GCSE BIOLOGY

COMPONENT 2
Applications in Biology

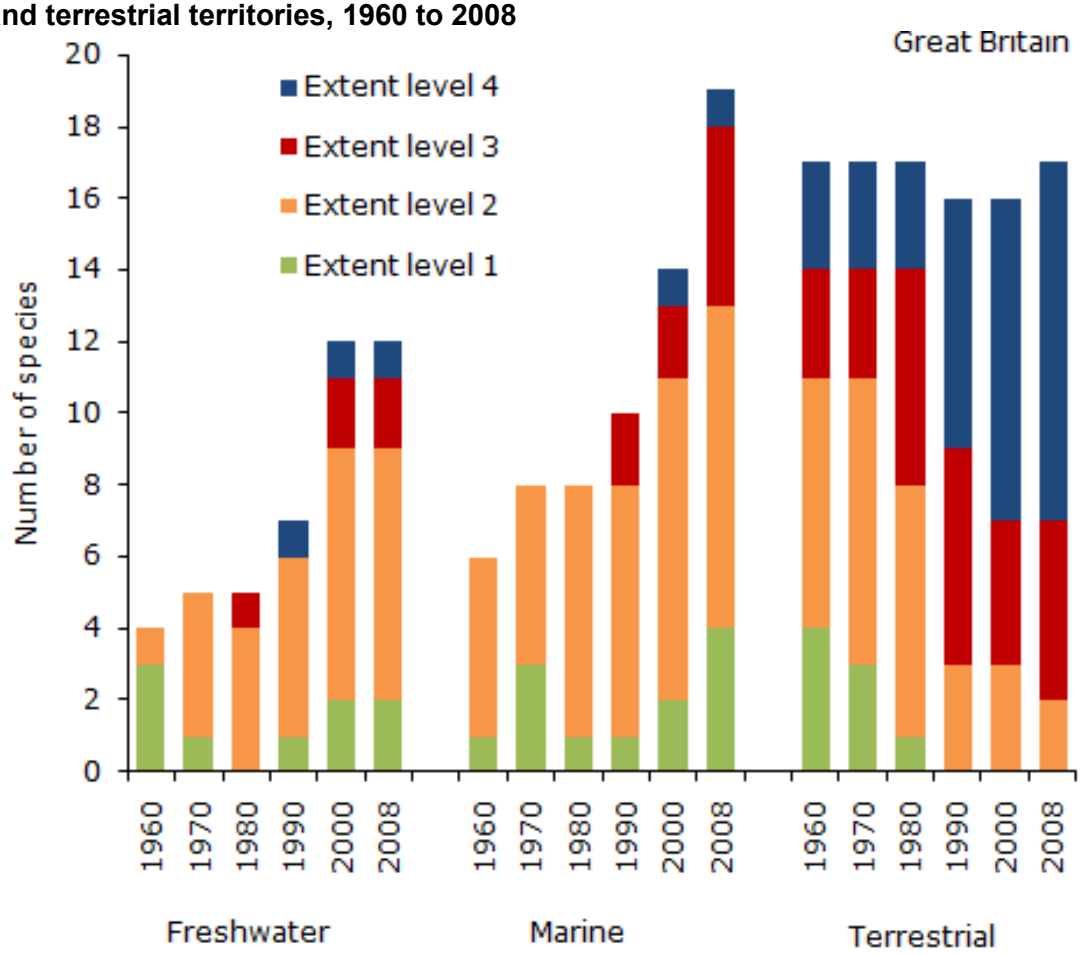
FOUNDATION TIER

RESOURCE BOOKLET
for use in Section B

ALIENS HAVE LANDED

Every year new 'alien invaders' are being found in Britain. These invasive species have been introduced either deliberately or by accident into habitats where they do not usually live. In the 1990s, conservationists estimated that 600 alien species were breeding in Britain. Since then, the number has increased by 80%.

Figure 1 Changes in the extent of invasive non-native species in marine, freshwater and terrestrial territories, 1960 to 2008



KEY: Extent levels are defined as follows:

Extent level 1	Present in territory and have not spread more than 10 km from their source
Extent level 2	Established populations represent less than 10% of territory
Extent level 3	Established populations represent 10 to 50% of the territory
Extent level 4	Established in more than 50% of the territory

Black swans are an example of an invasive species. They originate in Australia. They were first introduced to England in 1791. Now the species has a wide geographical spread throughout the British Isles. Black swans are regarded as pests by farmers, because of their grazing and fouling grass and eating crops. The species is also known to be aggressive and can out-compete native species of wildfowl. Adult black swans mainly feed on aquatic plants. Their cygnets (young swans) will also eat small insects.

Figure 2 A black swan in its natural habitat in Australia

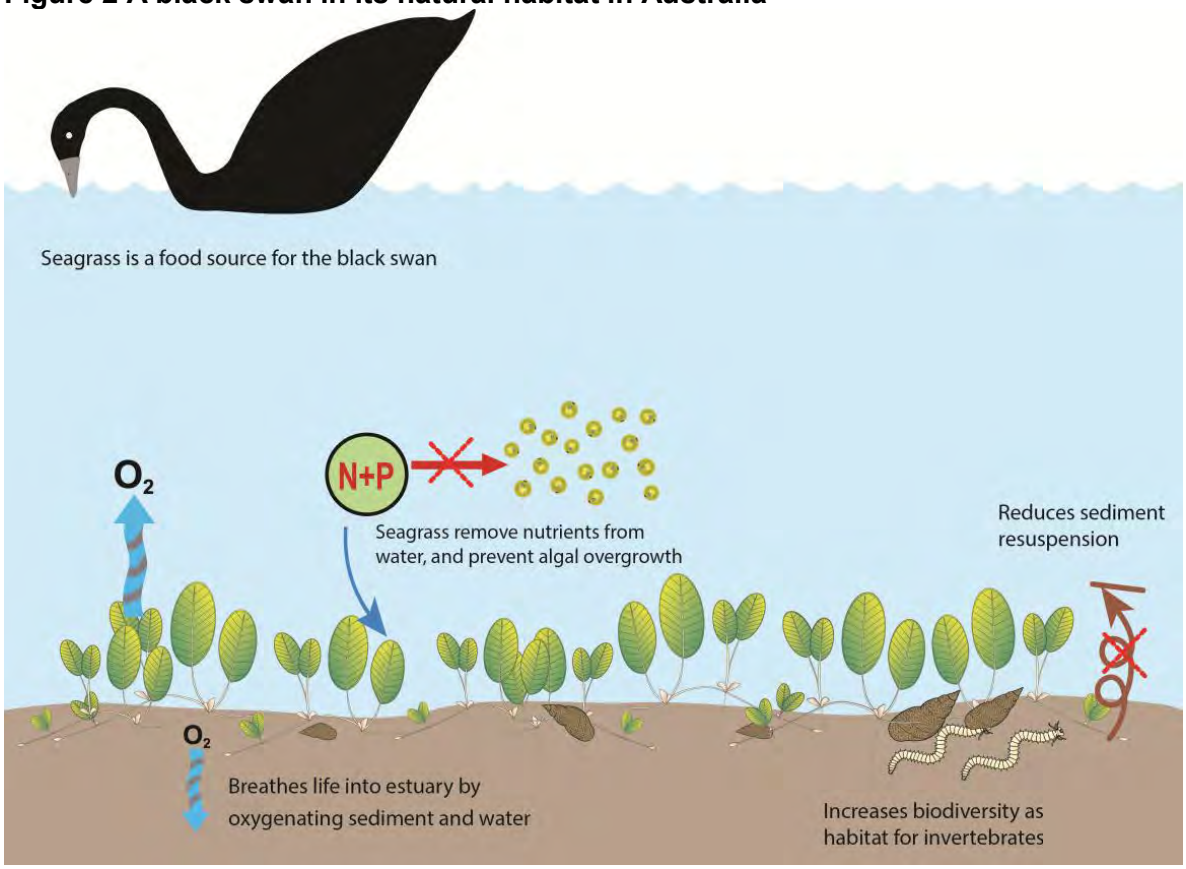
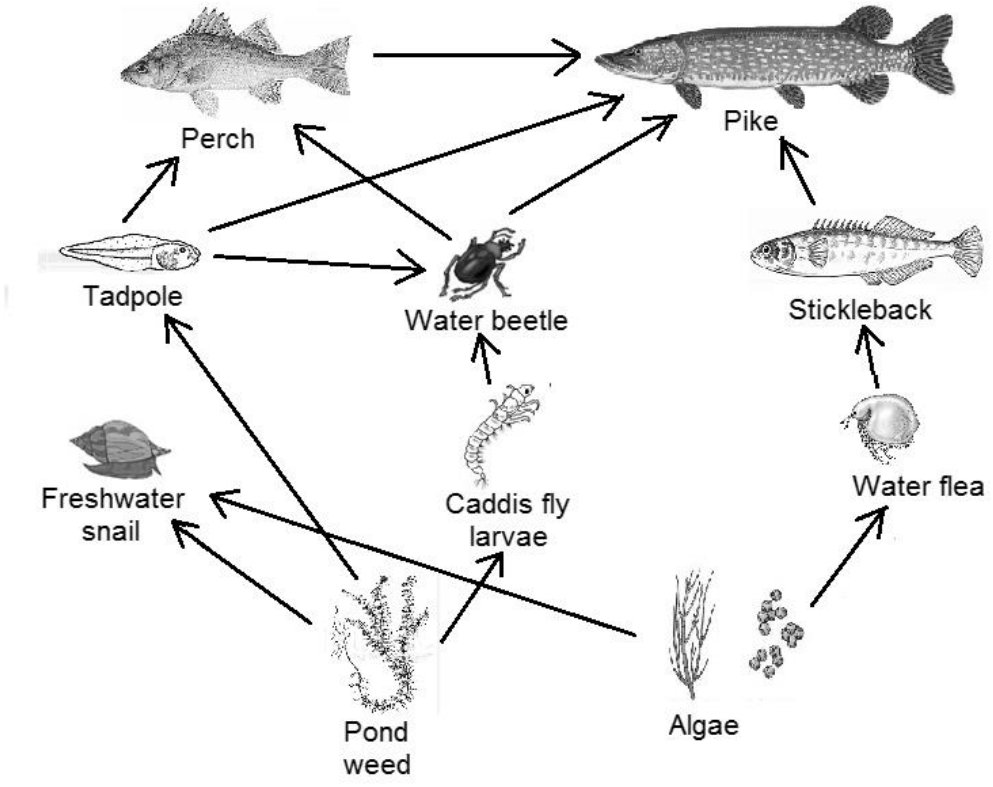


Figure 3 An aquatic food web in the UK



Candidate Name	Centre Number					Candidate Number				

GCSE BIOLOGY

COMPONENT 2

Applications in Biology

FOUNDATION TIER

SAMPLE PAPER

(1 hour 15 minutes)

	For Examiner's use only		
	Question	**Maximum Mark**	**Mark Awarded**
Section A	**1.**	**8**	
	2.	**14**	
	3.	**9**	
	4.	**14**	
Section B	**5.**	**15**	
	Total	**60**	

ADDITIONAL MATERIALS

In addition to this examination paper you will need a resource booklet, 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.

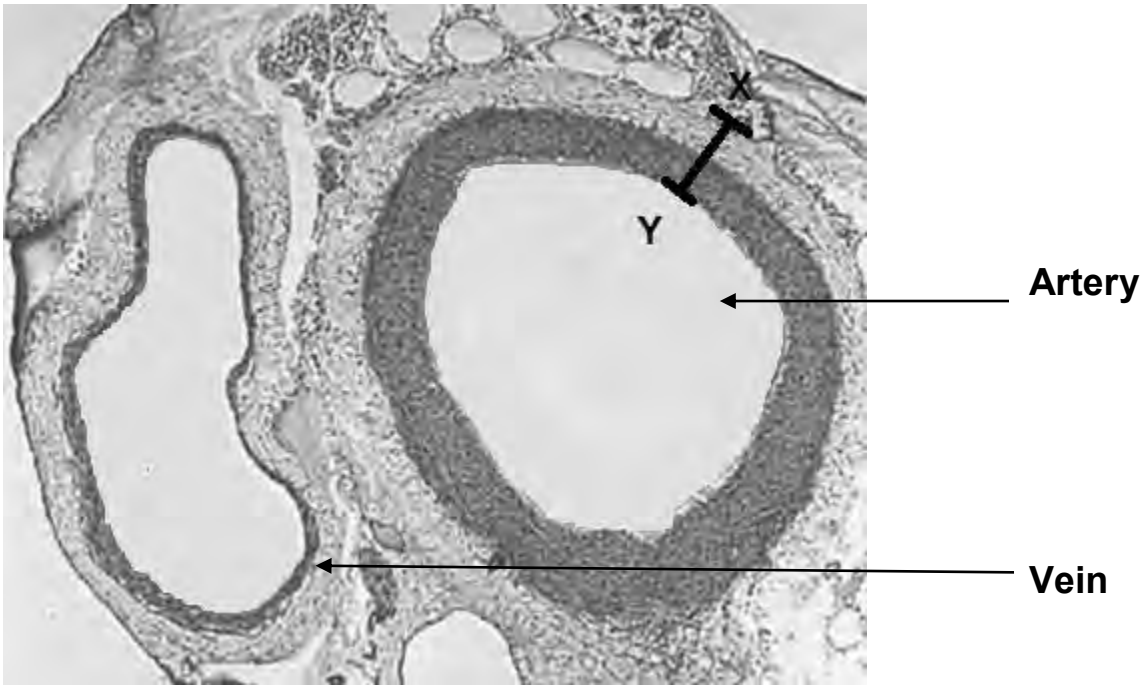
INFORMATION FOR CANDIDATES

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 20 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 **4(b)**.

SECTION A

Answer **all** *questions.*

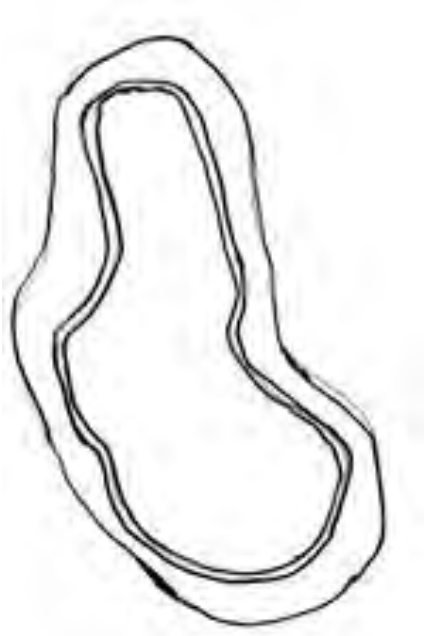
1. The photograph below shows a cross-section through an artery and a vein as seen under a light microscope.



Magnification X 50

(a) (i) In the space below, make a drawing of the **artery. The vein has been done for you.** [2]

Vein



Artery

(ii) On your drawing, label: [2]

I the lumen;

II the muscle layer.

(iii) Calculate the actual thickness of the artery wall from **X** to **Y**, showing your working. [2]

artery wall = ... mm

(b) From the photograph, state **two** ways in which the structure of the artery is different from that of the vein. [2]

…….....

…….....

…….....

…….....

8

2. Robert investigated reaction times in humans. He wanted to compare the reaction times of people of different ages.
Three people aged 20, 40 and 60 looked at a coloured shape on a computer screen. When it changed colour they tapped a key on the keyboard as quickly as possible. The computer logged the reaction time in milliseconds (ms) i.e. the time between the change of colour and the tap on the keyboard.
Each person took the test six times (Trials 1 – 6) and they all used the same computer.

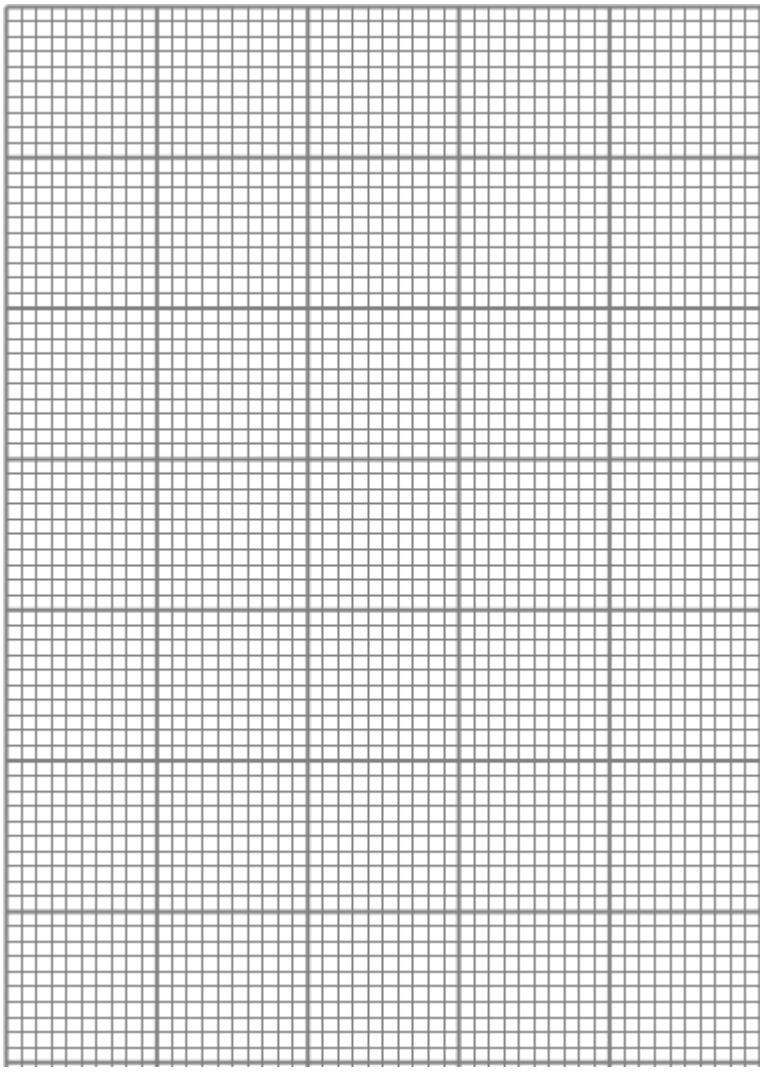
(a) The results of the investigation are shown in the table below.

			Reaction times (ms)						
Person	**Age**	**Gender**	**Trial 1**	**Trial 2**	**Trial 3**	**Trial 4**	**Trial 5**	**Trial 6**	**Mean reaction time**
1	20	male	276	261	255	250	245	242	254.8
2	40	female	303	272	270	264	256	253	.....
3	60	male	316	284	276	270	268	265	319.8

(i) Calculate the mean reaction time for person 2. Show your working. [2]

reaction time =…… ms

(ii) On the grid below, plot a bar chart to show the mean reaction time for each person by choosing a suitable scale for the mean reaction time, plotting the mean reaction times and labelling your bars clearly. [3]



(b) (i) From **these results** which person reacted most quickly? What evidence in the bar chart supports your choice? [2]

……

……

……

(ii) What do these results indicate about the effect of age on reaction time? [1]

……

(iii) Based on these results, suggest what might have happened to the reaction times if more than six trials had been completed. [1]

……

(c) Robert's teacher told him that although his investigation had been accurate and precise, he could not have much confidence in the results.

(i) In what ways was Robert's investigation accurate and precise? [2]

……

……

(ii) State how Robert could improve confidence in his results by:

I ensuring that his results were repeatable; [1]

.....

II ensuring that his results were reproducible. [1]

.....

(iii) Suggest **one** *other* way in which Robert's investigation could be improved. [1]

……

……

14

3. The following information relates to an investigation into osmosis.

Raw potato chips

Materials and apparatus
Peeled potatoes
5 large test tubes
5 sugar solutions – % concentrations 1.0, 2.5, 5.0, 7.5 and 10.0.
Ruler
Sharp knife
White tile
Balance
Measuring cylinder

Outline method

- Find the mass of potato chips
- Place potato chips in sugar solutions for a short time.
- Find the mass of potato chips again
- Calculate the percentage change in mass from the start of the investigation.

(a) Using the information above, describe how you could set up a series of test tubes to investigate how the mass of potato chips would change when they are placed in sugar solutions of different concentrations.
The investigation must be as accurate and fair as possible.

(i) State how you would prepare the potato chips. [2]

……

……

……

(ii) What essential step must be taken before weighing each chip? [1]

……

(iii) I **Complete the diagram**, to show how you would set up **one** of your test tubes. Label your diagram. [2]

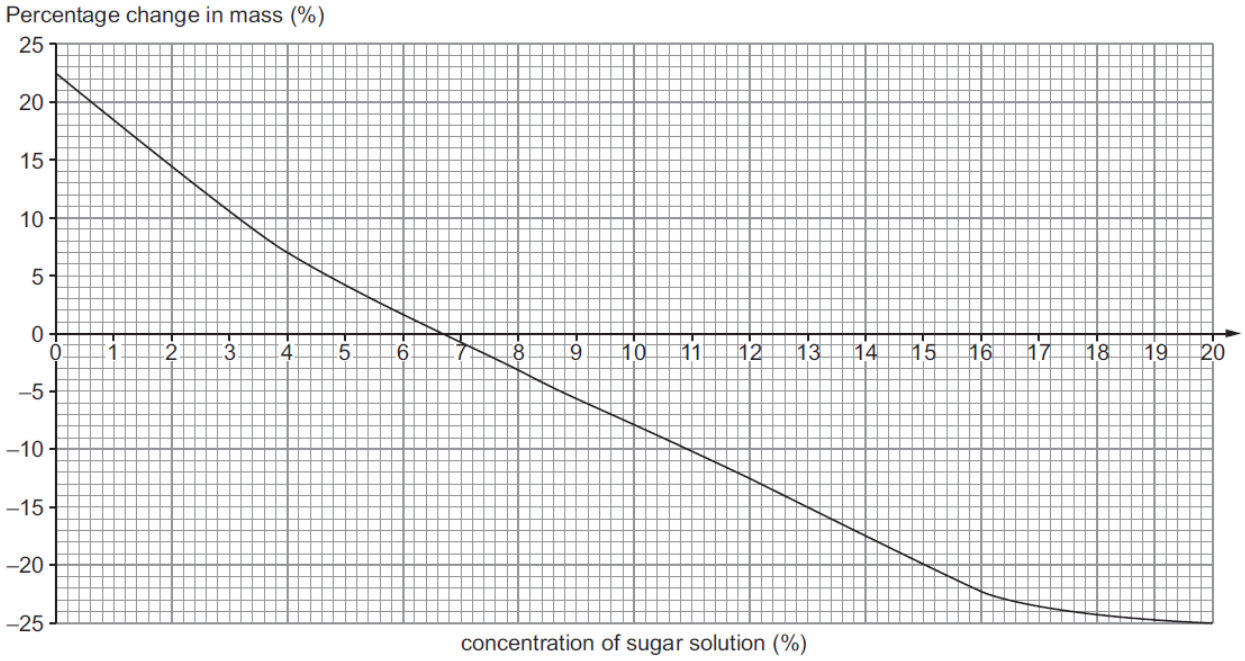
II How would the contents of this tube differ from your other tubes? [1]

.....

(iv) Identify **one** feature of the investigation which you judge to be a safety hazard. **Complete the risk assessment table** to show how you would deal with this problem. [1]

Hazard	**Risk**	**Control measure**

(b) The graph below shows the results of a similar investigation.



From this graph, give the concentration of sugar solution which would be the same as that of the potato cells and explain your answer with reference to osmosis. [2]

……

……

……

……

9

4. Scientists investigated the effects of certain factors on the decomposition of dead leaves. They collected dead leaves from one sycamore tree and carefully cut them into 20 mm squares.
They then placed the squares into mesh bags of two different mesh sizes. The bags were then buried in soil in large containers. One container was incubated at 15 °C and the other at 30 °C. The soil was obtained from the same field.
After six weeks, the mesh bags were removed from the soil. Some of the leaf material had decomposed. The scientists then observed the area of each leaf square which remained. They did this by placing the squares on pieces of graph paper.

(a) (i) State **three** features of the scientists' method which contributed to making the investigation fair and valid. [3]

.....

.....

.....

(ii) How did the scientists ensure that their observations were accurate? Explain your answer. [2]

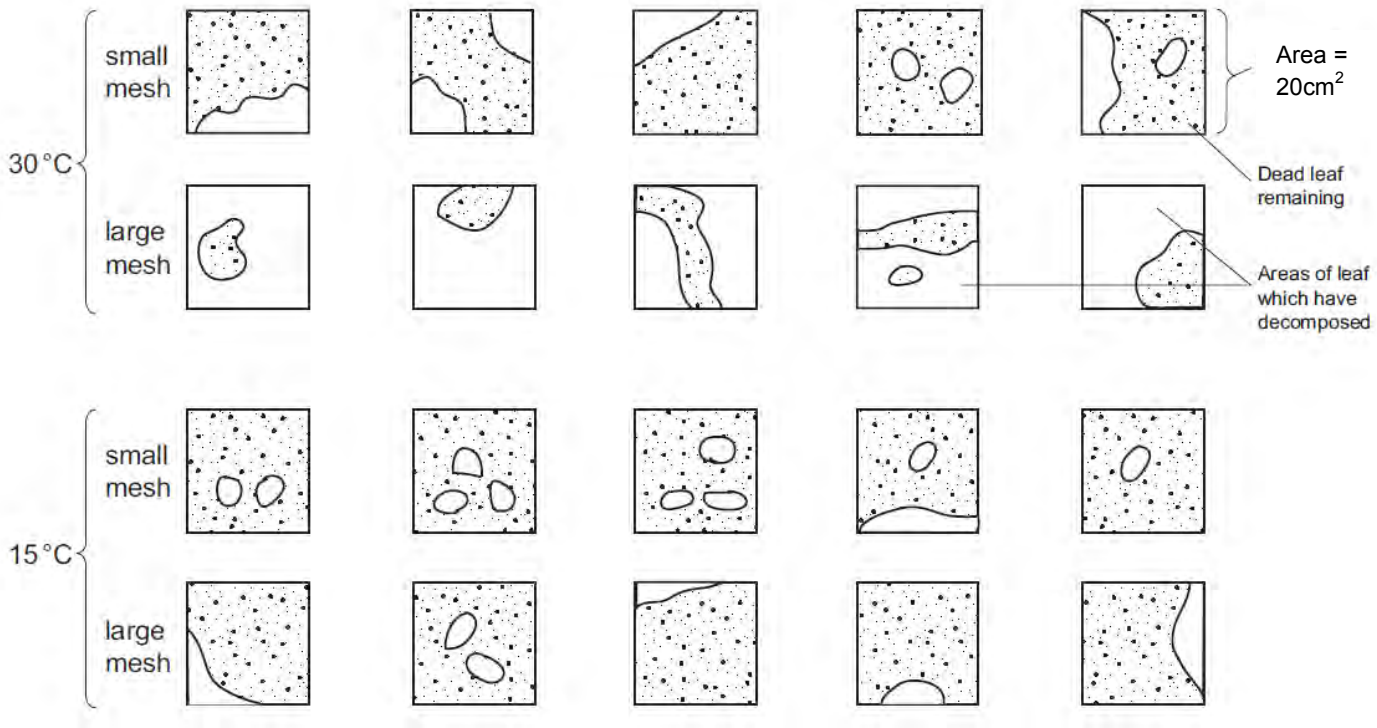
.....

.....

.....

.....

(b) The diagrams below show samples of the leaf squares at the end of the investigation.



What can be concluded about the effects of temperature and mesh size on the decomposition of leaves? Suggest reasons for your conclusions. [6 QER]

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

(c) Suggest the results that would have been obtained in this investigation if the scientists had used soil that had been sterilised by heating at 100 ^{o}C for 24 hours. Give reasons for your answer. [3]

……

……

……

……

……

……

14

SECTION B

Answer **all** *questions*

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

5. *(a)* (i) Calculate the number of alien species that are in Britain today. Show your working. [2]

number of species = ……

(ii) Suggest why the answer in (i) is only an estimated value. [1]

…….....

…….....

(b) Using the information in **Figure 1** describe how the distribution of invasive marine species changed between 1960 and 2008. [4]

…….....

…….....

…….....

…….....

…….....

…….....

…….....

(c) Research suggests that black swan numbers have increased at such a rate that they may now be added to the "British List" of birds found in the UK.

(i) Suggest a method by which black swans were introduced into England. [1]

…….....

(ii) Describe the method of collecting data to estimate the number of black swans in a habitat. [2]

…….....

…….....

(d) State **two** adverse effects on the ecosystem in **Figure 2** caused by the black swan feeding on seagrass. [2]

1. ……

2. ……...

(e) Adult and cygnet black swans are introduced into the food web shown in **Figure 3.** Explain how this will affect the pike population. [3]

…….....

…….....

…….....

…….....

15