OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL GCSE

BIOLOGY

9201/2 PAPER 2

Specimen material 1 hour 30 minutes

Materials

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the bottom of this page.
- Answer **all** questions.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname

Forename(s)

Candidate signature _____

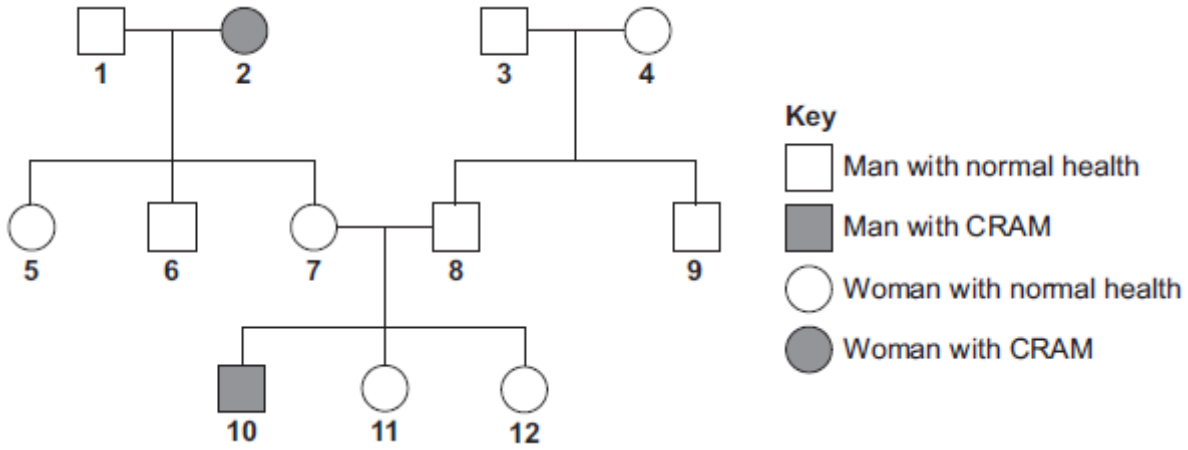
Answer **all** questions in the spaces provided.

1 "CRAM" is a disease. It is an inherited condition which causes muscle breakdown.

The breakdown products enter the urine, making it dark-coloured.

Figure **1** below shows the inheritance of CRAM in one family.

Figure 1



0 1 . 1 CRAM is caused by a recessive allele, **n**.

The allele for normal health is **N**.

What is an **allele**?

[1 mark]

0 1 . 2 What does **recessive** mean?

[1 mark]

0 1 . 3 Give evidence from the diagram that CRAM is caused by a **recessive** allele.

[1 mark]

0 1 . 4 Person **2** is homozygous for CRAM.

What does **homozygous** mean?

[1 mark]

0 1 . 5 Explain why none of person **2**'s children have CRAM.

[2 marks]

0 1 . 6 Persons **7** and **8** want to have another child.

What is the probability that this child will have CRAM?

Draw a genetic diagram to explain your answer.

Use the following symbols in your answer;

N = dominant allele for normal health (**NOT** having CRAM)

n = recessive allele for CRAM

[4 marks]

Probability = _____

Turn over for the next question

2 **Table 1** shows the number of chromosomes found in each body cell of some different organisms.

Table 1

Animals		Plants	
Species	**Number of chromosomes in each body cell**	**Species**	**Number of chromosomes in each body cell**
Fruit fly	8	Tomato	24
Goat	60	Potato	44
Human	46	Rice	24

0 2 . 1 Suggest why nearly every organism on earth has an even number of chromosomes in its body cells.

[1 mark]

0 2 . 2 Body cells divide by mitosis.

Why is the ability of body cells to divide important?

[1 mark]

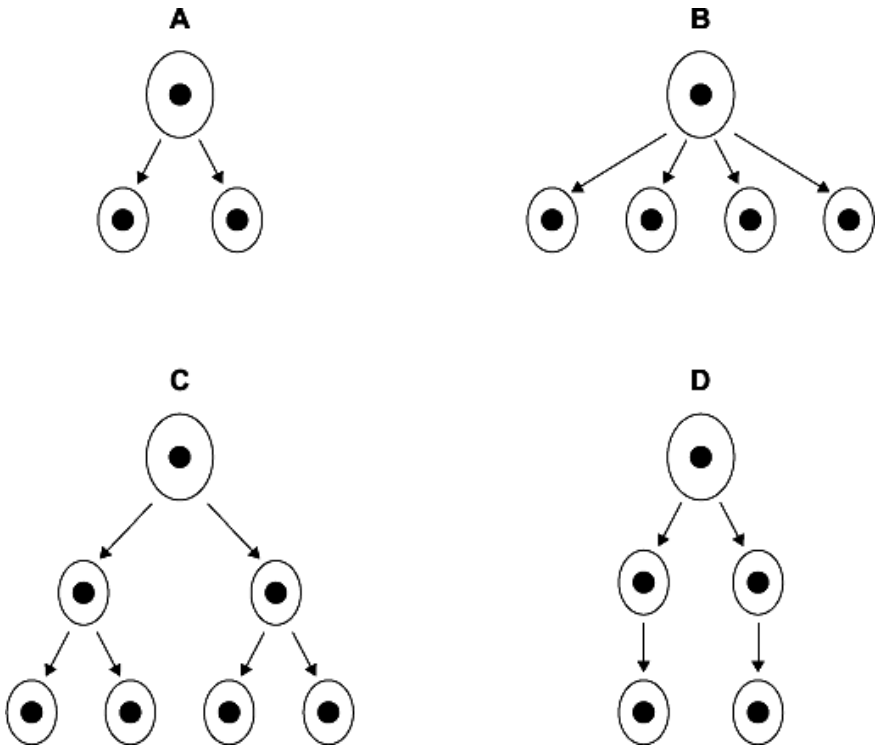
0 2 . 3 When a body cell of a potato plant divides, how many chromosomes will each of the new cells contain?

[1 mark]

Gametes are made in the testes by meiosis.

Look at the diagrams in **Figure 2** below.

Figure 2



0 2 . 4 Which diagram, **A**, **B**, **C** or **D**, represents how cell division by meiosis produce gametes in the testes?

[1 mark]

0 2 . 5 How many chromosomes will each goat gamete contain?

[1 mark]

Stem cells from an embryo can be grown in special solutions.

Some facts about stem cells are given below.

- Stem cells from an embryo can grow into any type of tissue.
- Stem cells may grow out of control, to form cancers.
- Large numbers of stem cells can be grown in the laboratory.
- Stem cells may be used in medical research or to treat some human diseases.
- Patients treated with stem cells need to take drugs for the rest of their life to prevent rejection.
- Collecting and growing stem cells is expensive.

0 2 . 6 Use **only** the information above to answer these questions.

Give **two** advantages of using stem cells.

[2 marks]

0 2 . 7 Give **two** disadvantages of using stem cells.

[2 marks]

During pregnancy, an umbilical cord and a placenta join the embryo to the mother.

At birth the umbilical cord is cut.

Stem cells can be obtained from the umbilical cord.

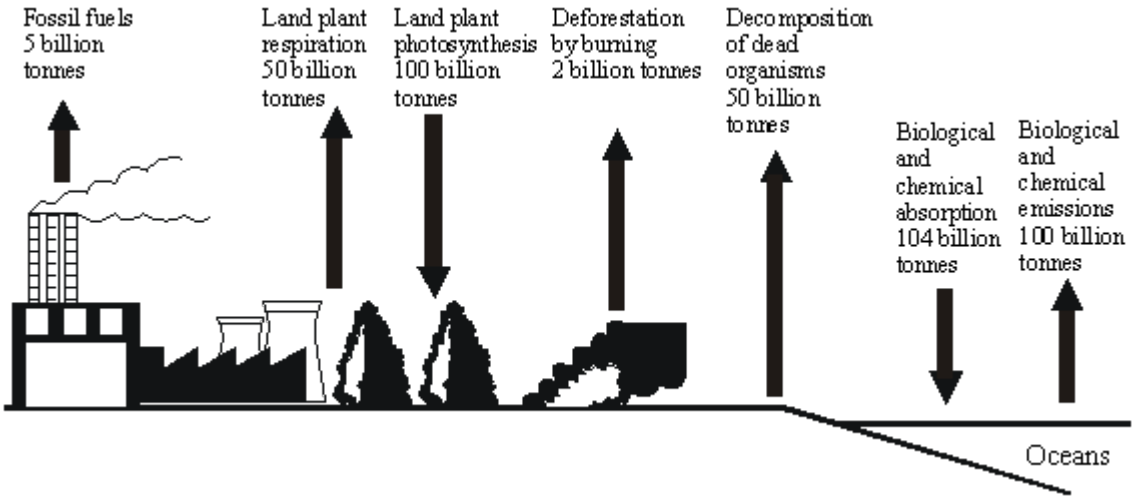
Many people think that the stem cells for treating human conditions should be obtained from umbilical cords rather than human embryos.

0 2 . 8 Suggest **one** reason why.

[1 mark]

3 **Figure 3** below shows the mass of carbon involved each year in some of the processes in the carbon cycle.

Figure 3



0 3 . 1 Give the balanced symbol equation of plant respiration.

[2 marks]

_____ + _____ → _____ + _____ (+ energy)

0 3 . 2 Calculate the mass of carbon removed from the atmosphere each year.

[1 mark]

Answer = _____ billion tonnes

0 3 . 3 Calculate the percentage of this total which is removed by the photosynthesis of land plants.

[2 marks]

Answer = _____ %

0 3 . 4 Calculate the net gain of carbon by the atmosphere in one year.

[2 marks]

Answer = _____ billion tonnes

0 3 . 5 Explain how the carbon contained in dead organisms can be made available to plants.

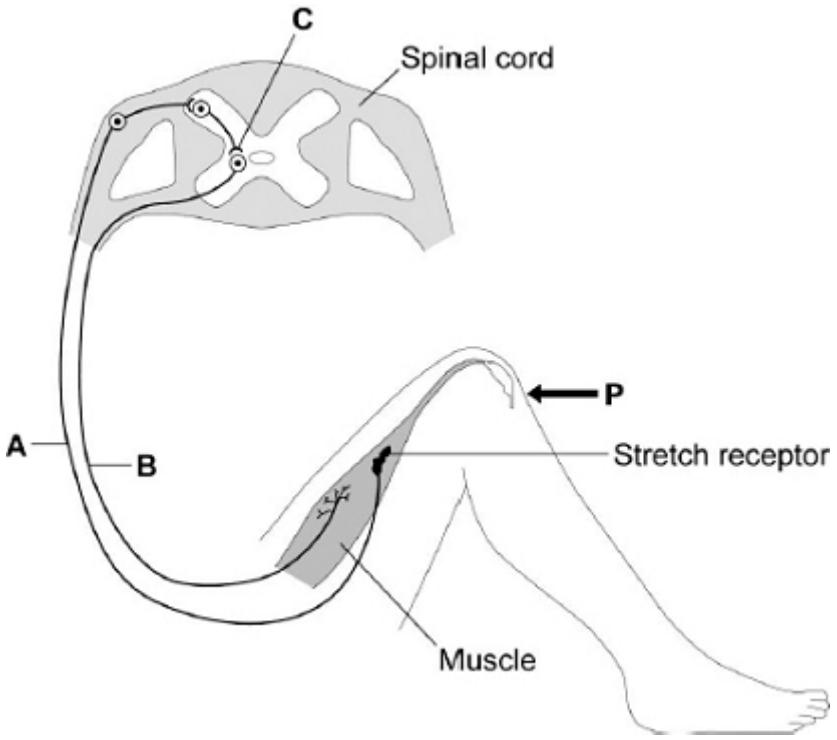
Use **Figure 3** to help you.

[3 marks]

4 The diagram in **Figure 4** shows the nervous pathway that is used to coordinate the knee-jerk reflex.

When the tendon below the knee is tapped with a hammer, the lower leg jerks upwards in a reflex action.

Figure 4



0 4 . 1 Name structure **A**.

[1 mark]

0 4 . 2 On the diagram in **Figure 4**, draw arrows next to the structures labelled **A** and **B** to show the direction in which a nerve impulse travels.

[1 mark]

0 4 . 3 How is information passed across the synapse at **C**?

[1 mark]

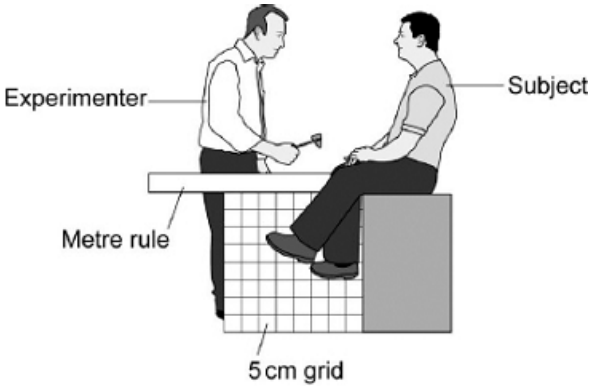
0 4 . 4 What is the effector in this response?

[1 mark]

A group of students wanted to find out how the speed of the hammer affected the distance the lower leg moved.

Figure 5 shows how the experiment was set up.

Figure 5



The student used a video to time the movement of the hammer.

In each trial, the experimenter held the hammer 20 cm from the subject's knee and then hit the subject's knee.

For each trial the experimenter used the hammer at a different speed.

Table 2 shows some of the results.

Table 2

Trial number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Distance hammer moved to knee in cm	20	20	20	20	20	20	20	20	20	20
Time taken by the hammer to move to the knee in s	0.50	0.46	0.40	0.33	0.30	0.26	0.23	0.20	0.07	0.07
Distance moved by toe in cm	0	0	5	5	4	10	10	10	10	10

0 4 . 5 What variable did the experimenter control in this experiment?

[1 mark]

0 4 . 6 One of the results seems to be anomalous.

Draw a ring around the anomalous result in the table.

Suggest **one** reason why the anomalous result may have happened.

[2 mark]

0 4 . 7 Draw a conclusion from the results of the experiment.

[2 marks]

0 4 . 8 Suggest **one** way in which the precision of the experiment could have been improved.

[1 mark]

0 5 . 1 A cuckoo is a bird that lays its eggs in the nests of other birds.

The hen cuckoo flies down to another bird's nest, pushes one egg out of the nest, lays an egg and flies away.

A female may visit up to 50 nests during a breeding season.

Suggest **two** advantages to the cuckoo of this behaviour.

[2 marks]

0 5 . 2 When the cuckoo's egg hatches, the chick will roll the other eggs out of the nest. If the eggs have already hatched, the cuckoo chick will push the other chicks out of the nest.

Suggest **two** advantages to the chick of this behaviour.

[2 marks]

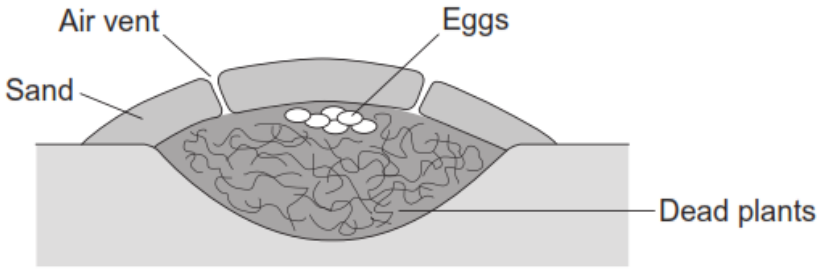
0 5 . 3 The cuckoo chick has a begging call that sounds like a family of chicks.

Suggest why this is an advantage to the cuckoo chick.

[2 marks]

Figure 6 shows a mound builder bird's nest.

Figure 6



0 5 . 4 Mound builder birds open and close the air vents of the nest at different times of the day.

Suggest reasons why it is necessary to open and close the air vents.

[3 marks]

0 5 . 5 The sex of a mound builder bird that hatches from an egg depends on the temperature at which the egg was kept.

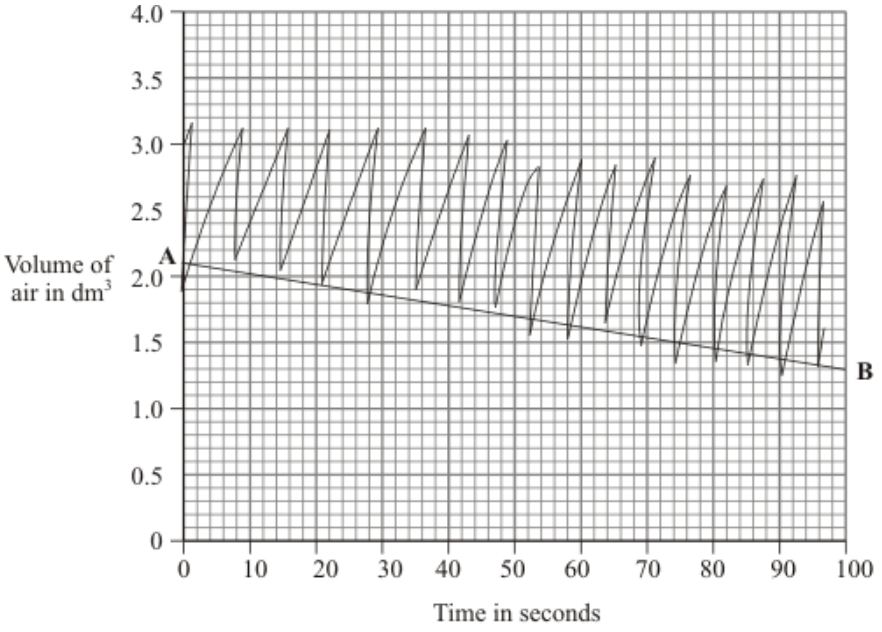
Suggest why it is important for mound builder birds to control the temperature of their nests.

[1 mark]

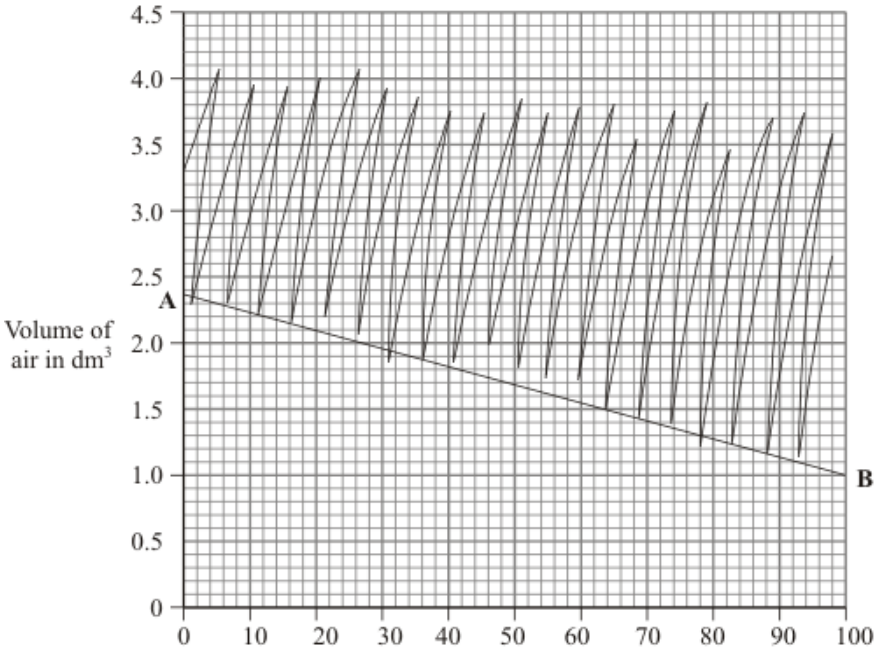
6 A student's breathing was monitored before and after vigorous exercise. The student breathed in and out through a special apparatus.

The graphs in **Figure 7** show the changes in the volume of air inside the apparatus. Each time the student breathed in, the line on the graph dropped. Each time the student breathed out, the line went up.

Figure 7



Before exercise



After exercise

0 6 . 1 How many times did the student breathe in per minute:

[1 mark]

before exercise;

after exercise?

0 6 . 2 On each graph, the line **A** – **B** shows how much oxygen was used.

The rate of oxygen use before exercise was 0.5 dm^3 per minute.

Calculate the rate of oxygen use after exercise.

[2 marks]

Rate of oxygen use after exercise = _____ dm^3 per minute

0 6 . 3 The student suggested they should repeat the experiment twice more.

How would repeating the experiment improve the investigation?

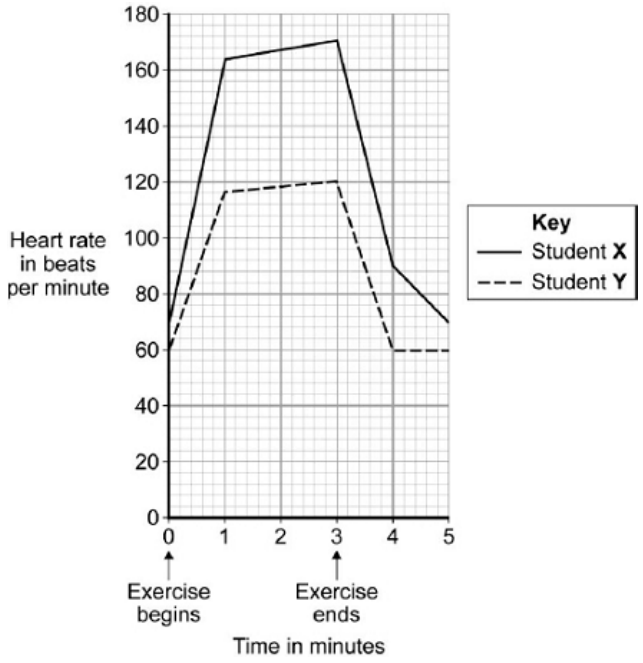
[1 mark]

Two other students did the same amount of vigorous exercise for 3 minutes.

One of the students was fit. The other student was unfit.

The graph in **Figure 8** shows how the students' heart rate changed during the exercise and after the exercise.

Figure 8



0 6 . 4 Give **two** ways in which the graph shows student **Y** is fitter than student **X**.

[2 marks]

0 6 . 5 In order to compare the results of the two students they had to be matched for a number of factors.

State **two** of these factors.

[2 marks]

0 6 . 6 Explain **two** advantages to the students of the change in heart rate during exercise.

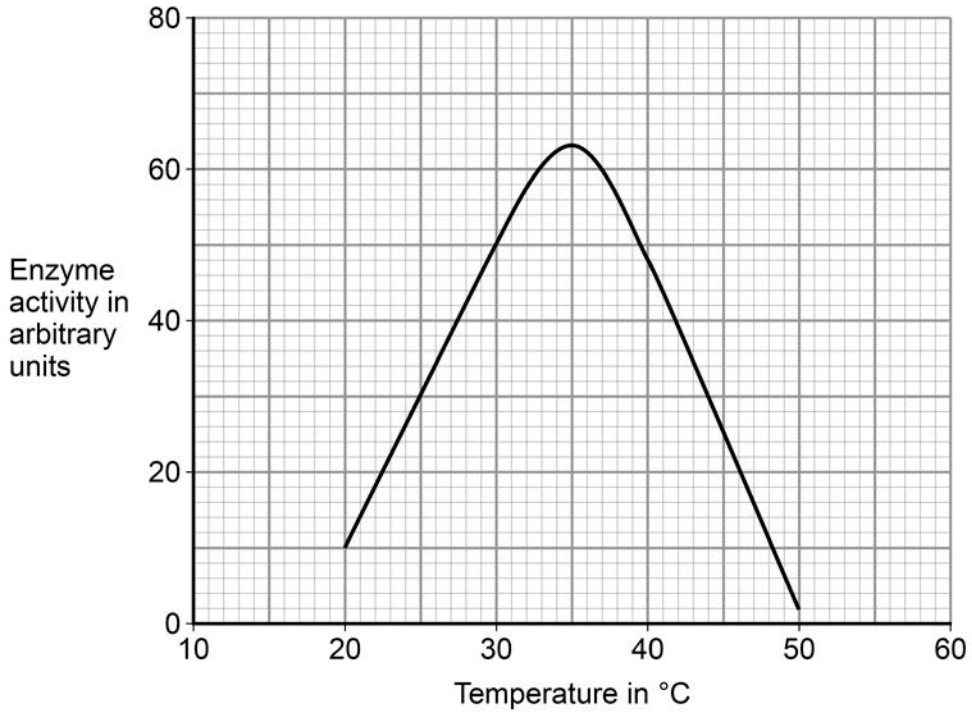
[2 marks]

7 A protease is an enzyme that digests protein.

A student investigated the activity of a protease enzyme at four different temperatures.

The graph in **Figure 9** shows how the activity of the protease varied with temperature.

Figure 9



0 7 . 1 Protease digests protein.

What is the product of the digestion of protein?

Tick **one** box.

[1 mark]

- Amino acids ☐
- Fatty acids ☐
- Glucose ☐
- Sucrose ☐

0 7 . 2 Describe what the graph shows about the effect of temperature on the rate of reaction.

Use data to support your answer.

[2 marks]

0 7 . 3 The student concluded the optimum temperature for protease was between 35 °C and 40 °C.

This conclusion may not be valid.

Describe how the experiment could be improved to find a more precise value for the optimum temperature.

[2 marks]

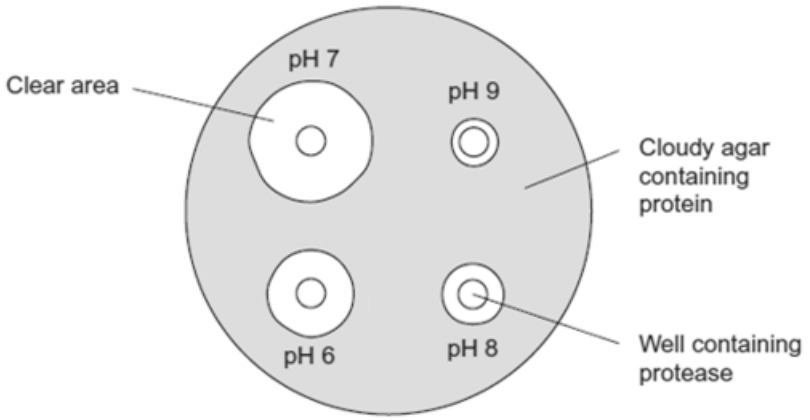
The student also investigated the effect of pH on the activity of the protease.

The student:

- used agar plates containing protein. The protein made the agar cloudy
- made four wells of equal size in the agar of each plate
- added a drop of protease solution to each of the wells. The protease solution in each well was at a different pH
- incubated the agar plates for 4 hours at a constant temperature.

The diagram in **Figure 10** shows the agar plates after they were incubated and the pH of the protease solution in each well.

Figure 10



0 7 . 4 Describe how the student could have used these results to compare the activity of the enzyme at different pH values.

[2 marks]

0 7 . 5 Describe a control that would be necessary for this investigation.

[2 marks]

0 7 . 6 Give a reason why 35 °C is a suitable temperature for incubating the agar plates.

Use the graph in **Figure 9** to help you.

[1 mark]

8 Scientists investigated how temperature affects the rate of photosynthesis.

The scientists grew some orange trees in a greenhouse.

They used discs cut from the leaves of the young orange trees.

The scientists used the rate of oxygen production by the leaf discs to show the rate of photosynthesis.

0 8 . 1 The leaf discs did not produce any oxygen in the dark.

Why?

[1 mark]

0 8 . 2 The leaf discs took in oxygen in the dark.

Explain why.

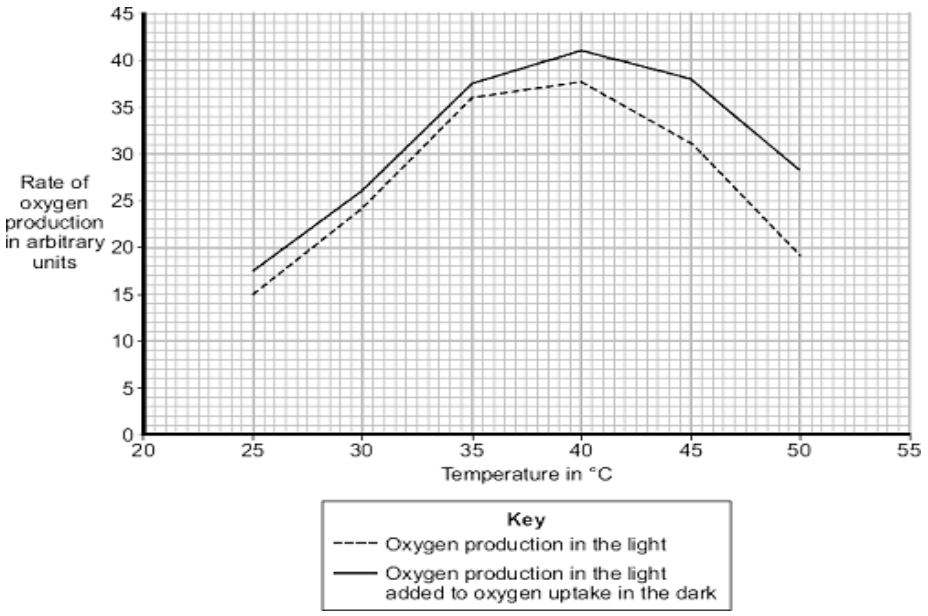
[2 marks]

In their investigation, the scientists measured the rate of oxygen release by the leaf discs in the light. The scientists then measured the rate of oxygen uptake by the leaf discs in the dark.

The graph in **Figure 11** shows the effect of temperature on

- oxygen production in the light
- oxygen production in the light added to oxygen uptake in the dark.

Figure 11



Use the information from the graph to answer each of the following questions.

0 8 . 3 Describe the effect of temperature on oxygen production in the light.

[2 marks]

0 8 . 4 Explain the effect of temperature on oxygen production in the light when the temperature is increased:

[3 marks]

from 25 °C to 35 °C

from 40 °C to 50 °C.

0 8 . 5 A farmer in the UK wants to grow orange trees in a greenhouse.

He wants to sell the oranges he produces at a local market.

He decides to heat the greenhouse to 35 °C.

Explain why he should **not** heat the greenhouse to a temperature higher than 35 °C.

Use information from the graph in your answer.

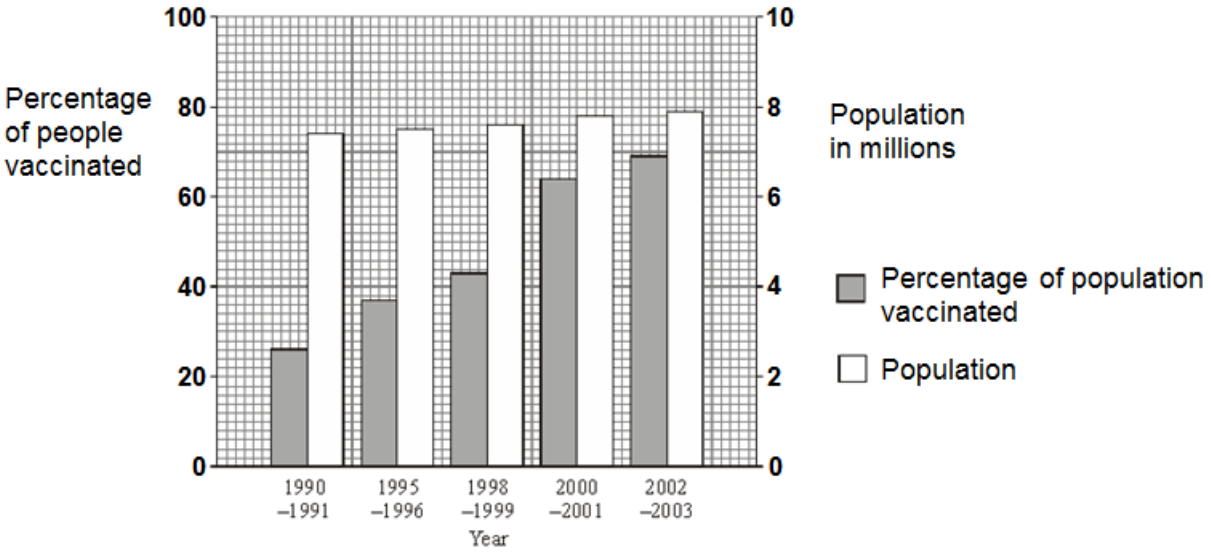
[2 marks]

9 Influenza (flu) is an infectious disease caused by a virus.

People who are considered 'at risk' are offered a vaccination against flu each year.

The bar chart in **Figure 12** shows the number of people in a population and the percentage of those who were vaccinated against flu.

Figure 12



0 9 . 1 Describe the change in the percentage of people vaccinated against flu from 1990 to 2003.

[1 mark]

0 9 . 2 Calculate the change in the total number of people being vaccinated between 1990/91 and 2000/01.

[2 marks]

0 9 . 3 A student suggested that some people were being vaccinated every year.

Explain how the information in the bar chart supports this suggestion.

[2 marks]

0 9 . 4 Suggest why it is advisable for people to be vaccinated against influenza every year.

[3 marks]

0 9 . 5 An influenza virus consists of a protein coat surrounding nucleic acid.

The influenza vaccine consists only of the protein coat of the virus.

Explain how the influenza vaccine produces immunity in the body.

[2 marks]

END OF QUESTIONS