Variation QP

Q:1 In the winter wild birds cannot find food easily.

A student carried out an investigation to find the best kind of food to put out for wild birds in winter.

- She nailed six black dishes to a piece of wood.
- She put 100 g of a different type of seed into each dish.
- She placed the piece of wood in her garden.
- She observed the birds that visited each of the dishes before school, after school and at weekends.
- At the end of the investigation, she weighed the amount of each type of seed remaining.
- She also calculated the percentage of each type of seed that was eaten by the birds.

(a) Name two control variables in this investigation.

1 _____

2 _____

(2 marks)

(b) Table 1 shows the number of bird visits to each dish of seeds that she recorded.

Table 1

Bird species	Number of visits to each dish of seeds					
	Corn	Niger	Safflower	Sunflower	Peanut	Millet
Morning Dove	12	10	6	13	2	10
Red-bellied Woodpecker	1	0	0	1	4	0
Dark-eyed Junco	3	6	1	4	0	3
Northern Cardinal	0	0	1	1	2	0
American Goldfinch	0	31	5	18	0	0
House Finch	1	5	23	19	1	3
House Sparrow	16	1	0	4	0	11
Total visits	33	53	36	60	9	27

(b) Which type of seed had visits from the greatest number of different bird species?

_____

(1 mark)

(c) Table 2 shows:

- the percentage of each type of seed eaten
- the percentage of fat in each type of seed.

Table 2

Type of seed	Percentage eaten	Percentage of fat
Corn	68	2
Niger	77	40
Safflower	86	3
Sunfl ower	91	35
Peanut	4	48
Millet	99	2

(c) (i) The girl concluded that the most popular seeds for the birds were the seeds with the highest percentage of fat.

Was her conclusion justified by the data in Table 2?

Draw a ring round your answer. Yes / No

Give a reason for your answer.

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(1 mark)

(c) (ii) Most winter bird food for sale in shops contains niger and sunflower seeds. Use the information in Table 1 and Table 2 to suggest two reasons why.

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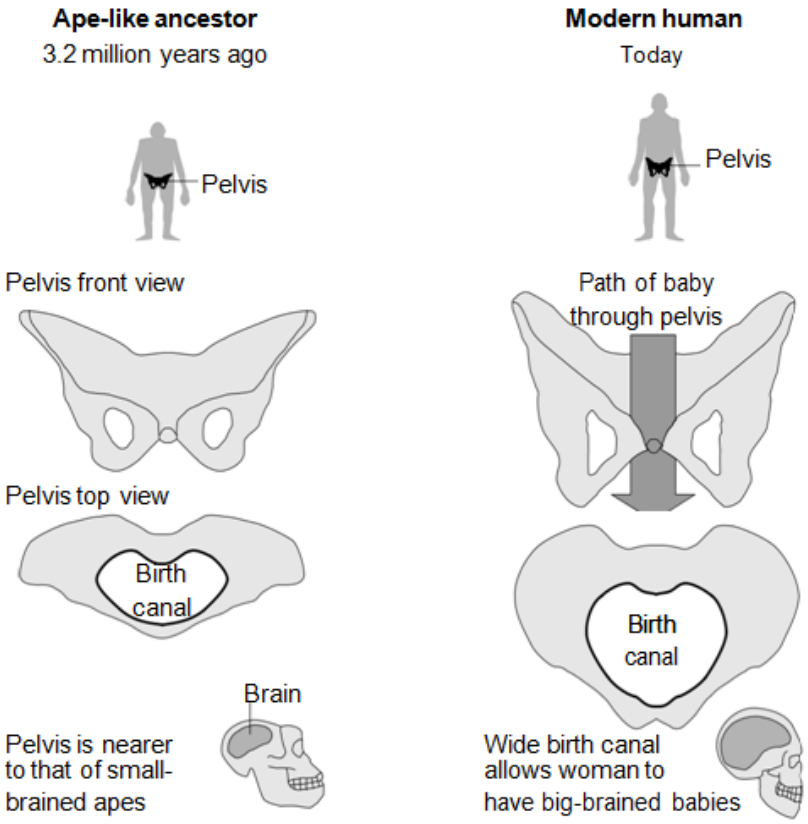
2_____

_____ **(2 marks)**

Q:2 Humans have evolved from ape-like ancestors by natural selection.

The drawing shows the pelvis of an ape-like ancestor and a modern human. The skull and brain of the new born baby are also shown to the same scale. Modern humans are much more intelligent than their ape-like ancestors.



Suggest an explanation for the evolution of the size and shape of the pelvis of modern humans.

Use information from the drawing to help you.

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(4 marks)

Q:3 The Blue-moon butterfly lives on a small island called Samoa, in the Pacific Ocean.

In 2006 Blue-moon butterflies almost became extinct.

Wolbachia bacteria killed males before they could hatch from eggs. Only females were resistant to the bacteria.

In 2006 the number of male Blue-moon butterflies had decreased to only 1 per cent of the population. Two years later, the number of males was equal to the number of females.

(a) Scientists believe that a change in a gene suddenly occurred to make some males resistant to the bacteria.

What scientific term describes a change in a gene?

_____

(1 mark)

(b) The numbers of male Blue-moon butterflies in the population increased quickly after the new form of the gene had appeared.

Suggest why.

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(4 marks)

Q:4 The photograph shows a snake eating a toad.

Cane toads were first introduced into Australia in 1935. The toads contain toxins and most species of Australian snake die after eating the toad.

The cane toad toxin does not affect all snakes the same way. Longer snakes are less affected by toad toxin.

Scientists investigated how red-bellied black snakes had changed in the 70 years since cane toads were introduced into their area. They found that red-bellied black snakes had become longer by around 3 – 5 %.

Suggest an explanation for the change in the body length of the red-bellied black snakes since the introduction of the cane toads.

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(4 marks)

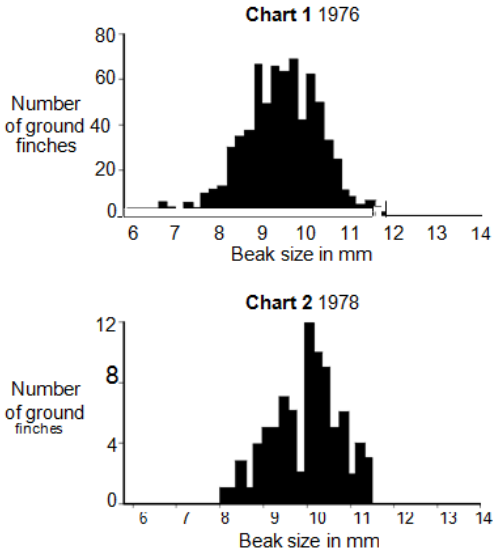
Q:5 The Galapagos Islands are in the Pacific Ocean, 1400 km from South America. A type of bird called a ground finch lives on the islands.

The picture shows a ground finch.

The size of the seeds the ground finch can eat depends upon the size of the beak.

To eat large seeds, a large beak is needed.

The bar charts show the sizes of the beaks of ground finches on one island, in 1976 and in 1978.



(a) The population of the ground finches and their beak sizes changed between 1976 and 1978.

Describe these changes.

(3 marks)

(b) In 1977 there was very little rain on the island. The lack of rain affected the seeds that the finches ate.

The table shows how the seeds were affected.

Year	Mean number of seeds per m^2	Mean mass of each seed in mg
1976	8.5	3.5
1978	2.8	4.2

Suggest an explanation for the changes in beak sizes between 1976 and 1978.

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(4 marks)

Q:6 There are two forms of peppered moth, dark and pale.

Birds eat the moths when the moths are resting on tree bark. Pollution in the atmosphere may:

- kill lichens living on tree bark
- make the bark of trees go black.

(a) Draw a ring around the correct answer to complete the sentence.

Lichens are very sensitive to air pollution caused by

carbon dioxide.

nitrogen.

sulfur dioxide.

(1 mark)

(b) The photographs show the two forms of peppered moth, on tree bark.

(b) (i) The dark form of the peppered moth was produced by a change in the genetic material of a pale moth.

Use one word from the box to complete the sentence.

characteristic clone mutation

A change in genetic material is called a _____ **(1 mark)**

(b) (ii) In the 19th century, pollution made the bark of many trees go black.

Explain why:

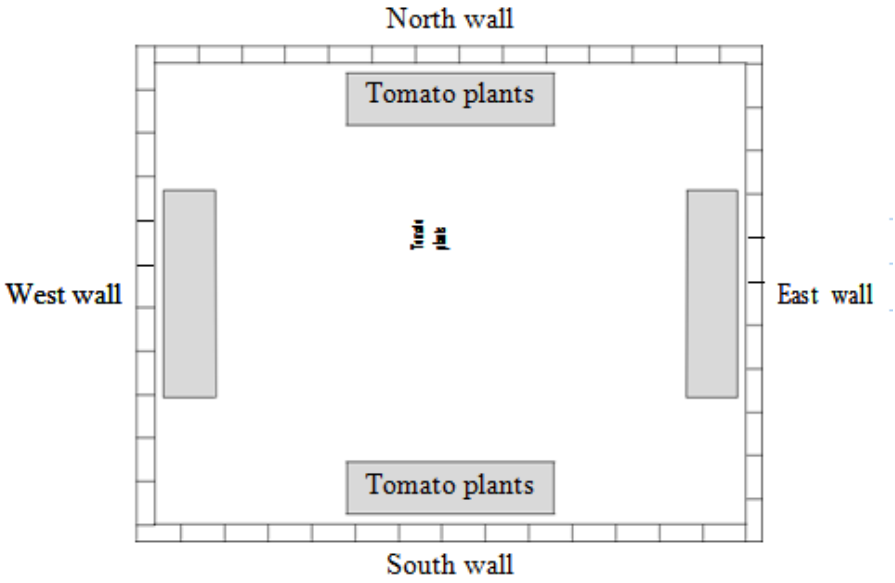
- the population of the pale form of the moth in forests decreased
- the population of the dark form of the moth in forests increased.

(3 marks)

Q:7 A gardener grows tomatoes.

He wants to find out how to get the biggest mass of tomatoes.

He plants different varieties of tomato against different walls in his garden.



(a) The gardener wants his test to be fair.

Name one condition which he should keep the same for all his tomato plants.

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(1 mark)

(b) The table shows the gardener's results.

Variety of tomato plant	**Sungold**	**Sungold**	**Sungold**	**Sungold**	**Nugget**	**Champion**
Wall they were planted against	North	West	South	East	East	East
Mean mass of tomatoes produced in kilograms per plant	3.5	3.0	1.2	2.5	3.2	2.7

Use these results to answer the questions.

(b)(i) To obtain the biggest mass of tomatoes, against which wall is it best to grow the tomato plants?

Tick (☒) one box.

North wall ☐

South wall ☐

East wall ☐

West wall ☐

(1 mark)

(b)(ii) To obtain the biggest mass of tomatoes, which variety of tomato plant would it be best to grow?

_____

(1 mark)

(c) From the information in the table, the gardener's test was not fair. Give one way in which the test was not fair.

_____

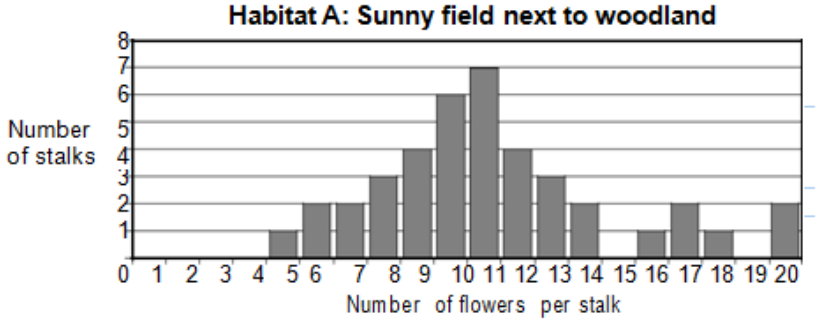
_____

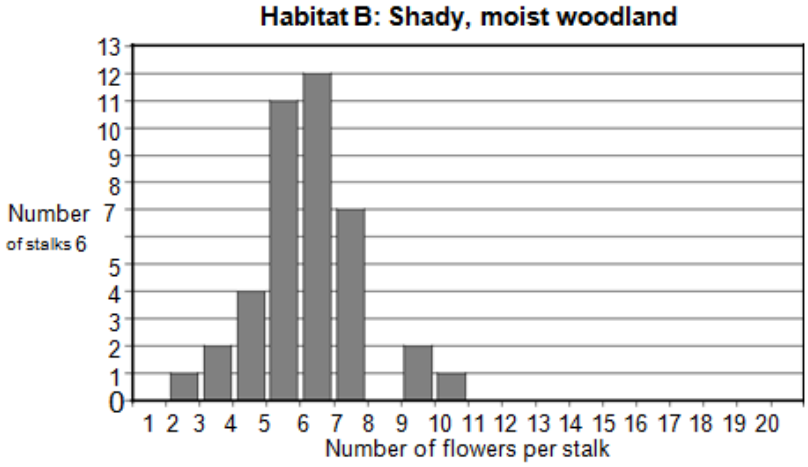
(1 mark)

Q:8 Some students studied bluebell plants growing in two different habitats.

Habitat A was a sunny field next to woodland. Habitat B was a shady, moist woodland.

A bluebell plant can have several flowers on one flower stalk. The students counted the number of flowers on each of 40 bluebell flower stalks growing in each habitat. The bar charts show the results.





(a) The students wanted to collect valid data.

Describe how the students should have sampled the bluebell plants at each habitat to collect valid data.

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(2 marks)

(b) (i) The students used the bar charts to find the mode for the number of flowers per stalk in the two habitats.

The mode for the number of flowers per stalk in habitat A was 11.

What was the mode for the number of flowers per stalk in habitat B?

Mode = _____

(1 mark)

(b) (ii) The students suggested the following hypothesis:

'The difference in the modes is due to the plants receiving different amounts of sunlight.'

Suggest why.

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(2 marks)

(b) (iii) Suggest how the students could test their hypothesis for the two habitats.

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(2 marks)

(c) Suggest how receiving more sunlight could result in the plants producing more flowers per stalk.

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(2 marks)

TOTAL MARKS=44