Surname		Centre Number	Candidate Number
Other Names			0

GCSE – NEW

wjec cbac

C400UB0-1

S18-C400UB0-1

eduqas
Part of WJEC

BIOLOGY – Component 2
Applications in Biology

HIGHER TIER

MONDAY, 11 JUNE 2018 – MORNING

1 hour 15 minutes

For Examiner's use only			
	Question	Maximum Mark	Mark Awarded
Section A	1.	15	
Section B	2.	13	
	3.	9	
	4.	7	
	5.	6	
	6.	10	
	Total	60	

C400UB01
01

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 **5**.

2

SECTION A

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

1. *(a)* (i) State **one** way in which communicable diseases caused by viruses can be spread by humans. [1]

....

(ii) Explain why a doctor would not prescribe antibiotics as a treatment for measles.[1]

....

(iii) Using the information in **Figure 1** explain how 'herd immunity' provides protection for the unvaccinated population. [1]

....

....

....

(iv) Explain why 'herd immunity' is particularly important for people with HIV/AIDS. [1]

....

....

(b) (i) Using **Figure 2**, describe the trend in deaths from measles in England and Wales between 1901 and 1995. [1]

....

(ii) Suggest how the data in **Figure 2** could be used to argue that vaccination had no effect on deaths from measles between 1901 and 1995. [1]

....

....

(c) (i) The national census in 2011 estimated that the number of children aged 2 in England was approximately 670 000.
Use **Figure 3** to calculate an estimate of the number of children aged 2 who had been vaccinated against MMR in 2011. [2]

Number vaccinated = ...

(ii) Suggest **one** reason why the 1998 study was discredited and how the study could have been improved. [2]

....

....

....

(d) Describe how the MMR vaccine causes the body to develop immunity against measles, mumps and rubella. [5]

....

....

....

....

....

....

....

....

....

15

C400UB01
03

4

BLANK PAGE

SECTION B

*Answer **all** questions.*

2. A group of students was given six concentrations of blackcurrant squash each with a volume of $20\,cm^3$.

   The students used a scalpel, cork borer and ruler to produce 6 potato cylinders 5 cm in length. The mass of each cylinder was recorded. Each cylinder was then placed in a boiling tube containing a different concentration of blackcurrant squash solution as shown below.

— blackcurrant squash

— cylinders of potato

0%   20%   40%   60%   80%   100%   ← concentration of blackcurrant squash
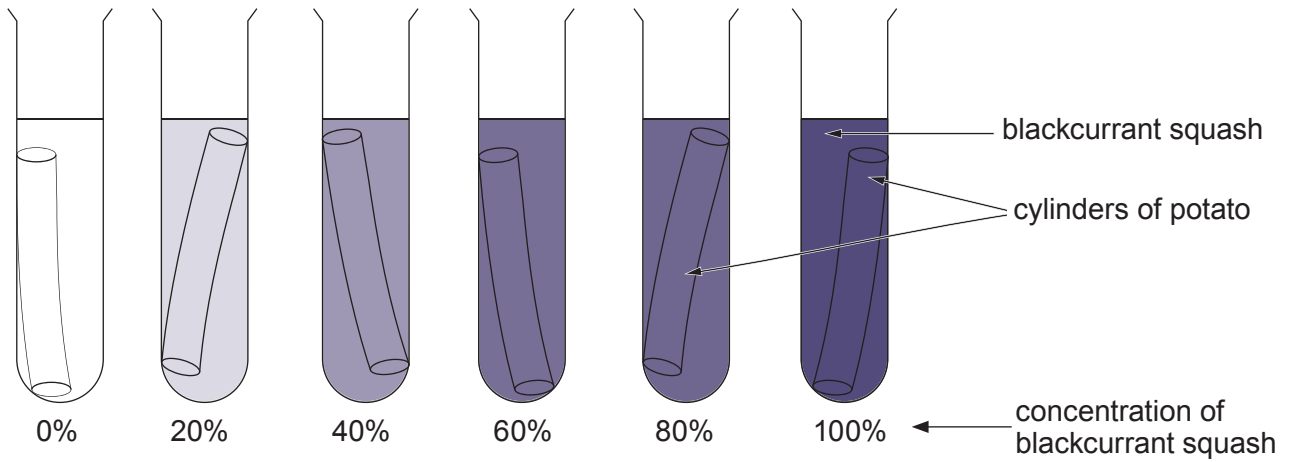
(a) Use the table below to carry out a risk assessment for this investigation. [2]

Hazard	Risk	Control measure

C400UB01
05

*(b)* The cylinders were left for 1 hour before the mass was recorded again. The results are shown in the table below.

Blackcurrant squash concentration (%)	Mass of cylinder at start (g)	Mass of cylinder after 1 hour (g)	Change in mass (g)	Percentage change in mass (%)
0	4.7	5.7	+1.0	+21.3
20	4.7	4.9	+0.2	+4.3
40	4.6	4.3	−0.3	−6.5
60	4.7	4.1	−0.6	−12.8
80	4.6	4.0	....	....
100	4.7	3.9	−0.8	−17.0

(i) Calculate the change in mass **and** the percentage change in mass for the cylinder in the 80 % squash concentration. [2]
Write your answers in the table.

(ii) **Complete the graph below** by plotting the value for 80% blackcurrant squash concentration on the grid and then drawing an appropriate line. [2]

8
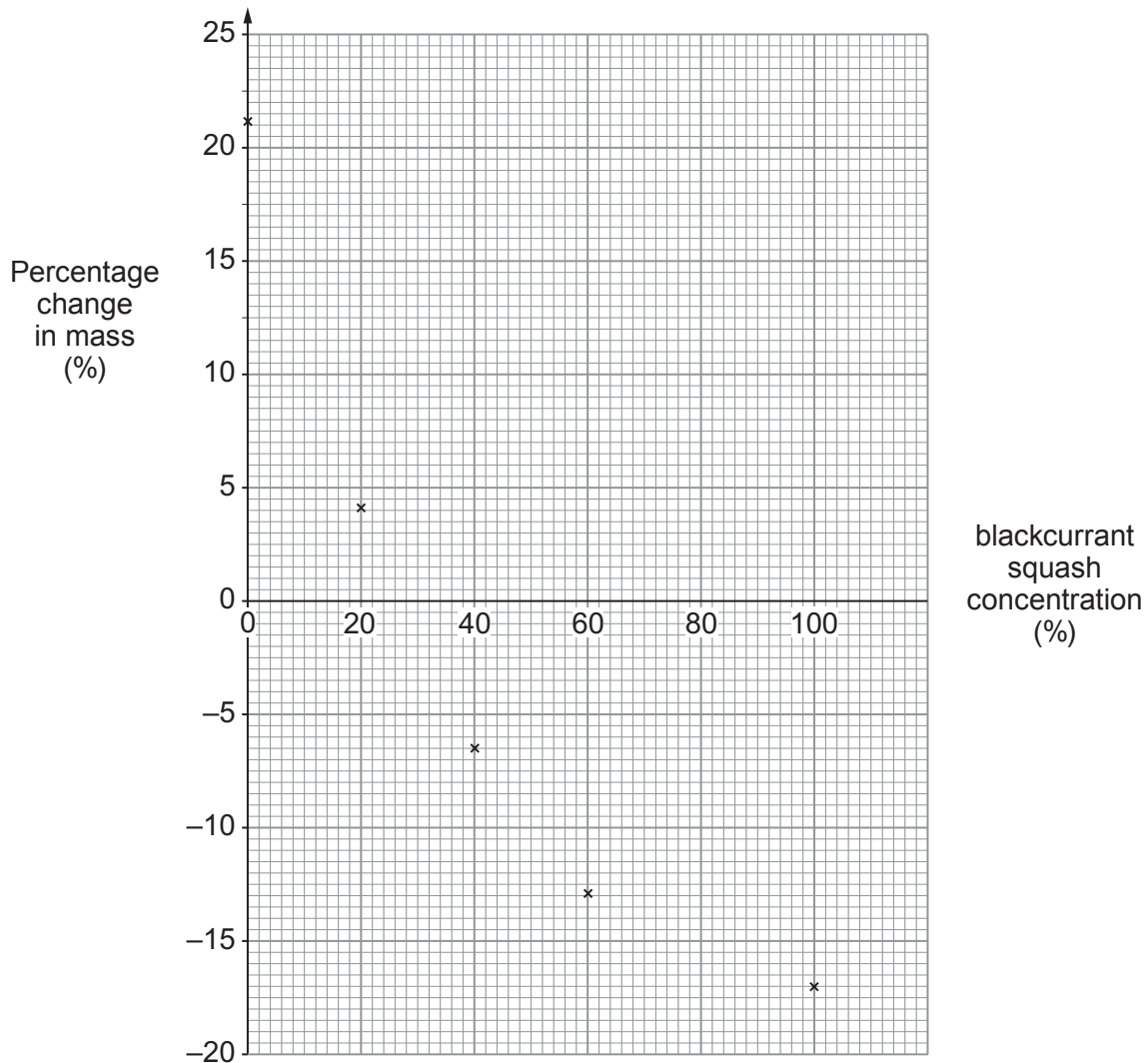
Examiner only

(iii) Explain the change in the mass of the potato cylinder at a squash concentration of 0%. [4]

....

....

....

....

....

....

....

....

(iv) Use your graph to estimate the solute concentration inside the potato cells. [1]

....

(c) (i) State how the students could improve the estimation of the solute concentration inside the potato cells. [1]

....

....

(ii) State how the students could have improved the precision of their measurements. [1]

....

....

13

BLANK PAGE

C400UB01
09

3. An experiment was carried out to investigate the effect of temperature on the activity of lipase.

- $15\,cm^3$ of full-fat milk was placed in each of two boiling tubes **A** and **B**.
- Tube **A** was placed in a water bath at 30 °C and tube **B** was placed in a water bath at 75 °C.
- A pH probe linked to a data logger was placed in each tube and set to begin recording.
- After 5 minutes, $3\,cm^3$ of 5% lipase was added to each boiling tube and mixed.

The results are shown below.
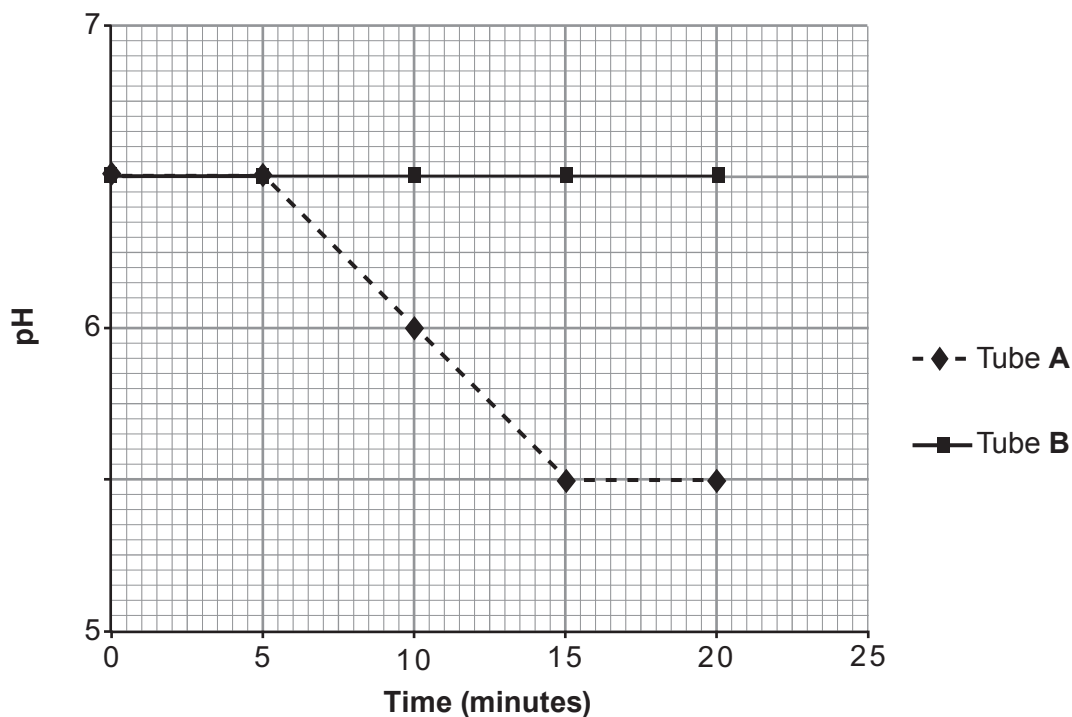
(a) State the name of the hypothesis which describes the way in which enzymes function. [1]

....

(b) (i) Explain the results for tube **A**. [3]

....

....

....

....

(C400UB0-1)

Examiner only

(ii) Explain the results for tube **B**. [2]

....

....

....

....

....

(c) (i) Give the reason why the milk was placed in the water bath for 5 minutes before adding the lipase. [1]

....

....

(ii) The students decided to use the same method to investigate the effect of lipase concentration on the activity of lipase.
Identify the independent variable and **two** controlled variables for this new investigation. [2]
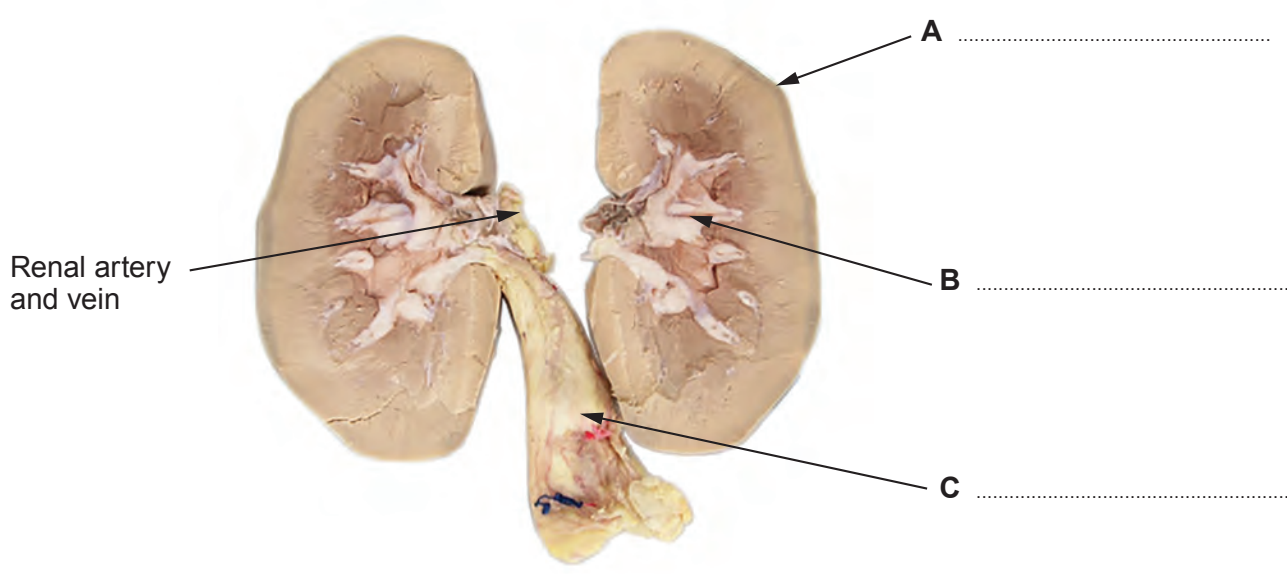
....

....

....

9

4. The photograph shows a dissected kidney.

A ....

Renal artery and vein

B ....

C ....

(a) Label parts **A**, **B** and **C**. [3]

(b) (i) State **two** ways that the composition of blood in the renal vein differs from that in the renal artery. [1]

....

....

....

(ii) The heart pumps approximately $5\,dm^3$ of blood per minute. Normally about one quarter of the heart's output passes through the kidney. About $180\,dm^3$ of liquid passes from the blood into the Bowman's capsule each day.

Calculate the percentage of liquid which passes from the blood into the Bowman's capsule each day. Show your working clearly. [3]

percentage of liquid passing from the blood into the Bowman's capsule each day

= .... %

7

BLANK PAGE

5. Two similar groups of barley seedlings were grown from seed in a culture solution. The culture solution contained all the ions necessary for plants to grow. The sulfate ions in the solution contained radioactive sulfur atoms, ^{35}S. During the investigation, oxygen was bubbled through the solution containing seedlings **A**. Nitrogen gas was bubbled through the solution containing the other group of seedlings **B**. Nitrogen is not harmful to seedlings, but bubbling it through the culture solution removes all the oxygen.
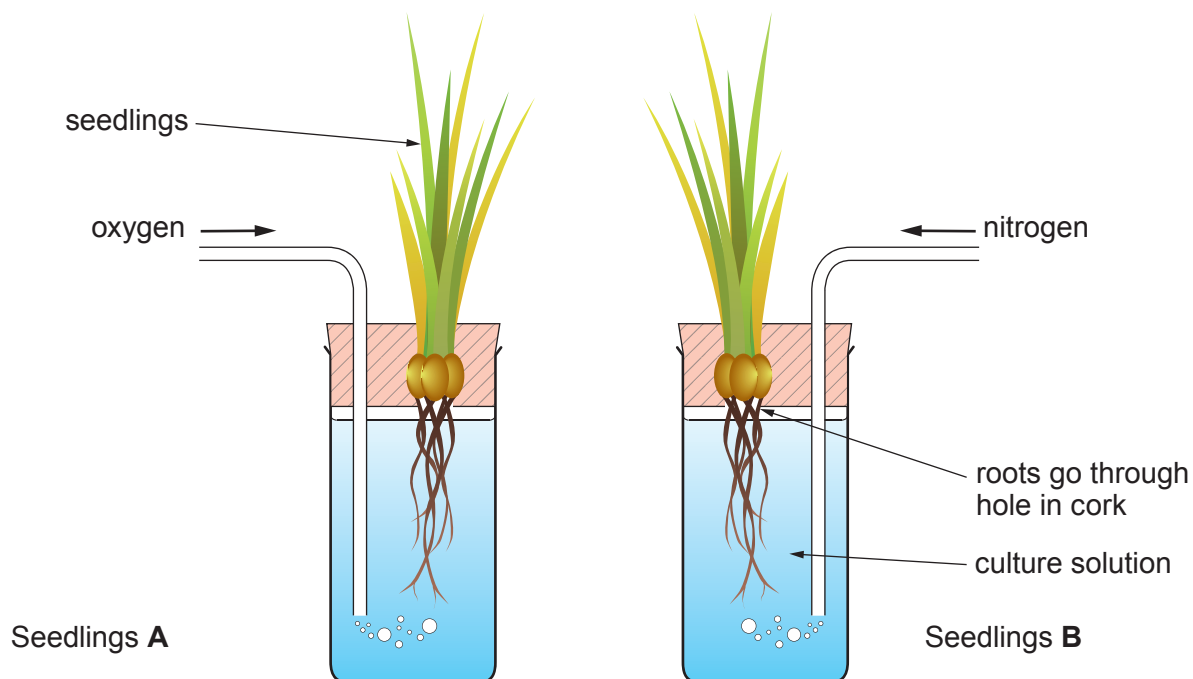
After 120 minutes, cyanide was added to both solutions. Cyanide is a chemical that inhibits respiration.

The number of radioactive sulfate ions absorbed by the seedlings in each culture solution was calculated at the start of the experiment, and then every 30 minutes for four hours. The results are shown below.

Time (minutes)	Total number of sulfate ions absorbed (arbitrary units)	
	Seedlings A (with oxygen)	Seedlings B (without oxygen)
0	0	0
30	220	140
60	290	190
90	350	210
120 cyanide added	390	225
150	403	238
180	415	250
210	425	260
240	455	290

Explain the difference between the uptake of ions shown by seedlings **A** and seedlings **B**.

[6 QER]

....

....

....

....

....

....

....

....

....

....

....

....

....

....

6

6. Peatlands in the UK store three billion tonnes of carbon. In natural peatlands, the annual rate of biomass production is greater than the rate of decomposition. Peat forms when plant material, usually in wet areas, is inhibited from decaying fully due to acidic and anaerobic conditions. If the peatlands are in good condition, they have the capacity to lock up thousands of tonnes of carbon, assisting in combating global warming.

In England, the largest expanses and deepest deposits of peat are found on the Pennine hills between 190 m and 893 m above sea-level. This includes the areas of Bleaklow and Black Hill in the Peak District, which are also amongst some of the oldest peatlands in the UK.

Wildfires, industrial pollution and overgrazing are some factors that have led to loss of vegetation on peatlands. Once the vegetation cover is lost the remaining peat is exposed. This causes erosion and oxidation of the peat which releases carbon dioxide.

Efforts have been made in recent years to re-introduce vegetation to parts of the Peak District. One example is Shelf Moor on Bleaklow Hill.
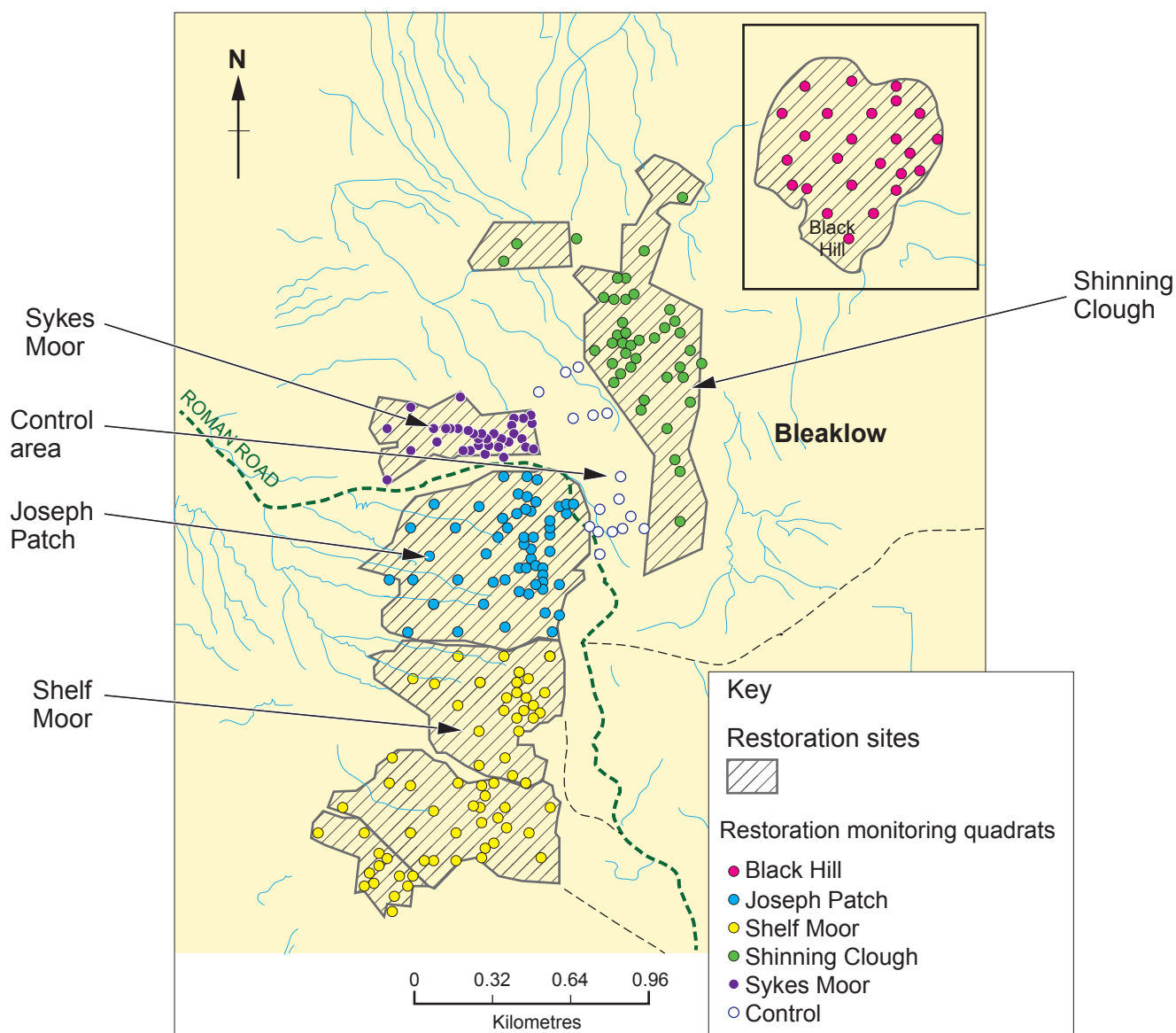
Map showing monitoring sites on Bleaklow and Black Hill. Dots represent locations of quadrats used for sampling.

(C400UB0-1)

(a) The effects of restoration on Shelf Moor and the control area are shown in the graph.
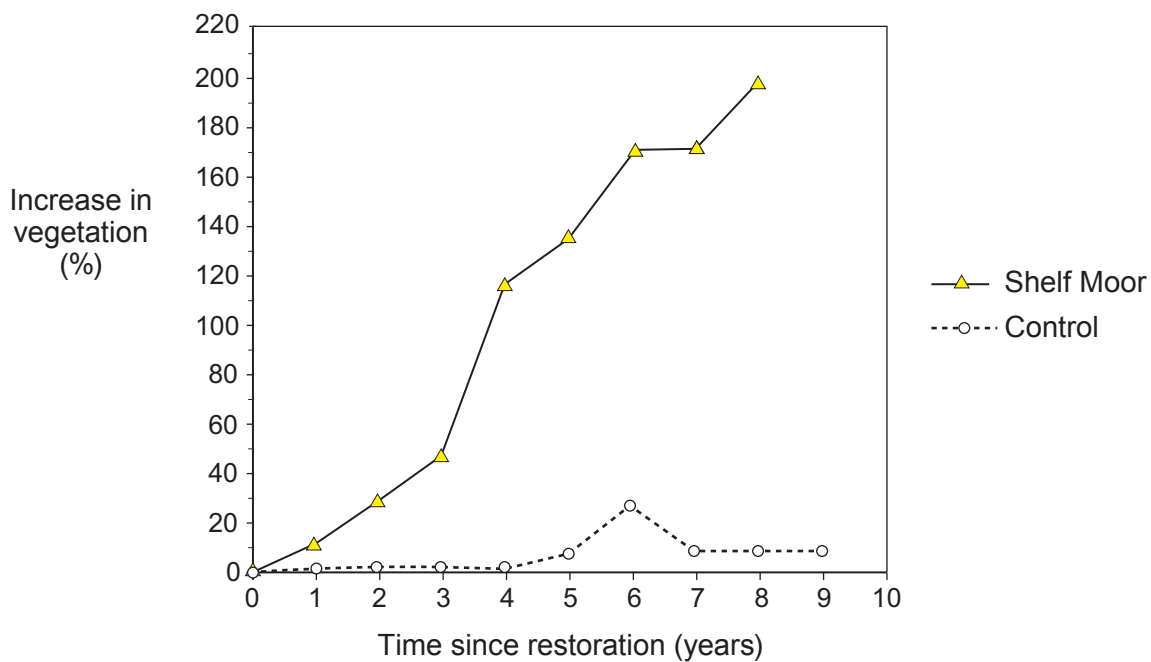
(i) Describe the trend shown in the graph for Shelf Moor. [1]

....

....

(ii) State the purpose of using a control in an investigation such as this. [1]

....

....

(b) Explain how carbon is removed from the air and stored in peat. [3]

....

....

....

....

....

© WJEC CBAC Ltd. (C400UB0-1) **Turn over.**

18

(c) A sample of soil was taken from Shelf Moor and added to a test tube containing $2.5\,cm^3$ of 1% urea solution and 10 drops of universal indicator solution. The test tube was placed in a water bath at 30 °C for 2 hours. The experiment was repeated using a sample of soil from farmland in the Peak District. The pH of the samples was recorded at the start and after two hours.

The results are shown below.

Soil sample	pH at start	pH after two hours
Peatland from Shelf Moor	3.0	3.0
Farmland	5.6	6.7

Explain the pH change for the soil sample from the farmland and suggest why there was no pH change for the soil sample from Shelf Moor. [5]

....

....

....

....

....

....

....

....

....

....

....

....

....

....

10

END OF PAPER

19

BLANK PAGE