree shoot was used, the air bubble in the capillary tube took 87 seconds to travel 50 mm. Calculate the rate of transpiration for the shoot from the beech tree in mm / s. [1]

Rate of transpiration = ... mm / s

(ii) When the bay tree shoot was used, the air bubble in the capillary tube took 51 minutes and 58 seconds to travel 50 mm.

State **one** conclusion that could be reached from the results. [1]

.....

.....

Examiner only

(d) (i) State **one** factor that should have been kept constant in this investigation. [1]

.....

(ii) Describe how the students could improve their confidence in the results. [1]

.....

.....

(e) Explain why a potometer cannot be used to study transport of sugars in a plant. [2]

.....

.....

.....

.....

9

END OF PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

Examiner only