

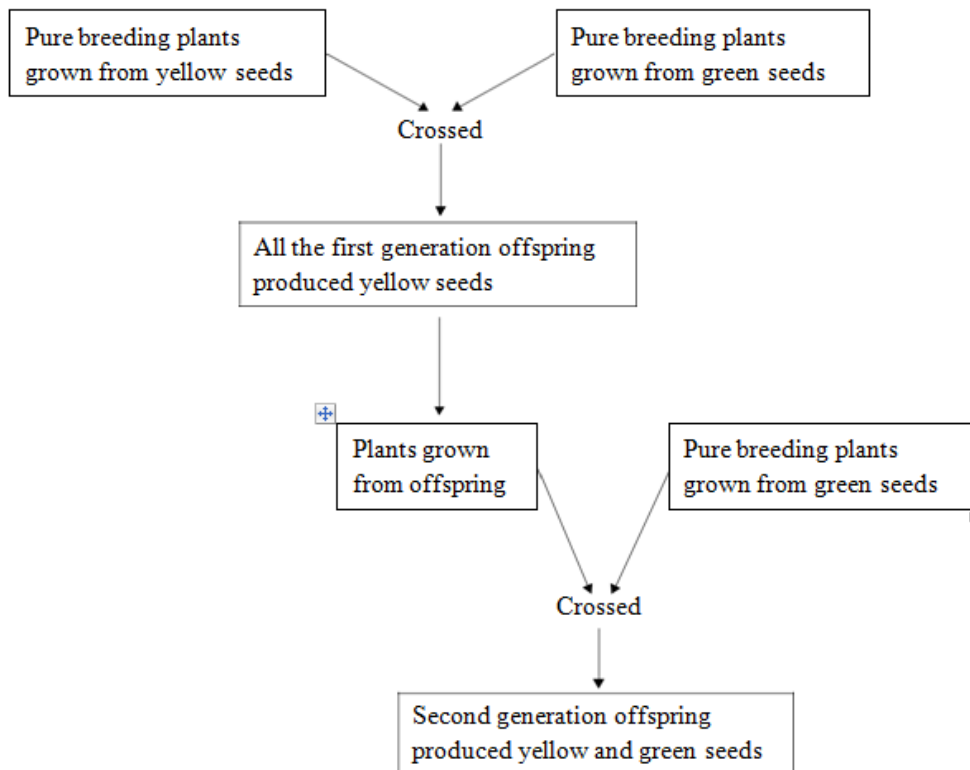
Genetic Diagram and Mendel Works

Q:1 In the 1850s, Gregor Mendel carried out breeding experiments using peas.

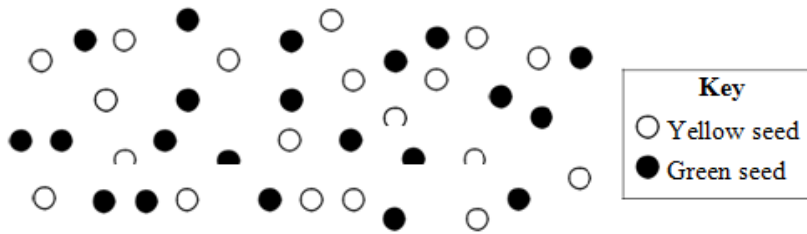
(a) The importance of Mendel's work was not recognised until the early 1900s. Explain why.

(2 marks)

(b) A student repeated one of Mendel's experiments. The flow chart shows her procedure.



The diagram shows a representative sample of seeds produced by second generation plants.



(i) Describe how the student could obtain a sample that is representative of seeds produced by the second generation.

(1 mark)

(ii) What was the approximate ratio of yellow seeds to green seeds in the seeds produced by the second generation?

(1 mark)

(iii) Seed colour in peas is controlled by a single gene which has two alleles.

Use a genetic diagram to show why this ratio of yellow seeds to green seeds was produced by the second generation.

Use the symbol A to represent the dominant allele, and a to represent the recessive allele.

(4 marks)

Q:2 In each question, draw a ring around the correct answer to complete the sentence.

(a) Our understanding of how genes are inherited is mostly because of

Darwin.

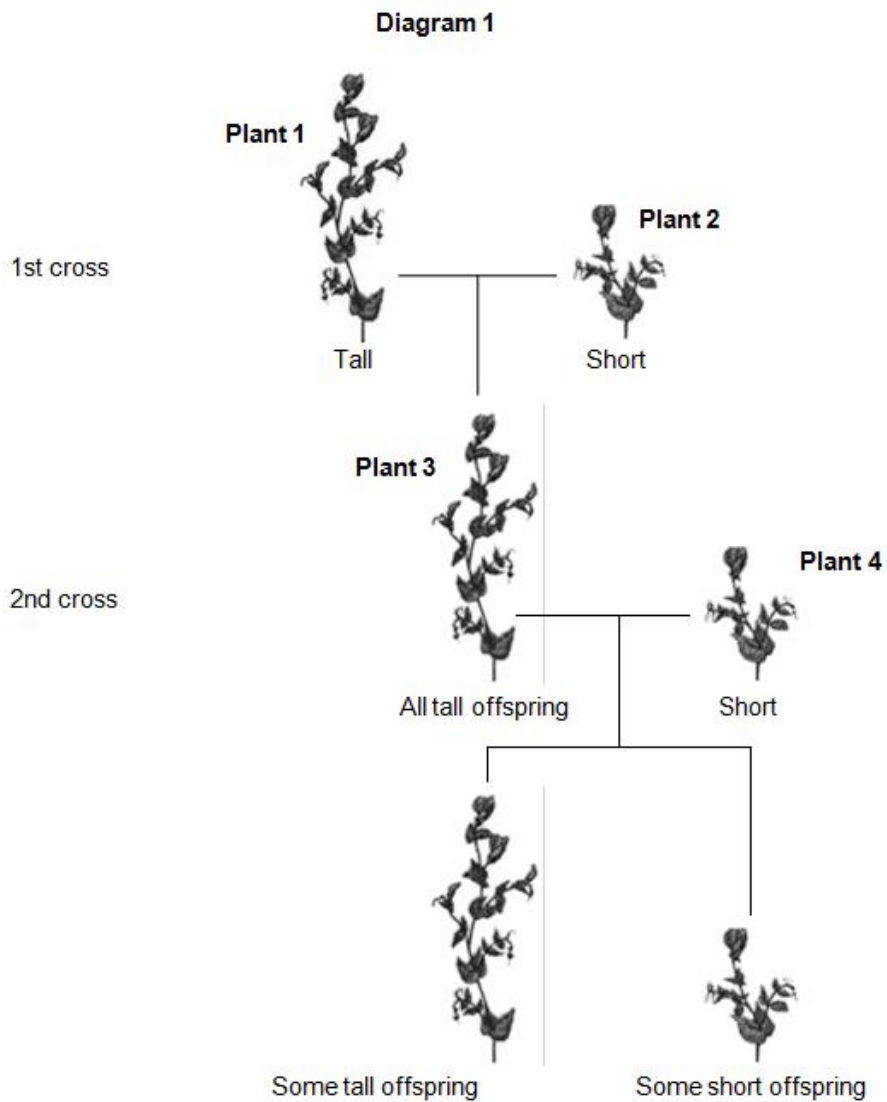
the work of Lamarck.

Mendel.

(1 mark)

(b) A scientist investigated inheritance in pea plants.

The scientist crossed tall pea plants with short pea plants. Diagram 1 shows the results.



In the rest of this question, the following symbols are used to represent alleles.

T = allele for tall

t = allele for short

(b) (i) The 1st cross in Diagram 1 produced 120 offspring. All of these offspring were tall.

This shows that plant 1 contained the alleles

TT.
Tt.
tt.

(1 mark)

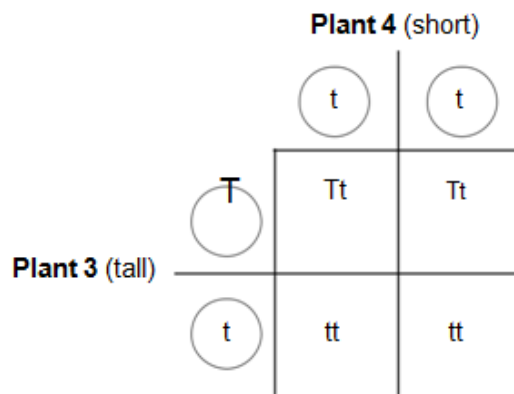
(b) (ii) Plant 3 is tall because of

a dominant allele.
the environment.
a recessive allele.

(1 mark)

(c) Diagram 2 gives more information about the cross between plant 3 and plant 4.

Diagram 2



This cross produced some tall offspring and some short offspring.

The ratio of tall to short offspring in Diagram 2 is

1:1.
2:1.
3:1.

(1 mark)

(d) Two short plants were crossed. This cross produced 100 offspring.

The expected offspring would be

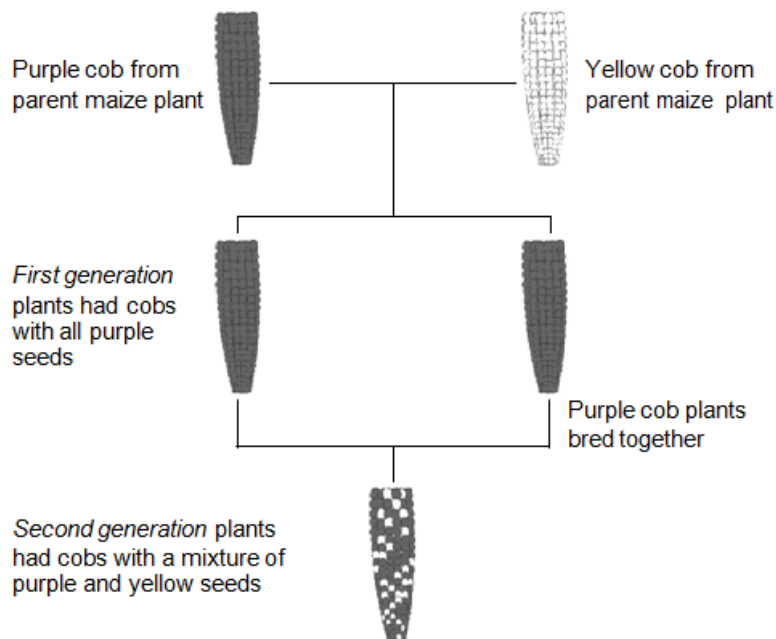
- | |
|-------------------------------------|
| 100 short plants. |
| 50 tall plants and 50 short plants. |
| 75 tall plants and 25 short plants. |

(1 mark)

Q:3 Maize plants reproduce sexually to form maize cobs. Each maize cob has many seeds.

The colour of the seeds is controlled by a gene. The gene has two alleles, purple and yellow.

The diagram shows the cobs produced by breeding maize plants.



(a) Use words from the box to complete the sentences.

dominant environmental recessive
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(a) (i) The first generation plants show that the purple allele is

(1 mark)

(a) (ii) The second generation plants show that the yellow allele is

(1 mark)

(b) The allele for purple can be represented by the letter A.

The allele for yellow can be represented by the letter a.

(b) (i) What alleles does a yellow seed have?

Draw a ring around one answer.

AA Aa aa

(1 mark)

(b) (ii) What alleles does a purple seed from a first generation plant have?

Draw a ring around one answer.

AA Aa aa

(1 mark)

(c) The drawing shows a cob from one of the second generation plants.

A student counted 334 purple seeds and 110 yellow seeds on this maize cob.

What is the approximate ratio of purple seeds to yellow seeds on the cob?

Tick (☑) one box.

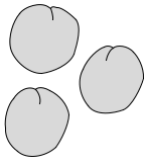
3 purple : 1 yellow

1 purple : 3 yellow

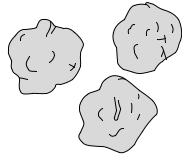
1 purple : 1 yellow

(1 mark)

Q:4 In the 1860s, Gregor Mendel studied inheritance in nearly 30 000 pea plants. Pea plants can produce either round seeds or wrinkled seeds.



Round pea seeds



Wrinkled pea seeds

(a) Mendel crossed plants that always produced round seeds with plants that always produced wrinkled seeds.

He found that all the seeds produced from the cross were round.

Use the symbol A to represent the dominant allele and a to represent the recessive allele.

Which alleles did the seeds from the cross have? _____

(1 mark)

(b) Mendel grew hundreds of plants from the seeds of the offspring.

He crossed these plants with each other.

(b) (i) Mendel's crosses produced 5496 round pea seeds and 1832 wrinkled pea seeds.

Explain why Mendel's crosses gave him these results.

In your answer you should use:

a genetic diagram

the symbols A and a.

(3 marks)

(b) (ii) One of Mendel's crosses produced 19 round seeds and 16 wrinkled seeds. These numbers do not match the expected ratio of round and wrinkled seeds. Suggest why.

(1 mark)

(c) The importance of Mendel's discovery was not recognised until many years after his death.

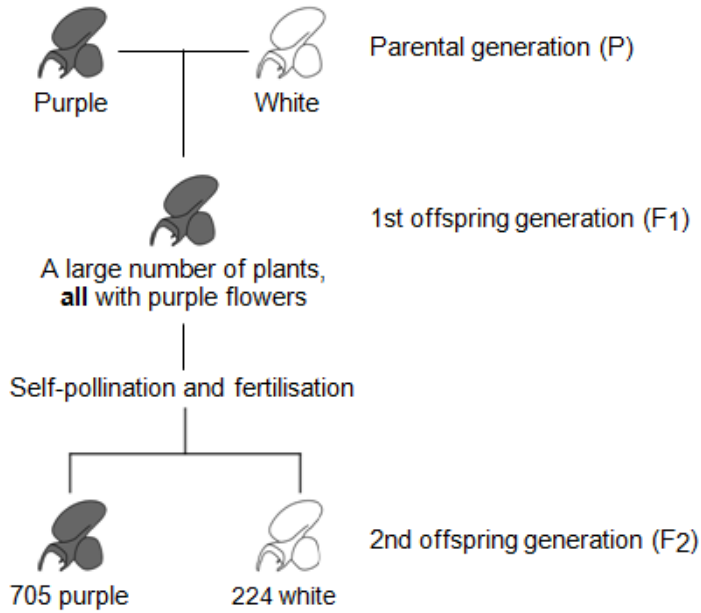
Give one reason why.

(1 mark)

Q:5 In 1866, Gregor Mendel published the results of his investigations into inheritance in garden pea plants.

Figure 9 shows the results Mendel obtained in one investigation with purple-flowered and white-flowered pea plants.

Figure 9



(a) (i) Calculate the ratio of purple-flowered plants to white-flowered plants in the F2 generation.

Ratio of purple : white = _____

(1 mark)

(a) (ii) There was a total of 929 plants in the F2 generation.

Mendel thought that the production of a large number of offspring plants improved the investigation.

Explain why.

(2 mark)

(b) (i) Some of the plants in Figure 9 are homozygous for flower colour and some are heterozygous.

Complete Table 1 to show whether each of the plants is homozygous or heterozygous.

For each plant, tick (☑) one box.

Table 1

	Homozygous	Heterozygous
Purple-flowered plant in the P generation		
White-flowered plant in the P generation		
Purple-flowered plant in the F ₁ generation		

(b) (ii) Draw a genetic diagram to show how self-pollination of the F₁ purple-flowered plants produced mainly purple-flowered offspring in the F₂ generation together with some white-flowered offspring.

Use the following symbols:

N = allele for purple flower colour

n = allele for white flower colour

(3 marks)

(c) When Mendel published his work on genetics, other scientists at the time did not realise how important it was.

Suggest two reasons why.

1. _____

2 _____

(2 mark)

TOTAL MARKS=34