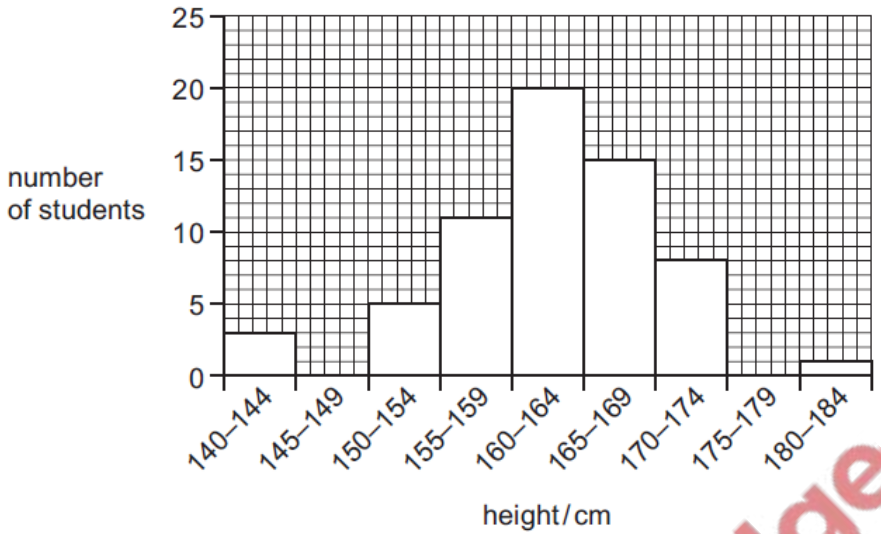
Variation and selection – 2023 November IGCSE 0610

1. Nov/2023 /Paper_ 0610/11/No.35

The graph shows the heights of students in a class.



What is a correct statement for these data?

A There are two students who are 147 cm tall.

B The most frequent height range is 160–164 cm.

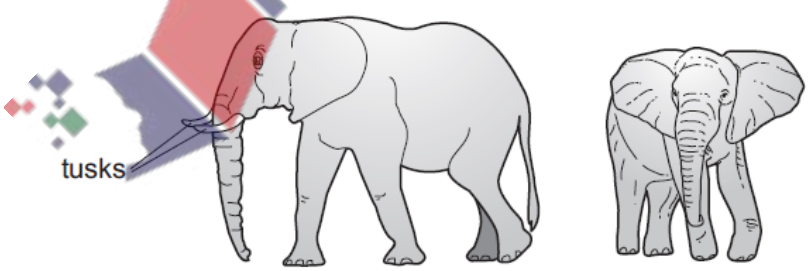
C The range of student heights measured is 150–174 cm.

D There are 72 students in this study.

2. Nov/2023 /Paper_ 0610/13/No.35

Tusks are modified teeth.

In one part of the world, most elephants used to be born with tusks. Over the last 50 years, more female elephants have been born without tusks. These elephants are giving birth to offspring that also do **not** have tusks.



Which types of variation can be illustrated by this example?

	continuous	discontinuous	genetic
A	✓	✗	✗
B	✗	✓	✓
C	✓	✗	✓
D	✗	✓	✗

key

✓ = yes

✗ = no

3. Nov/2023 /Paper_ 0610/21/No.34

Some statements about mutations are given.

1 A random change in the amino acid sequence in DNA causes gene mutation.

2 A mutation is a genetic change.

3 Ionising radiation decreases the rate of mutation.

4 New alleles are formed by mutations.

Which statements are correct?

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

4. Nov/2023 /Paper_ 0610/22/No.34

What are sources of genetic variation in populations?

1 meiosis

2 random mating

3 random fertilisation

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

5. Nov/2023 /Paper_ 0610/22/No.38

Red-green colour blindness is a sex-linked characteristic caused by a recessive allele.

Which prediction can be made about the children of a woman who is colour-blind and a man with normal vision?

A Boys will be colour-blind, and girls will have a 50% chance of being colour-blind.

B Boys will be colour-blind, and girls will have normal vision.

C Girls will be colour-blind, and boys will have a 50% chance of being colour-blind.

D Girls will be colour-blind, and boys will have normal vision.

6. Nov/2023 /Paper_ 0610/23/No.35

The table shows the number of stomata per mm^2 on the upper and lower epidermis of four different plants.

Which plant is **most** likely to be a hydrophytic plant?

	number of stomata per mm^2	
	upper epidermis	lower epidermis
A	25	16
B	70	88
C	460	0
D	0	150

7. Nov/2023 /Paper_ 0610/32/No.8(b _ c)

(b) Scientists measured the length of a sample of one species of fish.

Fig. 8.1 shows where the scientists took their measurements to determine the length of each fish.

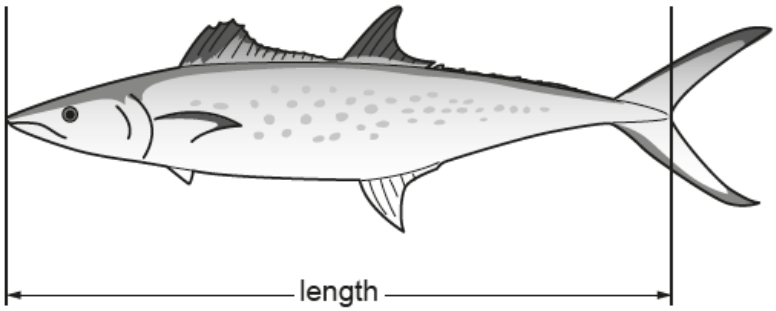


Fig. 8.1

Table 8.1 shows the results.

Table 8.1

length / cm	number of fish
0–19	8
20–39	162
40–59	1710
60–79	1350
80–99	130
100–119	5

(i) Use the information in Table 8.1 to calculate the total number of fish the scientists measured.

..... [1]

(ii) State the most frequent length shown in Table 8.1.

..... cm [1]

(iii) State the type of variation shown by the data in Table 8.1.

..... [1]

(c) Place a tick (✓) in the box that shows the meaning of variation.

Variation is an alternative form of a gene.	
Variation is the differences between individuals of the same species.	
Variation is the recessive allele in a genotype.	
Variation is the transmission of genetic information from generation to generation.	

[1]

8. Nov/2023 /Paper_ 0610/33/No.6

(a) A student investigated variation in flower colour in pea plants.

The student counted the number of pea plants that had purple flowers and the number of pea plants that had white flowers.

Fig. 6.1 shows the results.

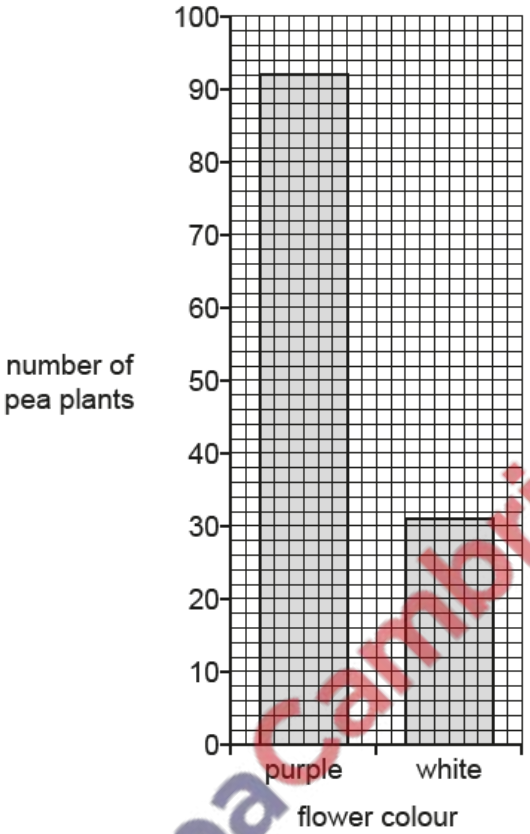


Fig. 6.1

Use the information in Fig. 6.1 and your own knowledge to complete the sentences about variation.

Variation is the ..... between individuals of the same species.

Flower colour in pea plants is an example of discontinuous variation. The other type of variation is known as ..... variation.

Discontinuous variation results in a limited number of phenotypes with no ..... .

Discontinuous variation is usually caused by ..... only.

The difference between the number of pea plants that had purple flowers and the number of pea plants that had white flowers is ..... .

The ratio of purple to white flowers in Fig. 6.1 is ..... .

[6]

(b) Some features of organisms show discontinuous variation.

The term discontinuous variation is in the box on the left.

The boxes on the right show some features of organisms.

Draw **two** lines from 'discontinuous variation' to **two** features that show discontinuous variation.

	blood group in humans
	body length in reptiles
discontinuous variation	height in humans
	mass of pea seeds
	pea seed shape

[2]

(c) New alleles for flower colour can arise as a result of genetic change.

(i) State the term used to describe genetic change.

..... [1]

(ii) State **one** factor that can increase the rate at which genetic change occurs.

..... [1]

(d) Scientists have experimented with genetically modifying pea plants to make them resistant to pea weevils.

Pea weevils are an insect pest.

(i) Suggest why pea plants might be genetically modified to make them resistant to pests.

.....

.....

..... [1]

(ii) State **two** other examples of genetic modification in **crop plants**.

1 .....

2 .....
[2]

[Total: 13]

9. Nov/2023 /Paper_ 0610/41/No.4

Mitosis and meiosis are both important processes for life.

(a) Complete the sentences about mitosis and meiosis.

Mitosis is a type of nuclear division which produces genetically identical cells.

It is important for growth, ... of tissues and

..... reproduction.

Just before mitosis the chromosomes are replicated and then the chromosomes

..... so that the chromosome number is maintained in each

daughter cell.

Meiosis is another type of nuclear division that is involved in the production of

gametes. The chromosome number is halved from ..... to

haploid resulting in genetically different cells. The fusion of the nuclei of two gametes

formed by meiosis forms a ..... This process is known as

..... .

[6]

(b) Mutations are a source of genetic variation in a population.

(i) Describe what is meant by a gene mutation.

.....

.....

..... [2]

(ii) State **two** examples of how mutation rates can be increased.

1 .....

2 .....

[2]

[Total: 10]

10. Nov/2023 /Paper_ 0610/43/No.6

(a) Xerophytes are plants that are adapted for an environment which has very little available water.

Describe the meaning of adaptation.

.....

.....

.....

..... [3]

(b) Fig. 6.1 is a photograph of a saguaro cactus, *Carnegiea gigantea*, which lives in a desert.

The climate in a desert has very low rainfall and very high daytime temperatures.

Fig. 6.1

Describe **two** visible adaptive features shown in Fig. 6.1 and explain how each feature is beneficial for living in a desert.

feature 1 .....

explanation .....

.....

.....

feature 2 .....

explanation .....

.....

.....

[4]

(c) Table 6.1 shows some data about stomatal density in the leaves of one plant that is **not** a xerophyte and three xerophyte plants.

Table 6.1

species	plant type	number of stomata per mm^2	
		upper leaf surface	lower leaf surface
oak tree	**not** a xerophyte	94	503
tongue leaf plant	xerophyte	0	18
lace aloe	xerophyte	2	15
ice plant	xerophyte	0	42

(i) Using the information in Table 6.1, estimate the total number of stomata in an ice plant leaf with a lower leaf surface area of 8 cm^2.

..... stomata [1]

(ii) Explain the data shown in Table 6.1.

.....

.....

.....

.....

..... [2]

(d) There are xerophytic forests which are threatened by human overexploitation.

Suggest reasons why it is important to conserve xerophytic ecosystems.

.....

.....

.....

.....

..... [2]

[Total: 12]