CAMBRIDGE IGCSE BIOLOGY · 0610

BIOLOGY



EXAM QUESTION PACK

TOPIC 18: VARIATION AND SELECTION

SCORE	PERCENTAGE
/	%

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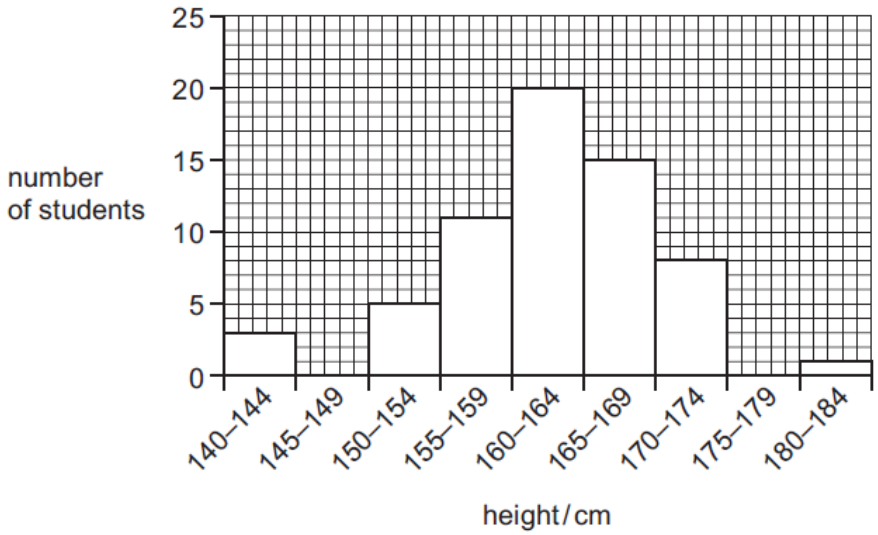
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Variation and selection – 2023 November IGCSE 0610

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.

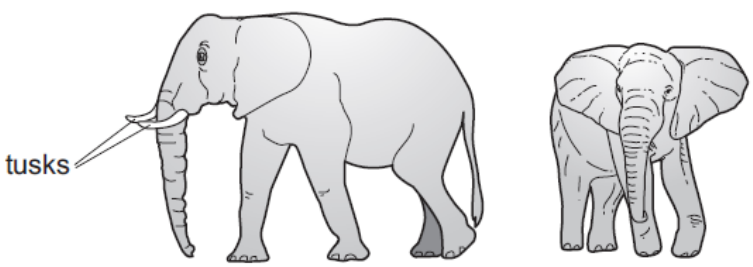
C The range of student heights measured is 150–174 cm.

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

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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

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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.

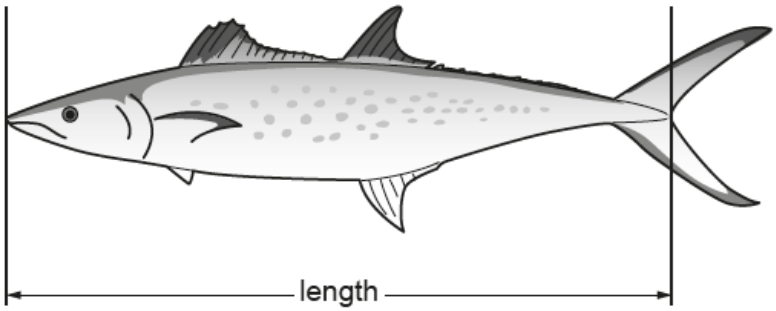


Fig. 8.1

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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]

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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.

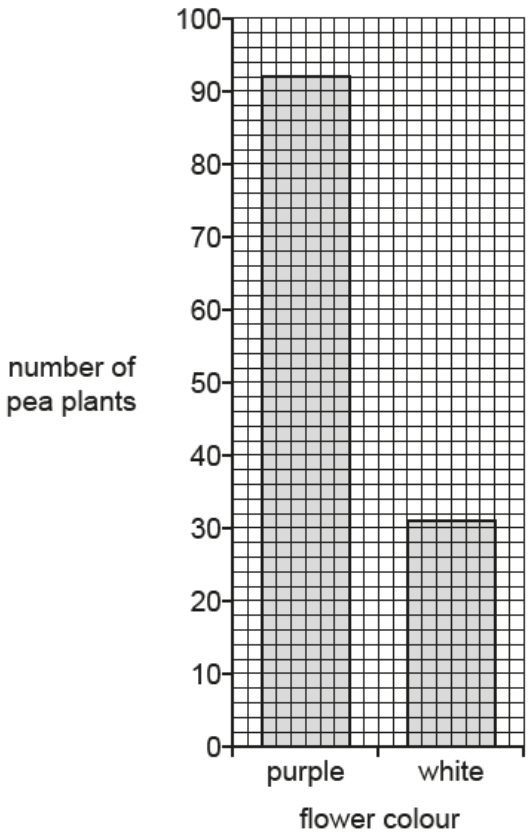


Fig. 6.1

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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]

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(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]

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(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]

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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]

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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

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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]

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

Suggest reasons why it is important to conserve xerophytic ecosystems.

.....

.....

.....

.....

..... [2]

[Total: 12]

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Variation and selection – 2023 June IGCSE Biology 0610

1. June/2023/Paper_0610/12/No.35

Which term is a genetic change?

A allele

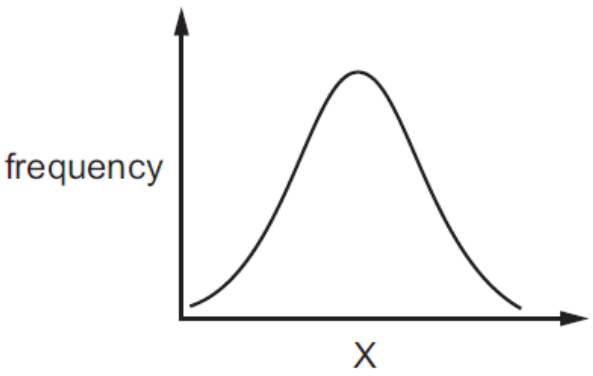
B genotype

C mutation

D phenotype

2. June/2023/Paper_0610/13/No. 31

The graph shows the frequency of a human characteristic, X.



Which characteristics can be represented by X?

	blood groups	height	sex
A	✓	✓	✗
B	✗	✗	✓
C	✗	✓	✗
D	✓	✗	✓

key

✓ = yes

✗ = no

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3. June/2023/Paper_0610/13/No. 32

Which row shows some of the features involved in natural selection?

	many offspring are produced	humans choose desirable features	alleles are passed onto offspring
A	✓	✗	✗
B	✗	✓	✗
C	✗	✓	✓
D	✓	✗	✓

key

✓ = yes

✗ = no

4. June/2023/Paper_0610/13/No. 33

Which statement is correct?

A Chromosomes are made of DNA.

B Chromosomes make up a gene.

C Each chromosome is a length of DNA that codes for a protein.

D Different forms of chromosomes are called alleles.

5. June/2023/Paper_0610/13/No. 35

What is an example of a characteristic that shows discontinuous variation in humans?

A body mass

B height

C ABO blood groups

D width of hand

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6. June/2023/Paper_0610/21/No. 34

Which adaptation may be present in a xerophyte?

A leaves with small surface area and large numbers of stomata

B little or no xylem tissue and leaves with large surface area

C stomatal hairs and rolled leaves

D thin or no cuticle and deep roots

7. June/2023/Paper_0610/22/No. 34

Which feature is a leaf adaptation for living in a hot, dry desert?

A hairy

B large surface area

C many stomata

D thin waxy cuticle

8. June/2023/Paper_0610/23/No. 29

Which row shows some of the features involved in natural selection?

	many offspring are produced	humans choose desirable features	alleles are passed onto offspring
A	✓	✗	✗
B	✗	✓	✗
C	✗	✓	✓
D	✓	✗	✓

key

✓ = yes

✗ = no

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9. June/2023/Paper_0610/23/No. 33

Which Punnett square shows a test cross that identifies a heterozygous parent?

A

	T	t
T	TT	Tt
t	Tt	tt

B

	T	T
T	TT	TT
t	Tt	Tt

C

	T	t
t	Tt	tt
t	Tt	tt

D

	T	T
t	Tt	Tt
t	Tt	Tt

10. June/2023/Paper_0610/23/No. 34

What is a feature of some xerophytes?

A large air spaces in the tissues

B leaves rolled up and covered with hairs

C leaves with stomata on the upper surface

D thin cuticle

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11. June/2023/Paper_0610/32/No. 7

(a) A farmer wanted to use selective breeding to produce goats with a high milk yield.

Fig. 7.1 shows a goat being milked.

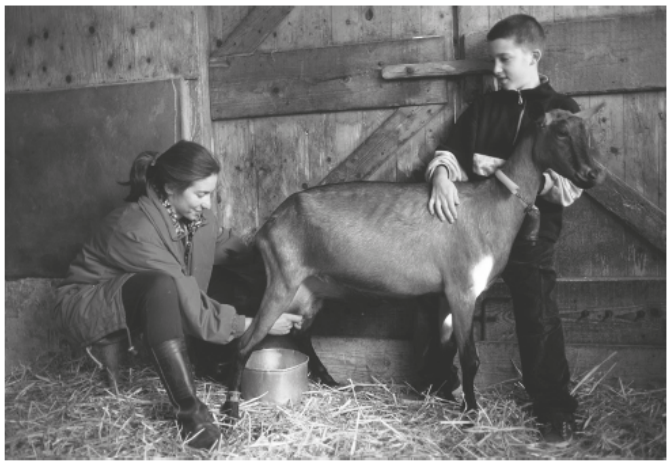


Fig. 7.1

Describe the stages in selective breeding to develop goats with a high milk yield.

.....

.....

.....

.....

.....

.....

..... [3]

(b) Animals can be farmed intensively.

State **two** advantages of intensive livestock production.

1 .....

.....

2 .....

.....

[2]

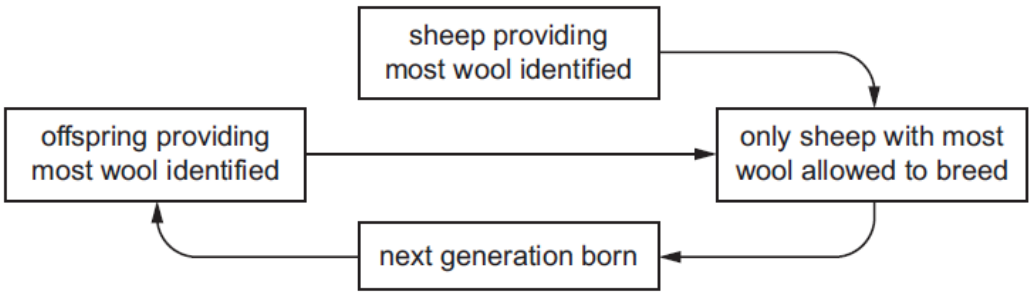
[Total: 5]

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12. March/2023/Paper_ 0610/12/No.35

Humans have kept sheep for many centuries because they supply us with wool.

The flow chart shows how a farmer would breed his sheep to provide more wool.



Which process is described by this flow chart?

A natural selection

B selective breeding

C struggle for survival

D genetic modification

13. March/2023/Paper_ 0610/22/No.34

Which statements are correct during both natural selection and artificial selection?

1 Only certain individuals reproduce.

2 Alleles are passed on to the offspring.

3 Organisms do **not** compete with each other for survival.

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

Variation and selection – 2022 June IGCSE 0610

1. June/2022/Paper_ 11/No.35

Which statement about selective breeding is correct?

A It does not involve humans.

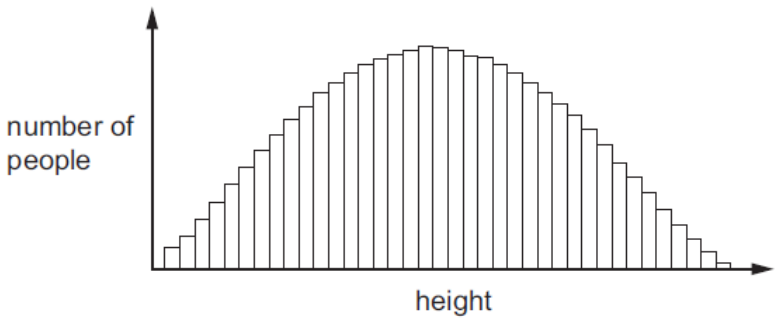
B It involves a struggle for survival.

C It always involves only one parent.

D It involves parents that possess desirable features.

2. June/2022/Paper_ 12/No.34

The graph shows the different heights of people in a human population.



Which row describes the variation shown by the graph?

	type of variation	has intermediate phenotypes
A	continuous	no
B	continuous	yes
C	discontinuous	no
D	discontinuous	yes

3. June/2022/Paper_ 12/No.35

Which statement about selective breeding is correct?

A It does not involve humans.

B It involves a struggle for survival.

C It always involves only one parent.

D It involves parents that possess desirable features.

4. June/2022/Paper_ 13/No.35

Which statement about selective breeding is correct?

A It does not involve humans.

B It involves a struggle for survival.

C It always involves only one parent.

D It involves parents that possess desirable features.

5. June/2022/Paper_ 21/No.33

Sickle cell anaemia is a genetic disorder which results in severe illness in homozygous individuals. In some human populations, being heterozygous can be beneficial.

What could be the reason for this?

A Heterozygous individuals are not affected by the disorder.

B Heterozygous individuals are more resistant to malaria.

C The disorder is caused by a dominant allele.

D The disorder is sex-linked.

6. June/2022/Paper_ 21/No.34

Which statement about selective breeding is correct?

A It does not involve humans.

B It involves a struggle for survival.

C It always involves only one parent.

D It involves parents that possess desirable features.

7. June/2022/Paper_ 23/No.37

With which kingdoms do bacteria share the same genetic code?

A animal, plant, fungus and protoctist

B animal, plant and fungus only

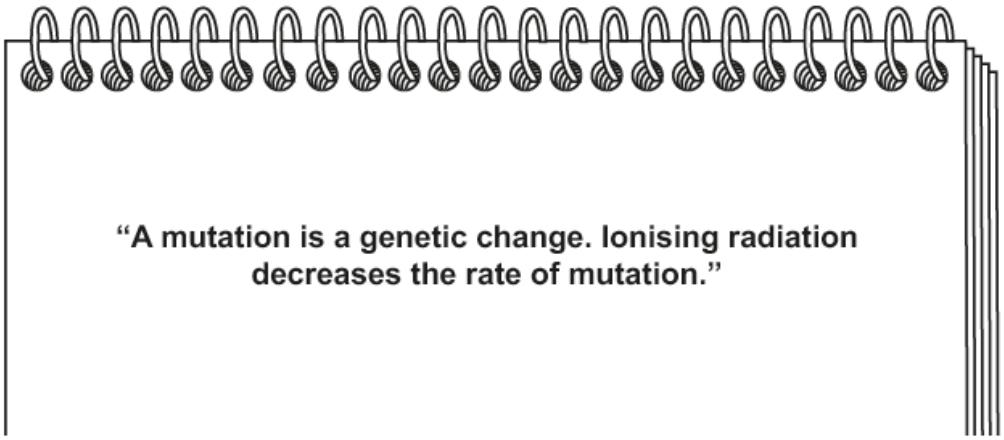
C animal and plant only

D animal only

8. June/2022/Paper_ 32/No.5(b)

(b) Mutations can create variation.

A student made some statements about mutations in their notebook.



Identify **one** incorrect word in the sentences.

..... [1]

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9. June/2022/Paper_ 43/No.2(c_ e)

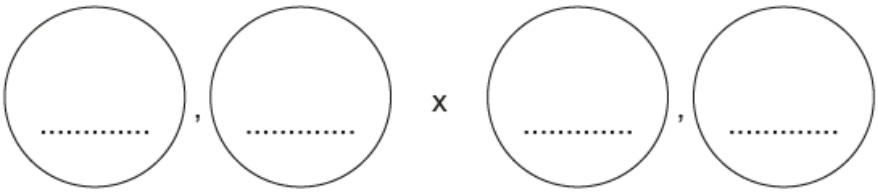
(c) The allele for the normal form of haemoglobin is Hb^A.

The allele for the abnormal form of haemoglobin is Hb^S.

Draw a genetic diagram to determine the probability of two heterozygous parents having a child who does **not** have the Hb^S allele.

parental phenotypes ..... x .....

parental genotypes ..... x .....

gametes  x

offspring genotypes .....

probability of offspring **not** having the Hb^S allele .....

[5]

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(d) Fig. 2.2 and Fig. 2.3 are maps showing some of the different regions in a country. Scientists studied the distribution of the Hb^S allele in the country.

Fig. 2.2 shows the estimated frequency of the allele within the population.

Fig. 2.3 shows the estimated number of babies born with sickle cell anaemia in each region.



Fig. 2.2



Fig. 2.3

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The scientists made a statement:

'There is a relationship between the frequency of the Hb^S allele and the number of babies born with sickle cell anaemia in regions **A**, **B** and **C**.'

(i) Using the information in Fig. 2.2 and Fig. 2.3, discuss the evidence for and against this statement for regions **A**, **B** and **C only**.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(ii) Suggest how the scientists would identify the presence of the Hb^S allele in tissue samples.

.....

.....

..... [1]

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(e) Mutations are always inherited in single-celled organisms that reproduce asexually but are **not always** inherited in organisms that reproduce sexually.

Explain why.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

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Variation and selection – 2021 IGCSE 0610

1. Nov/2021/Paper_11/No.35

A species of insect usually has pale-coloured wings. This helps to camouflage them on pale-coloured tree trunks. A few of the insects in this species have darker coloured wings.

After a number of years the tree trunks become darker in colour due to environmental changes. The insects with dark-coloured wings become more common than insects with pale-coloured wings in this species.

Which process causes this change in the proportion of insects with dark-coloured wings?

A biotechnology

B conservation

C natural selection

D selective breeding

2. Nov/2021/Paper_21/No.33

Which statement is correct?

A Genetic variation can be caused by phenotypic variation.

B Mutations can be caused by phenotypic variation.

C Phenotypic variation can be caused by genetic variation.

D Phenotypic variation cannot be caused by mutations.

3. Nov/2021/Paper_22/No.33

What is an adaptive feature of xerophytes?

A They do not have root hair cells.

B Their leaves have a large surface area.

C They have many stomata.

D Their leaves have thick cuticles.

4. Nov/2021/Paper_22/No.35

A species of insect usually has pale-coloured wings. This helps to camouflage them on pale-coloured tree trunks. A few of the insects in this species have darker coloured wings.

After a number of years the tree trunks become darker in colour due to environmental changes. The insects with dark-coloured wings become more common than insects with pale-coloured wings in this species.

Which process causes this change in the proportion of insects with dark-coloured wings?

A biotechnology

B conservation

C natural selection

D selective breeding

5. Nov/2021/Paper_23/No.33

A man with blood group AB and a woman with blood group O have a child.

What are the correct percentages of the possible blood groups for this child?

A 50% A and 50% B

B 50% AB and 50% O

C 25% A, 25% B and 50% O

D 25% AB, 25% A, 25% B and 25% O

6. Nov/2021/Paper_23/No.35

A species of insect usually has pale-coloured wings. This helps to camouflage them on pale-coloured tree trunks. A few of the insects in this species have darker coloured wings.

After a number of years the tree trunks become darker in colour due to environmental changes. The insects with dark-coloured wings become more common than insects with pale-coloured wings in this species.

Which process causes this change in the proportion of insects with dark-coloured wings?

A biotechnology

B conservation

C natural selection

D selective breeding

7. Nov/2021/Paper_31/No.6

(a) (i) State the word equation for photosynthesis.

..... [2]

(ii) State the source of energy for photosynthesis.

..... [1]

(iii) State the name of the structure in a cell where photosynthesis takes place.

..... [1]

(b) The effect of carbon dioxide concentration on the rate of photosynthesis in an aquatic plant was investigated.

- 10 test-tubes were prepared. Each contained water, an aquatic plant and a different concentration of carbon dioxide.
- Each test-tube was placed next to a lamp and the temperature in the test-tubes was maintained at 20 °C.
- The number of bubbles produced by each aquatic plant in one minute was counted.

Fig. 6.1 shows the apparatus that was used.

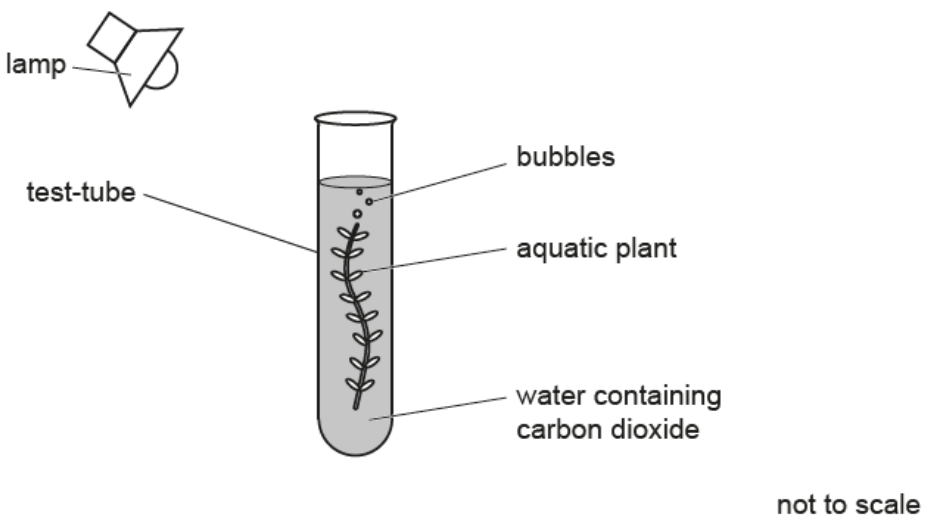


Fig. 6.1

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The results of the investigation are shown in Fig. 6.2.

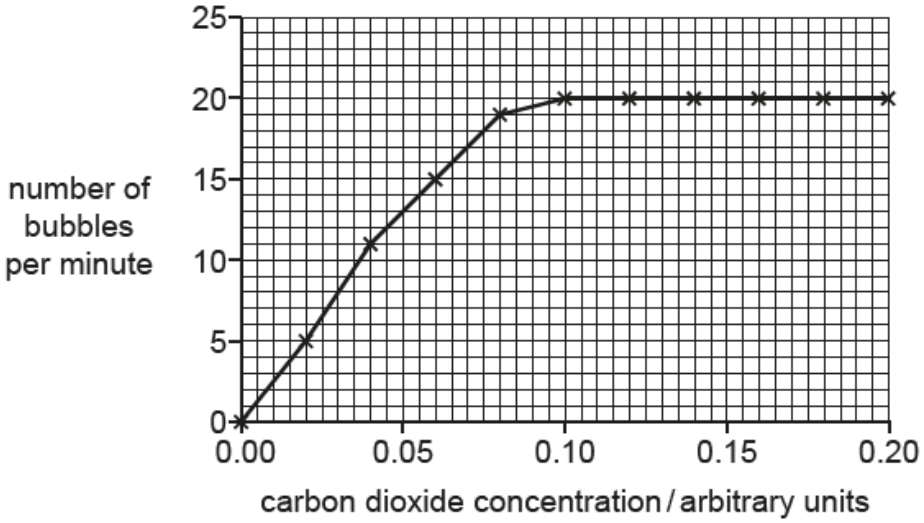


Fig. 6.2

(i) State the maximum number of bubbles produced in one minute.

..... [1]

(ii) The investigator concluded that 0.10 arbitrary units was the optimum (best) concentration of carbon dioxide for photosynthesis in this investigation.

Describe the evidence shown in Fig. 6.2 that supports the investigator's conclusion.

.....

.....

.....

.....

..... [2]

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(iii) The investigation described in **6(b)** was repeated but the temperature was reduced from 20 °C to 10 °C.

Predict the effect of reducing the temperature on the number of bubbles produced and explain your answer.

prediction .....

.....

explanation .....

.....

.....

[2]

(c) Carbon dioxide is a greenhouse gas.

State the name of **one** other greenhouse gas.

..... [1]

[Total: 10]

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Variation and selection – 2021 IGCSE 0610

1. March/2021/Paper_12/No.34

Foxes are mammals. The table shows adaptations of four different species of fox.

Which fox is best adapted to live in a hot dry desert region?

	behaviour	ear size	fur colour	daily volume of urine produced
A	mainly active in the day	very small	white	large
B	mainly active at night	very large	pale brown	small
C	mainly active at night	small	dark brown	large
D	mainly active in the day	large	dark grey	small

2. March/2021/Paper_22/No.35

A man heterozygous for the sickle cell anaemia allele, $Hb^{S}Hb^{A}$, has children with a woman who is homozygous for the normal haemoglobin allele, $Hb^{A}Hb^{A}$.

What is the probability that the first child will be resistant to malaria?

A 0.125 **B** 0.25 **C** 0.5 **D** 0.75

3. March/2021/Paper_22/No.36

Which leaf feature is an adaptation of xerophytes to their environment?

A hairs surrounding stomata

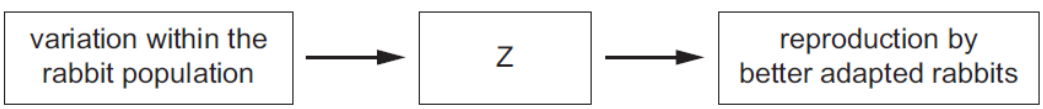
B large internal hollow spaces

C large numbers of stomata

D thin cuticle on both surfaces

4. June/2021/Paper_12/No.35

The diagram shows some of the stages involved in natural selection in wild rabbits.



Which statement is missing from box Z?

A competition between rabbits for limited resources

B passing on of alleles to the next generation of young rabbits

C production of limited numbers of young rabbits

D selection by humans of rabbits with desirable characteristics

5. June/2021/Paper_13/No.35

What is an adaptive feature of an organism?

A any feature that is not changed by the environment

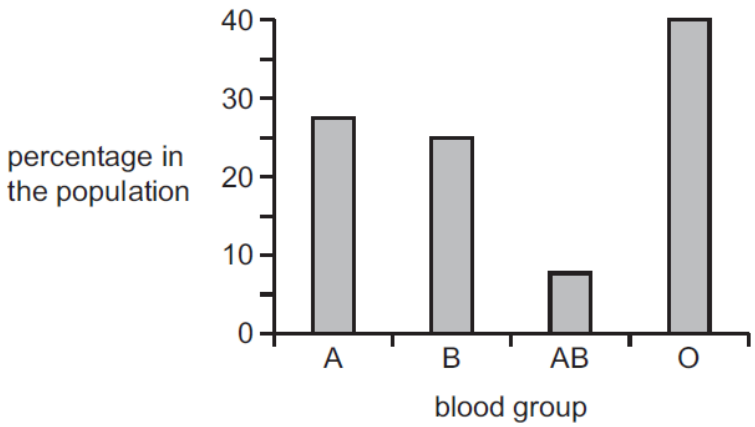
B any inherited feature that helps an organism to survive and reproduce

C any feature that shows discontinuous variation

D any inherited feature that an organism has

6. June/2021/Paper_21/No.35

The graph shows the percentage of different blood groups in a human population.



Which type of variation is shown by human blood groups?

A continuous variation caused by genetic and environmental factors

B continuous variation caused by genetic factors only

C discontinuous variation caused by genetic and environmental factors

D discontinuous variation caused by genetic factors only

7. June/2021/Paper_21/No.36

New strains of the crop plant wheat can be produced by cross-breeding disease resistant plants with those that give high yields of grain.

What is this an example of?

A natural selection

B artificial selection

C genetic engineering

D asexual reproduction

8. June/2021/Paper_22/No.36

What occurs as a result of artificial selection?

A antibiotic resistance in bacteria

B disease resistant crops

C presence of roots in cactus plants

D sickle cell anaemia

9. June/2021/Paper_23/No.35

What is a correct description of a gene mutation?

A a duplicate copy of DNA

B a change in the base sequence of DNA

C an increase in the number of chromosomes

D a phenotypic variation

Variation and selection – 2020 IGCSE 0610

1. Nov/2020/Paper_11/No.34

Which statement is best used to describe differences in height in humans?

A continuous variation resulting in a limited number of phenotypes

B continuous variation resulting in a range of phenotypes

C discontinuous variation resulting in a limited number of phenotypes

D discontinuous variation resulting in a range of phenotypes

2. Nov/2020/Paper_11/No.35

A student wrote some statements describing the stages involved during selective breeding of plants.

1 Farmers select individual plants with desirable features.

2 Farmers cross these individuals to produce the next generation.

3 The farmers then select the offspring with the desirable features.

Which statements are correct?

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

3. Nov/2020/Paper_13/No.34

What is a definition of variation?

A having two identical alleles of a particular gene

B individuals of the same species in one area

C differences between individuals of the same species

D the way in which new alleles are formed

4. Nov/2020/Paper_21/No.34

The development of antibiotic resistance in bacteria is an example of which process?

A evolution by artificial selection

B evolution by natural selection

C variation due to genetic engineering

D variation due to asexual reproduction

5. Nov/2020/Paper_22/No.34

Desert plants have evolved to survive in places where very little water is available.

Which process is reduced to enable them to retain as much water as possible?

A transpiration

B translocation

C respiration

D digestion

6. Nov/2020/Paper_23/No.27

Scientists investigated the amount of genetic variation found within different crop plants. They grew large numbers of each crop and measured the genetic variation within the species of crop. The results are shown in the table.

crop	percentage genetic variation
banana	0
pea	65
carrot	54

Which crop or crops have been produced by sexual reproduction?

A banana only

B banana, pea and carrot

C pea only

D pea and carrot only

7. Nov/2020/Paper_23/No.34

How does artificial selection differ from natural selection?

A Artificial selection changes the characteristics of living things.

B Artificial selection is based on genetic variation.

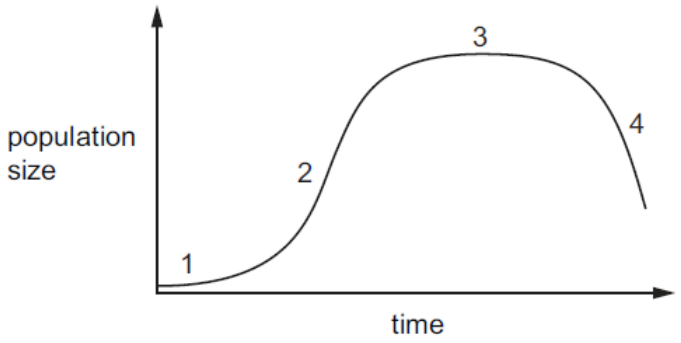
C Artificial selection does not involve competition for resources.

D Artificial selection occurs over many generations.

8. Nov/2020/Paper_23/No.36

A few yeast cells were placed in a container of nutrient solution.

The graph shows how their population size changed over time.



Which row shows when the reproduction rate was greater than the death rate for the numbered phases on the graph?

	reproduction rate greater than death rate			
	1	2	3	4
A	✓	✓	✓	✗
B	✓	✓	✗	✗
C	✓	✗	✗	✗
D	✗	✓	✓	✓

key
✓= yes
✗= no

9. Nov/2020/Paper_33/No.4

(a) Define the term homeostasis.

.....

.....

.....

.....

..... [2]

(b) The skin is an important organ involved in temperature regulation in mammals.

Fig. 4.1 is a diagram of a cross-section of mammalian skin.

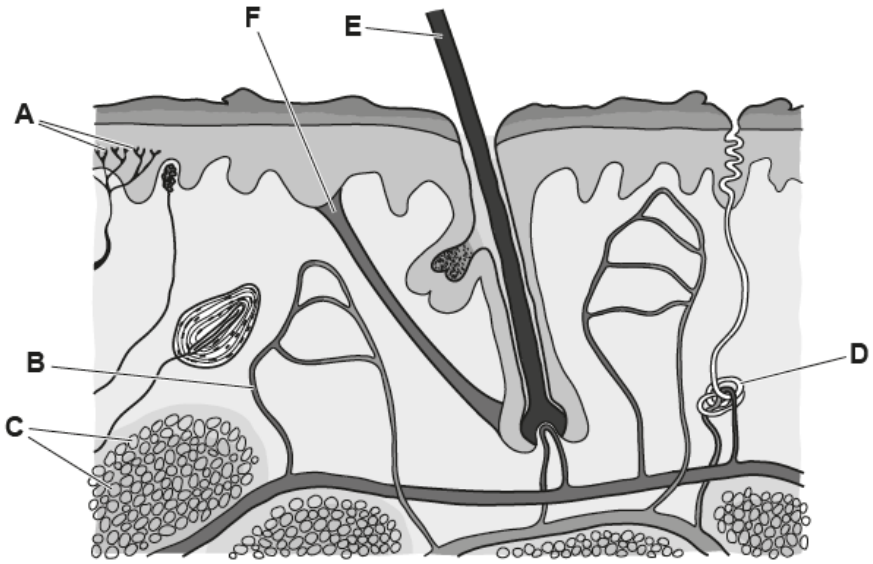


Fig. 4.1

(i) State the names of structures **A**, **B**, **C** and **D** on Fig. 4.1.

A .....

B .....

C .....

D .....

[4]

(ii) Describe how the structures labelled **C**, **E** and **F** in Fig. 4.1 reduce heat loss in **cold** conditions.

.....

.....

.....

.....

.....

.....

..... [3]

(iii) Complete the sentences about maintenance of body temperature using the words and phrases from the list.

Each word or phrase may be used once, more than once or not at all.

blood **brain** **condenses** **evaporates**

neurones **receptors** **skin**

sweat **temperature** **water content**

Control of body temperature is coordinated by the ..... .

There are temperature ..... that sense the temperature of the

..... .

When the temperature gets too hot, glands release ..... onto

the surface of the skin and the water in it ..... reducing body

temperature.

[5]

[Total: 14]

Variation and selection – 2020 IGCSE 0610

1. March/2020/Paper_12/No.34

What applies to selective breeding but **not** to natural selection?

A Humans select individuals with desirable features.

B Individuals may produce a large number of offspring.

C Individuals pass their alleles to the next generation.

D There is variation among the offspring produced.

2. March/2020/Paper_32/No.3

(a) The length of hair in cats is controlled by a single gene.

- The allele for short hair is dominant – **H**
- The allele for long hair is recessive – **h**

Fig. 3.1 is a photograph of two cats.



cat A **cat B**

Fig. 3.1

(i) Table 3.1 shows some of the genetic and physical features of the cats in Fig. 3.1.

Complete Table 3.1.

Table 3.1

	cat **A**	cat **B**
phenotype	long hair	.....
genotype	.....	**HH** or .....

[3]

(ii) State the genotype of a pure-breeding short-haired cat.

..... [1]

(iii) Two cats with the genotypes **HH** and **hh** were bred together.

Predict the percentage of offspring that are heterozygous.

.....% [1]

(b) The statements describe features of continuous or discontinuous variation.

Identify the type of variation each statement describes.

Write the letter **C** for continuous variation or **D** for discontinuous variation in the spaces provided.

Height is an example of this type of variation. .....

There are no intermediate phenotypes with this type of variation. .....

This type of variation results in a limited number of phenotypes. .....

[2]

(c) A student wrote a definition of variation as:

'the similarities between individuals of the same kingdom'.

Identify the **two incorrect** words in the student's definition.

1 .....

2 .....

[2]

[Total: 9]

3. June/2020/Paper_11/No.33

Pea plants produce either yellow or green seeds. Yellow (Y) is dominant to green (y).

What are the most likely phenotypes of the offspring of a cross between YY and Yy plants?

A 50% yellow and 50% green

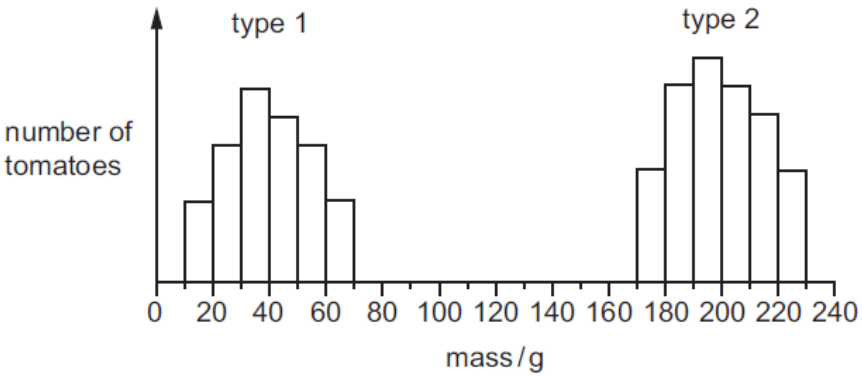
B 75% yellow and 25% green

C 100% yellow

D 100% green

4. June/2020/Paper_11/No.34

The graph shows the masses of two different types of tomato.



What can be concluded from the graph?

A Genes do not affect the mass of tomatoes.

B Type 1 tomatoes show continuous variation.

C Type 2 tomatoes are sometimes smaller than type 1 tomatoes.

D Type 2 tomatoes show discontinuous variation.

5. June/2020/Paper_12/No.32

Which statement about the human sex chromosomes is correct?

A Females have an X chromosome and a Y chromosome.

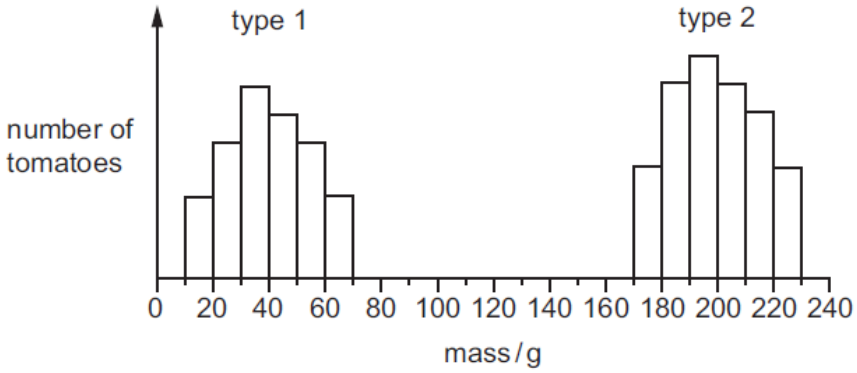
B Females have two Y chromosomes.

C Males and females have at least one X chromosome.

D Males and females have at least one Y chromosome.

6. June/2020/Paper_12/No.34

The graph shows the masses of two different types of tomato.



What can be concluded from the graph?

A Genes do not affect the mass of tomatoes.

B Type 1 tomatoes show continuous variation.

C Type 2 tomatoes are sometimes smaller than type 1 tomatoes.

D Type 2 tomatoes show discontinuous variation.

7. June/2020/Paper_21/No.34

Which adaptation may be present in a xerophyte?

A leaves with small surface area and large numbers of stomata

B little or no xylem tissue and leaves with large surface area

C stomatal hairs and rolled leaves

D thin or no cuticle and deep roots

8. June/2020/Paper_22/No.34

Which adaptation may be present in a xerophyte?

A leaves with small surface area and large numbers of stomata

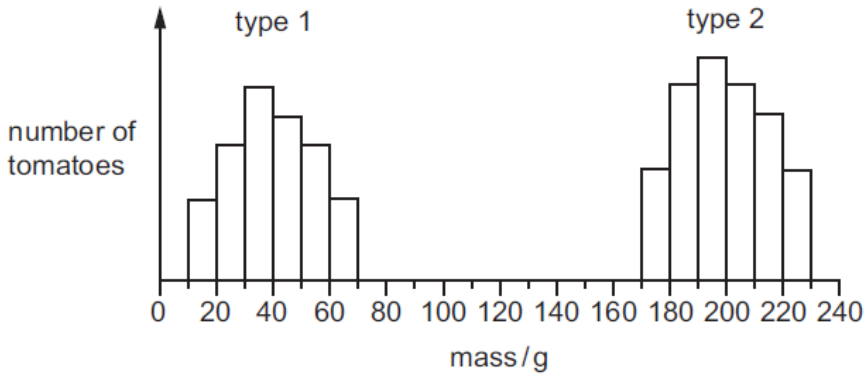
B little or no xylem tissue and leaves with large surface area

C stomatal hairs and rolled leaves

D thin or no cuticle and deep roots

9. June/2020/Paper_22/No.33

The graph shows the masses of two different types of tomato.



What can be concluded from the graph?

A Genes do not affect the mass of tomatoes.

B Type 1 tomatoes show continuous variation.

C Type 2 tomatoes are sometimes smaller than type 1 tomatoes.

D Type 2 tomatoes show discontinuous variation.

10. June/2020/Paper_22/No.34

Which adaptation may be present in a xerophyte?

A leaves with small surface area and large numbers of stomata

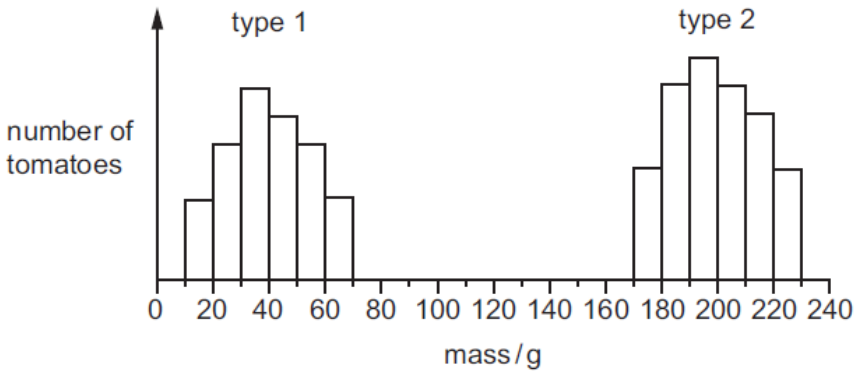
B little or no xylem tissue and leaves with large surface area

C stomatal hairs and rolled leaves

D thin or no cuticle and deep roots

11. June/2020/Paper_23/No.34

The graph shows the masses of two different types of tomato.



What can be concluded from the graph?

A Genes do not affect the mass of tomatoes.

B Type 1 tomatoes show continuous variation.

C Type 2 tomatoes are sometimes smaller than type 1 tomatoes.

D Type 2 tomatoes show discontinuous variation.

12. June/2020/Paper_42/No.3

Cheetahs, *Acinonyx jubatus*, are carnivores found in the dry grasslands and woodlands of southern Africa. Cheetahs hunt for food during the day. They eat deer and antelope.

The cheetah is the fastest mammal on land but can only run at high speed (sprint) over a short distance. Its hunting strategy is to creep up on prey and then sprint to catch them.

Fig. 3.1 is a photograph of a cheetah in its natural habitat.



Fig. 3.1

(a) Suggest how these adaptive features enable cheetahs to survive in their natural environment.

fur colouring .....

.....

.....

streamlined body shape .....

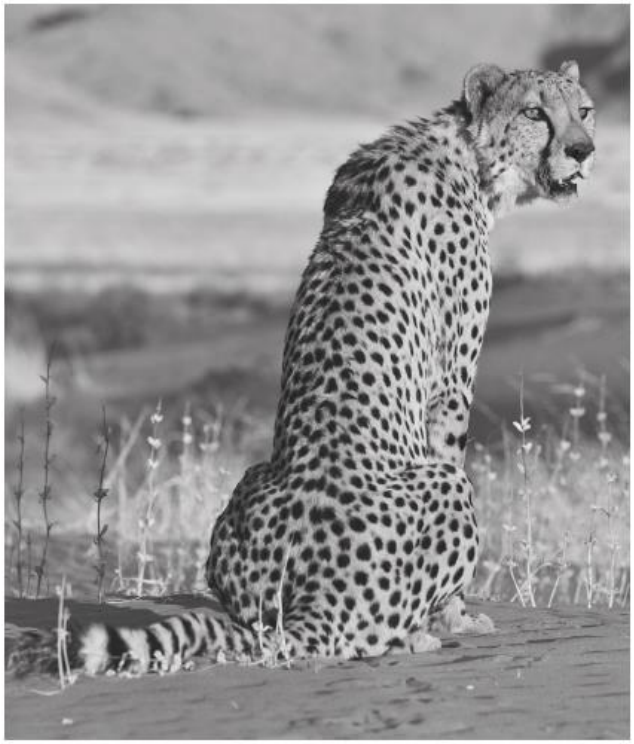
.....

.....

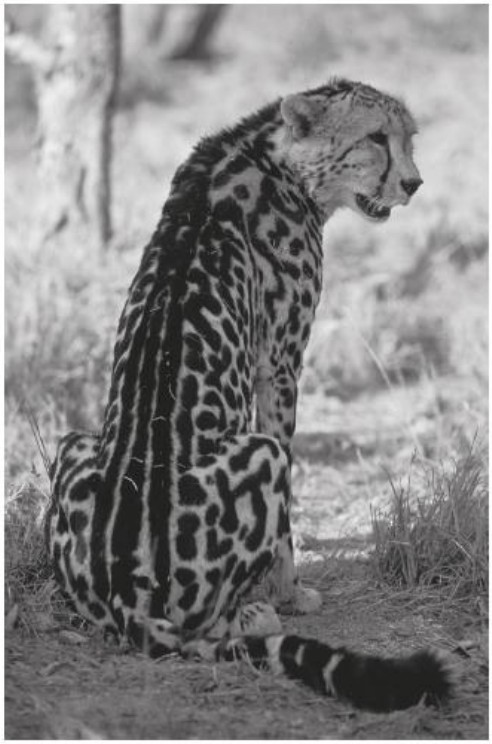
[2]

(b) The king cheetah is a rare variety of *A. jubatus* that has inherited striped fur markings.

Fig. 3.2 shows a cheetah with spots and a king cheetah.



cheetah with spots



king cheetah

Fig. 3.2

(i) Define the term *inheritance*.

.....

.....

..... [1]

Fig. 3.3 shows a pedigree diagram of a population of cheetahs.

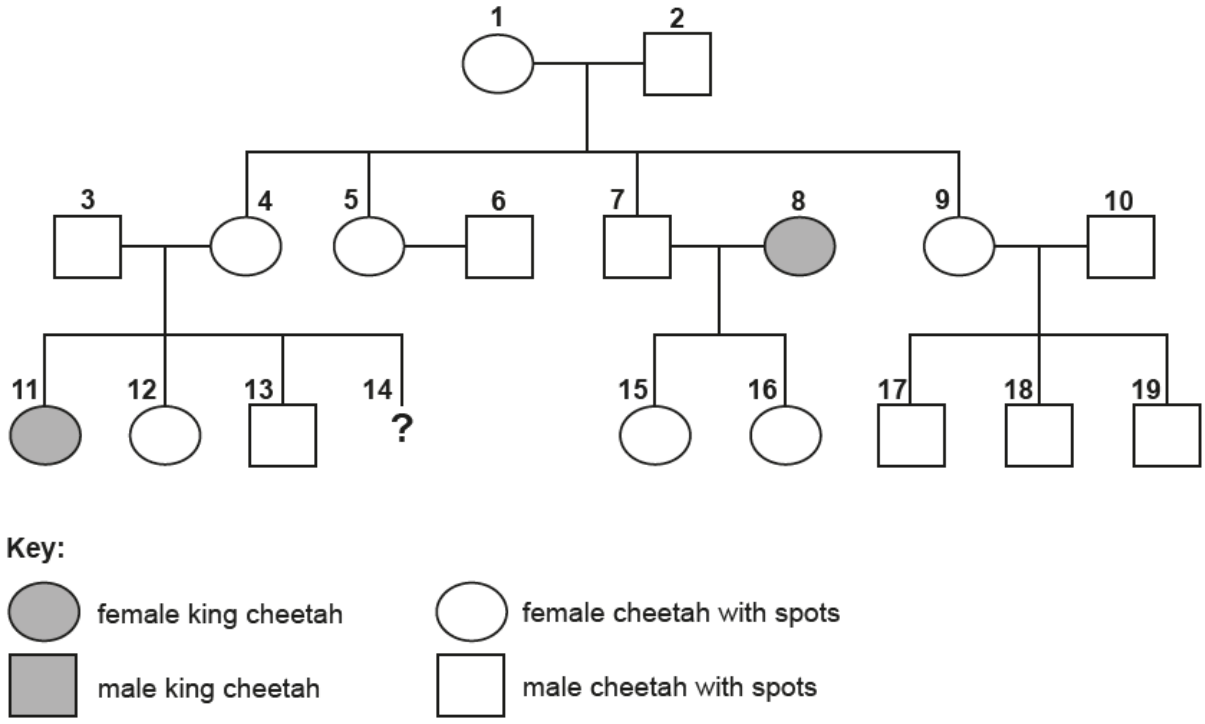


Fig. 3.3

(ii) Deduce the genotype of cheetah **11**.

..... [1]

(iii) Predict the probability of cheetah **14** being a king cheetah.

..... [1]

(iv) Describe how a breeder could determine the genotype of cheetah **17**.

.....

.....

.....

.....

..... [2]

(v) When the king cheetah was first discovered it was thought that it was a new species.

Pedigree diagrams of cheetahs proved it was not a new species.

Suggest **one** type of evidence, other than pedigree diagrams, that can be used to determine how closely related organisms are.

.....

.....

..... [1]

(c) Cheetahs are at risk of becoming endangered.

(i) Suggest why the cheetah is at risk of becoming endangered.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Describe how species like the cheetah can be conserved.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 14]

13. June/2020/Paper_42/No.5

The Galápagos Islands are a group of small islands in the Pacific Ocean.

In 1839 Charles Darwin published a book that described differences in a family of birds called finches.

Each species of Galápagos finch had:

- a different diet
- a different beak shape, as shown in Fig. 5.1.

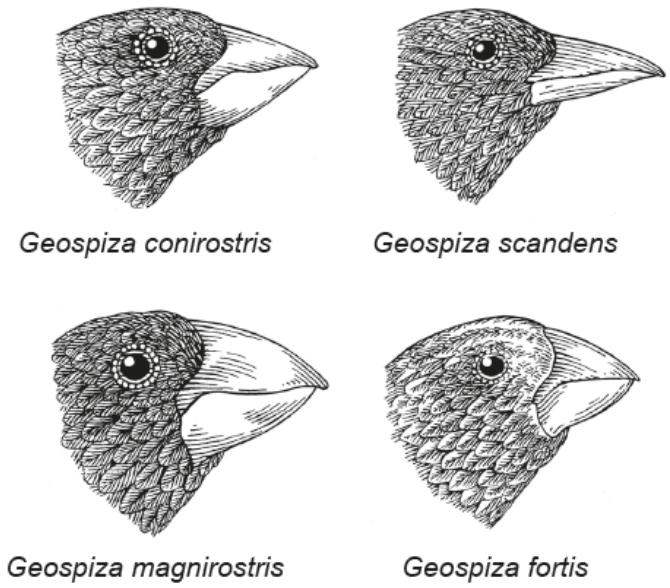


Fig. 5.1

(a) State the genus name for the Galápagos finches shown in Fig. 5.1.

..... [1]

Suggest how Galápagos finches have evolved different shaped beaks.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 6]

1 What is a mutation?

A a change in a gene or chromosome

B a condition caused by a dominant allele

C a process used in genetic engineering

D a type of continuous variation

2 Which characteristic shows discontinuous variation in humans?

A height

B length of foot

C tongue rolling

D weight

3 The whole of an island's population of short-haired bumblebees is descended from just two parents. These were introduced from the mainland.

Which statement about the island's short-haired bumblebee population, compared with that of the mainland, is correct?

A The population is less in danger of collapsing from disease.

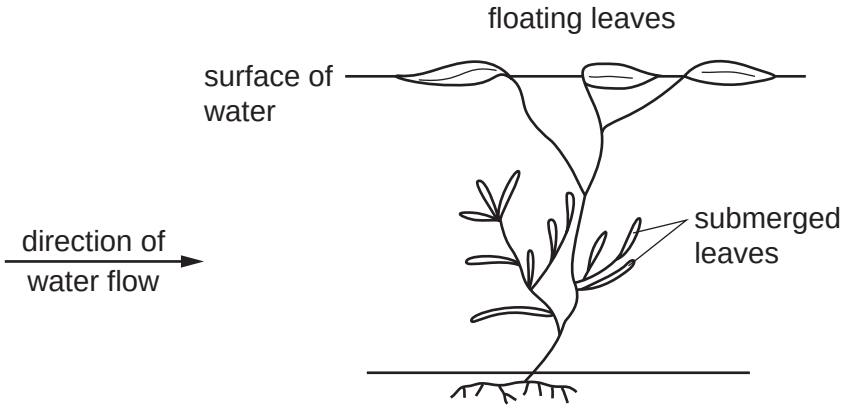
B The population is more able to adapt to environmental changes.

C The population shows more genetic variety.

D The population will adapt to environmental changes more slowly.

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4 The diagram shows a hydrophyte in a river.



Which statement about the submerged leaves is correct?

A They cannot photosynthesise.

B They have a thick cuticle.

C They offer little resistance to water flow.

D They require many xylem vessels for support.

5 Some disease-causing bacteria survive treatment with an antibiotic.

Which statement about the surviving bacteria is correct?

A The antibiotic will work better on the next generation of bacteria.

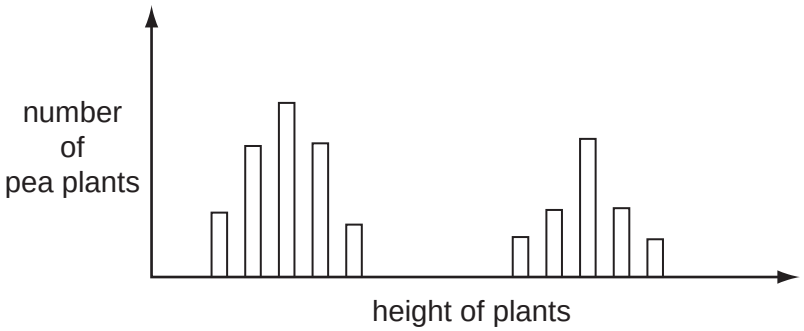
B The bacteria have undergone a process of natural selection.

C The bacteria will now be resistant to all antibiotics.

D The resistance of the bacteria is a result of selective breeding.

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6 The bar chart shows the heights of pea plants grown from 500 pea seeds.



What variation do the plants show?

A continuous variation only

B discontinuous variation only

C both continuous variation and discontinuous variation

D neither continuous variation nor discontinuous variation

7 What is an example of a characteristic that shows discontinuous variation in humans?

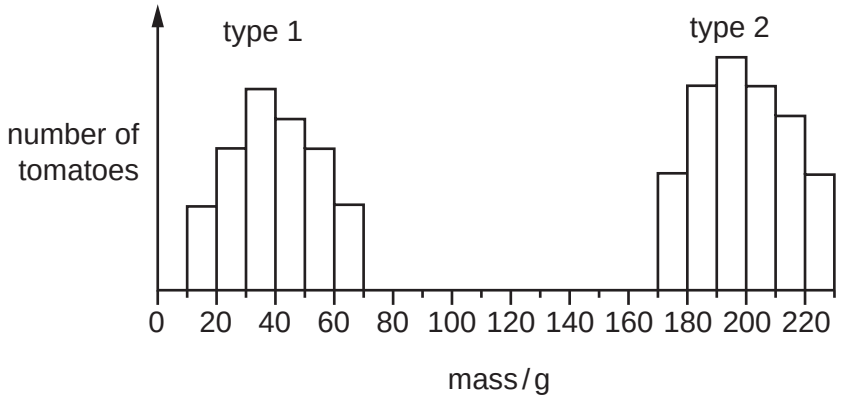
A blood group

B body mass

C height

D width of hand

8 The graph shows the masses of two different types of tomato.



What can be concluded from the graph?

A Genes do not affect the mass of tomatoes.

B Type 1 tomatoes show continuous variation.

C Type 2 tomatoes are sometimes smaller than type 1 tomatoes.

D Type 2 tomatoes show discontinuous variation.

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9 A man who was blood group A and a woman who was blood group B had four children, each with a different blood group A, B, AB and O.

Which type of variation does this demonstrate?

A continuous, environmental and genetic

B continuous and genetic only

C discontinuous, environmental and genetic

D discontinuous and genetic only

10 Which is a sudden change in a gene or chromosome?

A allele

B genotype

C mutation

D phenotype

11 What is **not** a feature of hydrophytes?

A large air spaces in the tissues

B leaves rolled up and covered with hairs

C leaves with stomata on the upper surface

D roots and xylem reduced

12 What is **not** a feature of natural selection?

A competition for resources

B production of many offspring

C selection by humans

D variation within the population

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13 Cacti have fewer stomata than other plants.

How does this help them to survive in desert conditions?

A It increases loss of water.

B It increases uptake of carbon dioxide.

C It reduces loss of water.

D It reduces uptake of carbon dioxide.

14 What is **unlikely** to be affected by the environment?

A blood group

B body mass

C health

D height

15 What makes tongue rolling an example of discontinuous variation?

A A person can roll their tongue only when they are young.

B There are many different types of tongue rollers.

C Tongue rolling has to be learnt.

D Tongue rolling is something that a person either can or cannot do.

16 What is an example of continuous variation?

A blood group

B gender

C height

D tongue rolling

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17 The distribution of the sickle-cell allele in human populations varies in different areas of the world.

What is an explanation for this difference?

A People that are heterozygous for the sickle-cell allele have a resistance to cholera.

B People that are heterozygous for the sickle-cell allele have a resistance to malaria.

C People that are heterozygous for the sickle-cell allele are more likely to suffer from anaemia.

D People with sickle-cell anaemia have more alleles.

18 When growing millet, farmers choose seeds from high-yielding plants.

Which biological practice is this an example of?

A adaptation

B artificial selection

C evolution

D natural selection

19 Which feature is an example of discontinuous variation?

A blood group

B body mass

C foot size

D height

20 Which description of an adaptive feature is correct?

A a change in phenotype that is caused by the environment

B a change in the environment that is an advantage to an organism

C an action by an organism that aids its ability to survive and reproduce

D an inherited feature that increases an organism's ability to survive and reproduce

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21 Which human phenotype is affected by environmental and genetic factors?

A blood group

B body size

C gender

D tongue rolling

22 Which adaptation may be present in a xerophyte?

A leaves with small surface area and large numbers of stomata

B little or no xylem tissue and leaves with large surface area

C stomatal hairs and rolled leaves

D thin or no cuticle and deep roots

23 How does artificial selection differ from natural selection ?

A Selection changes the characteristics of living things.

B Selection is based on genetic variation.

C Selection is not based on adaptation to their environment.

D Selection occurs over many generations.

24 The number of bacteria resistant to antibiotics is increasing.

What has contributed to this situation?

A choosing the antibiotic carefully to match the strain of bacterium

B not completing the course of prescribed antibiotics

C tracing, testing and treating people who have been in contact with the infected person

D using antibiotics only when essential

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25 Which row best describes human blood groups?

	affected by environment	has no intermediate phenotypes	shows continuous variation	shows discontinuous variation
A	✓	✗	✓	✗
B	✓	✗	✗	✓
C	✗	✓	✓	✗
D	✗	✓	✗	✓

26 During sexual reproduction in plants, what will give rise to the greatest variation in the offspring?

A All of the flowers on the same plant have male and female reproductive organs.

B The anthers and stigmas on the same plant mature at the same time of year.

C There are separate male and female flowers on the same plant.

D There are separate male and female plants.

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