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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Monday 4 November 2024

Morning (Time: 2 hours)

Paper reference 4BI1/1B 4SD0/1B

Biology

Unit: 4BI1
Science (Double Award) 4SD0
PAPER: 1B

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 7 3 4 9 1 R A 0 1 3 2

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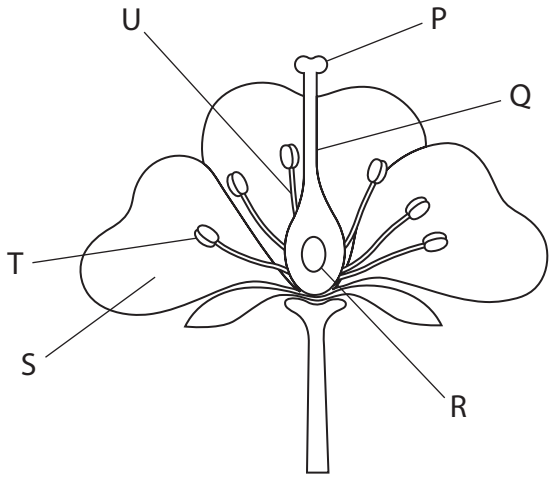
Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 The diagram shows an insect-pollinated flower with some structures labelled.



(a) (i) Which structures are the male parts of the flower?

(1)

☒ **A** P and Q

☒ **B** P and R

☒ **C** S and T

☒ **D** T and U

(ii) On which structure does the pollen grain germinate?

(1)

☒ **A** P

☒ **B** R

☒ **C** S

☒ **D** T

(iii) Which structure becomes the seed after fertilisation?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** T

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(b) The picture shows a strawberry plant.

This plant can reproduce sexually using its flowers, or asexually.



(Source: © Havryliuk-Kharzhevska / Shutterstock)

(i) Describe how a strawberry plant reproduces asexually.

(2)

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(ii) A farmer wants to produce a plant that has strawberries with a different flavour.

He then wants to produce large numbers of these plants.

Discuss how he can use sexual and asexual reproduction to achieve this.

(4)

(Total for Question 1 = 9 marks)

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2 Complete the passage about the lungs by writing a suitable word in each blank space.

(6)

The organs of gas exchange in humans are the lungs.

A single tube called the ..... allows air to move towards the lungs.

This tube splits into two tubes called ..... which then divide into many narrow tubes called ..... .

At the end of these narrow tubes are air sacs called ..... .

These are where gas exchange takes place.

The lungs are inflated by the contraction of a muscular sheet called the ..... .

The ..... muscles also contract to move the ribs to expand the chest cavity.

(Total for Question 2 = 6 marks)

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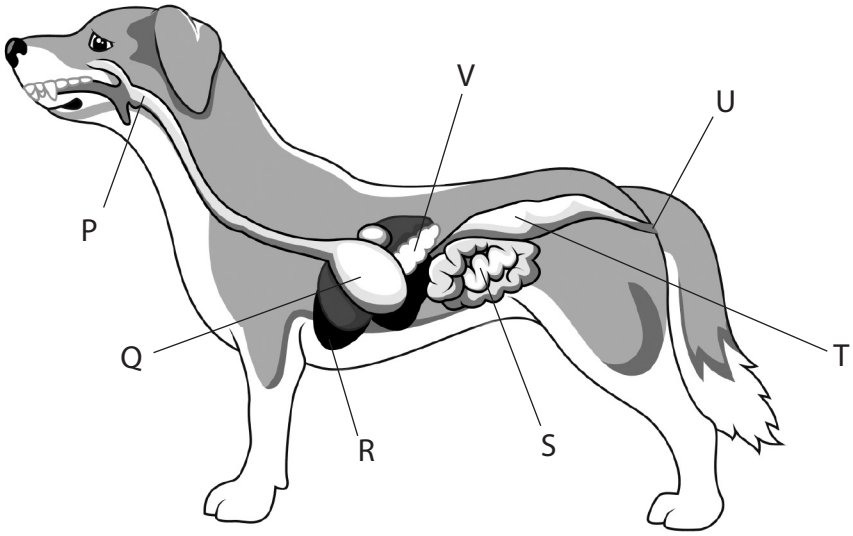
3 The diagram shows the digestive system of a dog with some structures labelled. The digestive system of the dog is similar to that of a human.



(Source: © Teguh Mujiono / Shutterstock)

(a) (i) Which structure is the oesophagus?

(1)

- ☒ **A** P
- ☒ **B** Q
- ☒ **C** R
- ☒ **D** U

(ii) Which structure is part of the large intestine?

(1)

- ☒ **A** P
- ☒ **B** Q
- ☒ **C** R
- ☒ **D** T

(iii) Which structure contains villi?

(1)

- ☒ **A** Q
- ☒ **B** R
- ☒ **C** S
- ☒ **D** V

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(iv) Which structure is the stomach?

(1)

- ☒ **A** Q
- ☒ **B** S
- ☒ **C** T
- ☒ **D** V

(b) Describe how food is moved along the gut of the dog.

(2)

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(c) The table lists some ingredients in food given to young dogs and in food given to adult dogs.

Ingredient	Percentage by mass of each ingredient	
	young dog food	adult dog food
protein	22	18
fat	8.0	5.0
calcium	1.0	0.6
phosphate	0.8	0.5

(i) Discuss the differences between the composition of the two foods.

(4)

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(ii) The diet of wild dogs consists of prey animals and a small amount of plant material contained in the gut of their prey.

Domesticated dogs are often given a diet that contains large amounts of carbohydrates such as starch.

Explain the possible effects of feeding domestic dogs large quantities of carbohydrates such as starch.

(3)

(Total for Question 3 = 13 marks)

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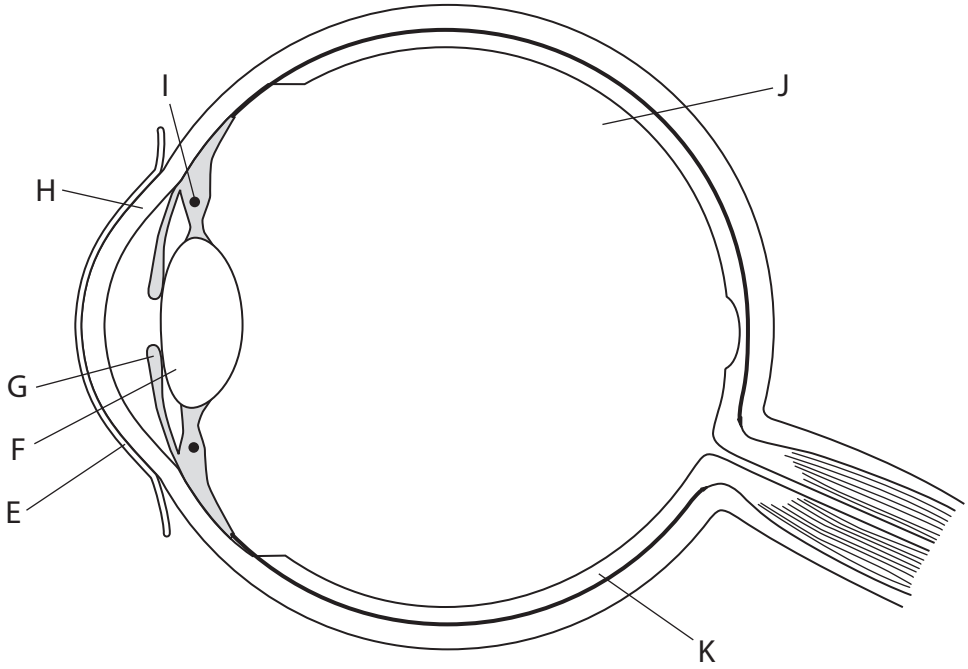
4 The diagram shows a section through a human eye with some structures labelled.



(a) (i) Which structures refract light onto the retina?

(1)

- ☒ **A** E and J
- ☒ **B** F and H
- ☒ **C** G and K
- ☒ **D** I and J

(ii) Which structure controls the amount of light reaching the retina?

(1)

- ☒ **A** E
- ☒ **B** F
- ☒ **C** G
- ☒ **D** H

(iii) Which structure contains light sensitive cells?

(1)

- ☒ **A** H
- ☒ **B** I
- ☒ **C** J
- ☒ **D** K

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(b) The eye can focus on near objects and distant objects.

Describe the changes that take place in the eye when it focuses on a near object.

(4)

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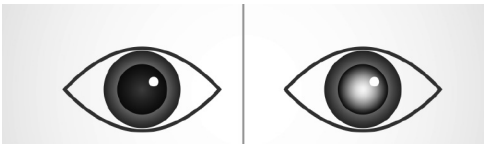
(c) Some people develop cataracts in their lenses as they get older.

The diagram shows how a cataract changes the appearance of a person's eye.

CATARACTS



Normal

Eye with Cataract

(Source: © iLoveCoffeeDesign / Shutterstock)

(i) Explain how cataracts affect a person's vision.

(2)

.....

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(ii) The treatment for a person with cataracts is to remove the affected lenses.

Suggest what additional treatment is needed for the person.

(1)

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(Total for Question 4 = 10 marks)

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5 Scientists can investigate the effect of exercise on breathing rate.

An athlete wears a face mask that covers their nose and mouth. The mask contains electronic sensors that measure and record the athlete's breathing rate as they exercise.

An investigation using this mask produces these results.

Time since start of exercise in minutes	Breathing rate in breaths per minute
0	20
2	28
4	35
6	45
8	48
10	50
12	50

(a) (i) Calculate the percentage change in the breathing rate from the start of exercise to the breathing rate at 10 minutes.

(2)

percentage change = ... %

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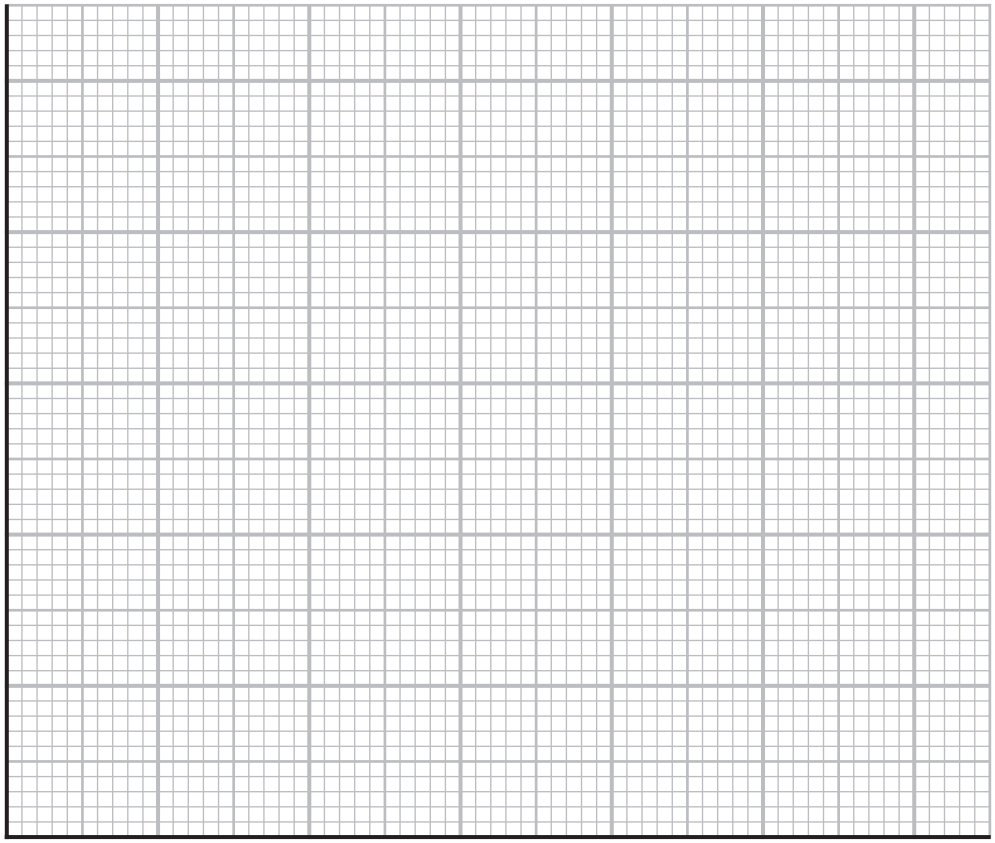
(ii) Plot a line graph to show how breathing rate changes during exercise.

Join your points with straight lines.

(5)



(iii) Explain the change in breathing rate during the 12 minutes of exercise.

(3)

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(b) Explain why the breathing rate would remain high for a few minutes after the exercise has finished.

(2)

(c) The difficulty with measuring breathing rate during exercise is that wearing a mask may affect breathing rate and performance.

A different method of recording breathing rate is to wear a shirt that contains sensors that record chest movements.

Suggest one advantage and one disadvantage of using a shirt that measures breathing rate by recording chest movements.

(2)

advantage

disadvantage

(Total for Question 5 = 14 marks)

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6 This insect is the fruit fly *Drosophila melanogaster*. These flies are the most commonly used organisms for genetic research.

They have a life cycle of around 10 days and each female can produce hundreds of offspring.



(Source: © Nechaevkon/ Shutterstock)

(a) Explain one reason why *Drosophila* are a popular choice for scientists to use in genetic studies.

(2)

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(b) Flies normally have long wings, but some flies have been found that have short wings.

In a first cross, a scientist mates 10 male flies with long wings with 10 female flies that have short wings.

They have 2810 offspring that all have long wings.

The scientist then sets up a second cross.

They mate a male offspring from the first cross with a female offspring from the first cross.

This second cross produces 241 offspring with long wings and 79 offspring with short wings.

(i) Draw a genetic diagram to show the genotypes and phenotypes of the parents in the second cross and the ratio of phenotypes and genotypes of their offspring.

(4)

(ii) Calculate the expected probability of a fly being male and having long wings in this second cross.

(2)

probability = ...

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(iii) The scientists counted the number of male and female offspring with long wings or with short wings from this second cross.

The table shows their results.

Number of flies			
male flies		**female flies**	
long wings	**short wings**	**long wings**	**short wings**
118	37	123	42

Comment on these results compared with the expected results.

In your answer refer to

- the number of males and the number of females
- the number of flies with long wings and the number of flies with short wings

Use data from the table in your answer.

(4)

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(c) Flies with short wings are not found in wild populations of *Drosophila*.

Explain this observation.

(3)

(Total for Question 6 = 15 marks)

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7 This food chain comes from a Swedish lake.

algae → crustacea → perch → pike → osprey

(a) (i) Name the trophic level of the algae in this food chain.

(1)

.....

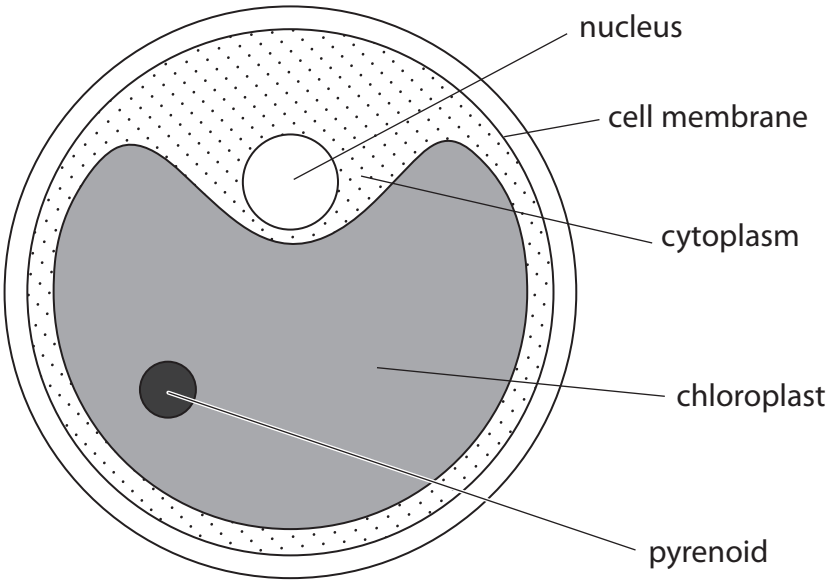
(ii) Name the trophic level of the pike in this food chain.

(1)

.....

(b) Some algae are single-celled such as *Chlorella* whilst other algae are multicellular such as seaweeds.

The diagram shows a species of *Chlorella*.



(i) The actual diameter of the *Chlorella* is 10 μm.

Calculate the magnification of the diagram.

[1 mm = 1000 μm]

(2)

magnification = ...

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(ii) Calculate the volume of the *Chlorella*.

Assume *Chlorella* is a sphere with a radius (*r*) of 5.00 μm.

[volume of sphere = $\frac{4}{3}\pi r^3$ $\pi = 3.14$]

(2)

volume = ... μm^3

(iii) The cytoplasm contains a very large chloroplast.

Describe the function of the chloroplast.

(2)

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(iv) *Chlorella* contains many starch granules.

Describe the function of the starch granules in the organism.

(2)

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(c) A student wants to compare the number of individuals in seaweed populations on two different beaches.

Describe how the student could carry out this investigation.

(4)

(Total for Question 7 = 14 marks)

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8 The body has a hormonal control system that coordinates some of the body's responses.

(a) The table shows the effects of some of the hormones and the gland that produces each hormone.

Complete the table by giving the missing information.

(4)

Effect	Name of hormone	Name of gland
converts blood glucose into glycogen		pancreas
stimulates the development of male secondary sexual characteristics		
increases heart rate	adrenaline	
maintains the uterus lining		

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(b) Plants also respond to changes in their environment.

(i) Explain how plants benefit from the responses of their roots and stems to the direction of light they receive.

(4)

(ii) In many plants, flowering is stimulated by the number of hours of daylight.

Suggest why flowering in many plants is stimulated by the number of hours of daylight rather than by temperature.

(2)

(Total for Question 8 = 10 marks)

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9 Many insect species damage crop plants.

One such pest is the larvae of the Fall Armyworm moth.

The photograph shows a larva of this moth feeding on a leaf of a maize plant.



(Source: © Alchemist from India / Shutterstock)

(a) Explain how the larvae of the moth cause a reduction in the yield of the maize crop.

(2)

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(b) Biological control involves using a predator species to control the numbers of a pest species.

Explain the advantages of using biological control rather than chemical pesticides to control a pest species.

(4)

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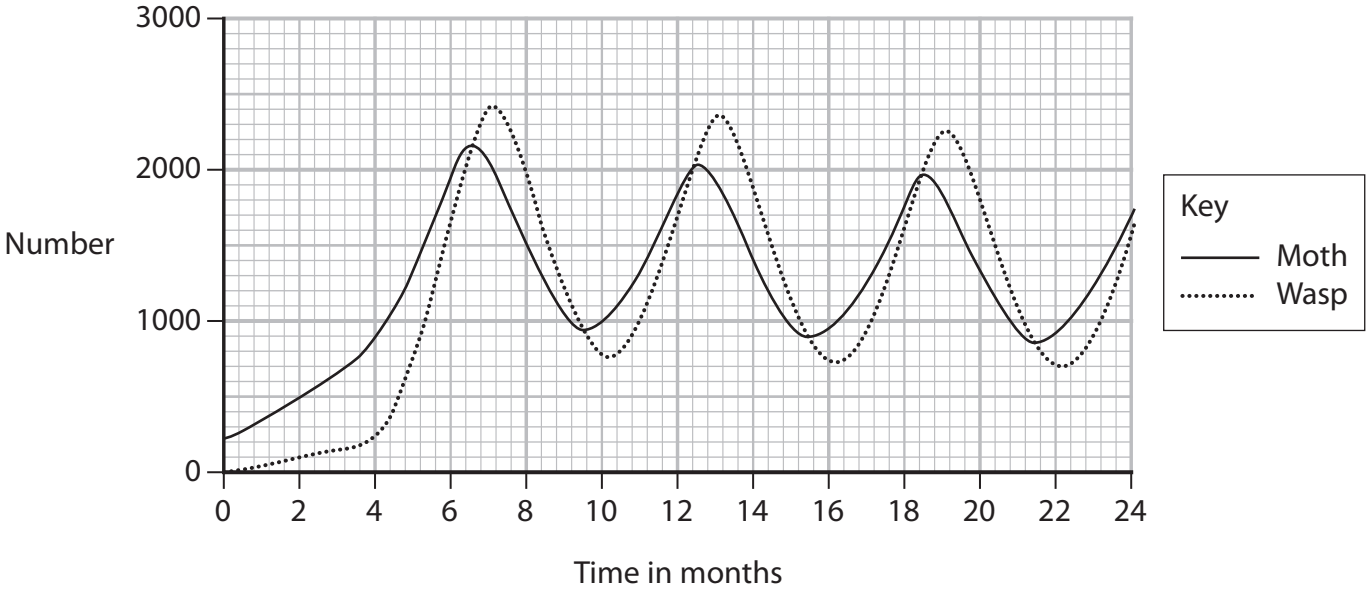
(c) A parasitic wasp is used as a biological control of the larvae of the Fall Armyworm moth. The wasp feeds off the moth larvae.

The graph shows the change in the numbers of the larvae of the Fall Armyworm moth. It also shows the change in the numbers of the parasitic wasp.



(i) Explain the relationship between the number of moths and the number of wasps during the 24-month period.

(3)

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(ii) The range in moth numbers is the difference between the highest number of moths and the lowest number of moths.

Use the graph to determine the maximum range in the number of moths in the period from 6 months to 24 months.

(2)

maximum range = ...

(iii) Suggest why some maize farmers choose not to use biological control to control the moth.

(2)

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(Total for Question 9 = 13 marks)

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10 Some scientists believe that increasing the temperature by 3 °C in a glasshouse will significantly increase crop yield.

Design an investigation to determine whether a small change in temperature in a glasshouse will produce a significant increase in crop yield.

Include experimental details in your answer and write in full sentences.

(6)

(Total for Question 10 = 6 marks)

TOTAL FOR PAPER = 110 MARKS

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