Chapter 18

Variation and selection

18.1 Variation

01. 0610_m22_qp_22 Q: 34

Which statement about variation is correct?

A Continuous variation results in few phenotypes with no intermediates.

B Discontinuous variation results in few phenotypes with no intermediates.

C Phenotypic variation is caused by environmental factors only.

D Phenotypic variation is caused by genetic factors only.

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02. 0610_m21_qp_22 Q: 35

A man heterozygous for the sickle cell anaemia allele, Hb^SHb^A, has children with a woman who is homozygous for the normal haemoglobin allele, Hb^AHb^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

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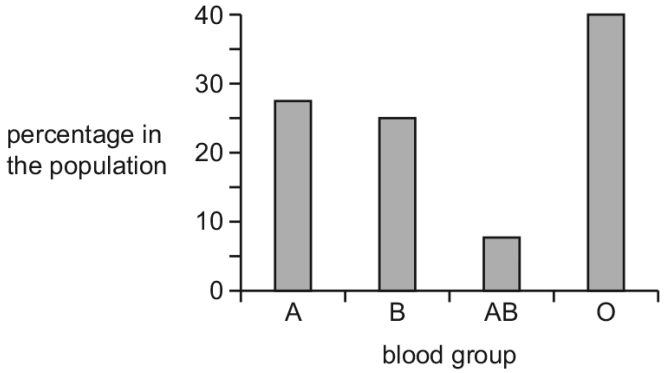
03. 0610_s21_qp_21 Q: 35

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

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04. 0610_s21_qp_23 Q: 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

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05. 0610_w21_qp_21 Q: 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.

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06. 0610_w21_qp_23 Q: 34

Which statement about a person who is heterozygous for the sickle-cell allele is correct?

A They are not resistant to malaria and their genotype is Hb^AHb^S.

B They are not resistant to malaria and their genotype is Hb^SHb^S.

C They are resistant to malaria and their genotype is Hb^AHb^S.

D They are resistant to malaria and their genotype is Hb^SHb^S.

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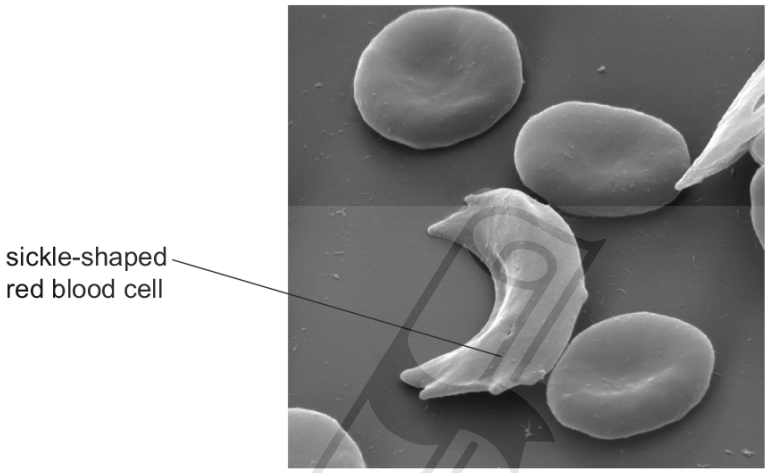
07. 0610_m20_qp_22 Q: 35

The photomicrograph shows some red blood cells.



What are the possible genotype combinations of this person?

A Hb^SHb^A or Hb^SHb^S

B Hb^SHb^A or Hb^AHb^A

C Hb^AHb^A only

D Hb^SHb^S or Hb^AHb^A

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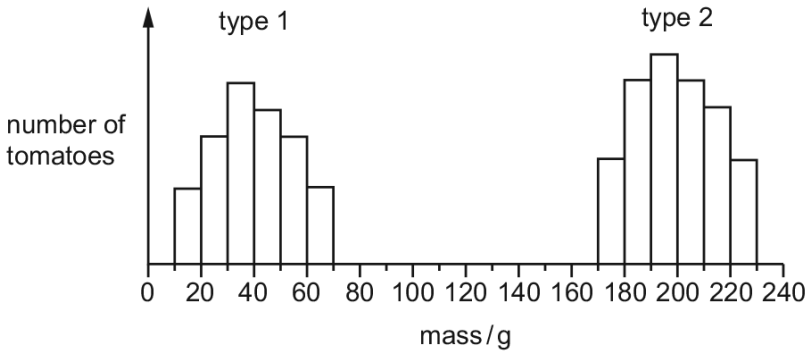
08. 0610_s20_qp_21 Q: 33

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.

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09. 0610_w20_qp_23 Q: 33

A couple are both heterozygous for the sickle-cell allele.

What is the probability that their first child will have sickle-cell anaemia?

A 25% **B** 33% **C** 50% **D** 75%

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10. 0610_m19_qp_22 Q: 34

What is the correct definition of a gene mutation?

A a change in the base sequence of DNA

B a change in the gene or chromosome

C a change in the number of amino acids

D a change in the number of chromosomes

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11. 0610_s19_qp_21 Q: 34

Why is the allele for sickle-cell anaemia common in some parts of the world?

A Malaria protects against sickle-cell anaemia.

B Sickle-cell anaemia is caused by malaria.

C Sickle-cell anaemia is transmitted by mosquitoes.

D The sickle-cell anaemia allele protects against malaria.

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12. 0610_s19_qp_22 Q: 34

Which statement is correct?

A People who are heterozygous for the sickle-cell allele have a resistance to malaria.

B Sickle-cell anaemia is caused by a change in the amino acid sequence of the haemoglobin gene.

C Sickle-cell anaemia is caused by both genetic and environmental factors interacting.

D The sickle-cell allele is rare in human populations in areas where there is malaria.

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13. 0610_w19_qp_23 Q: 32

Sickle-cell anaemia is caused by a mutation in the haemoglobin gene.

The normal base sequence is shown in 1, and the sickle-cell base sequence is shown in 2.

1 TGA GGA CTC CTC

2 TGA GGA CAC CTC

What causes the change in the DNA?

A the addition of one base

B the addition of two bases

C the change of one base for another

D the deletion of one base

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14. 0610_m18_qp_22 Q: 29

In areas of the world where malaria is present, the sickle-cell allele is more common.

What is the reason for this?

A Both diseases are caused by the same allele.

B Heterozygous individuals with the sickle-cell allele are less likely to have malaria.

C Heterozygous individuals with the sickle-cell allele are more likely to have malaria.

D These are parts of the world with many diseases.

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15. 0610_s18_qp_21 Q: 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 It is caused by a dominant allele.

D The disorder is sex-linked.

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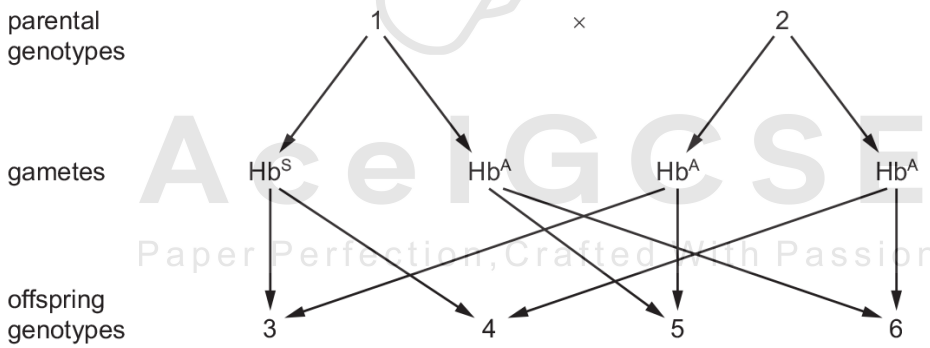
16. 0610_s18_qp_22 Q: 33

Sickle-cell anaemia is an inherited disease.



Which genotypes represented in the diagram would increase an individual's resistance to malaria?

A 1, 3 and 4 **B** 1, 4 and 5 **C** 2, 3 and 4 **D** 2, 5 and 6

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17. 0610_s18_qp_23 Q: 33

Which statement about blood groups in humans is correct?

A They are determined by genes and the environment.

B They are determined only by the environment.

C They are determined only by genes.

D They show continuous variation.

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18. 0610_w18_qp_21 Q: 33

Sickle-cell anaemia is a genetic disease that is caused by the allele Hb^S.

Hb^A is the normal allele.

A woman does not have the symptoms of the disease but her brother does show symptoms.

If her mother and father do **not** have symptoms, which statement is correct?

A The woman has the genotype Hb^SHb^S.

B The woman's brother has the genotype Hb^AHb^A.

C The woman's father and mother both have the genotype Hb^AHb^S.

D The woman's father and mother both have the genotype Hb^SHb^S.

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19. 0610_w18_qp_22 Q: 33

The diagram shows the bases on part of a chromosome, P, responsible for the production of normal haemoglobin. The same part of another chromosome, Q, is responsible for the production of sickle-cell haemoglobin.

chromosome P chromosome Q

What has caused the difference between the two chromosomes?

A discontinuous variation

B gene mutation

C phenotypic variation

D selective breeding

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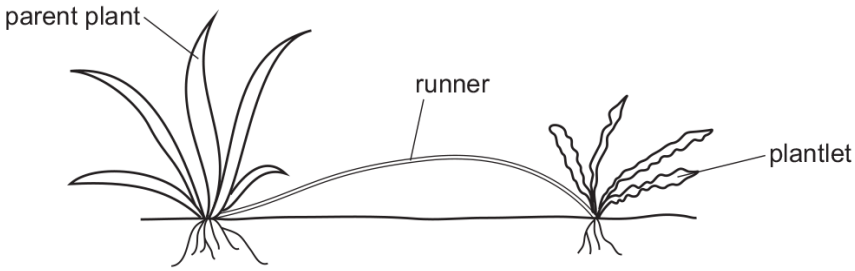
20. 0610_w18_qp_23 Q: 33

The diagram shows a plant reproducing asexually by growing a plantlet from a runner. The leaves of the plantlet appear different to the leaves of the parent plant.



Which statement explains the difference in the leaf shape of the plantlet?

A A mutation has occurred in the genes of the plantlet.

B The plantlet inherited the genes from the parent plant.

C The plant was produced by meiosis.

D The plantlet was produced by the fusion of gametes.

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21. 0610_m17_qp_22 Q: 32

Which human phenotype is affected by environmental and genetic factors?

A blood group

B body size

C gender

D tongue rolling

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22. 0610_s17_qp_22 Q: 35

Which feature is an example of discontinuous variation?

A blood group

B body mass

C foot size

D height

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23. 0610_s17_qp_23 Q: 34

Which row best describes human blood groups?

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

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24. 0610_w17_qp_21 Q: 33

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.

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25. 0610_w17_qp_21 Q: 34

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.

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26. 0610_w17_qp_23 Q: 34

What is a mutation?

A a change in appearance

B a change in a gene

C a change in behaviour

D a change in the environment

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27. 0610_s16_qp_23 Q: 33

Which characteristic shows discontinuous variation in humans?

A height

B length of foot

C tongue rolling

D weight

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28. 0610_s16_qp_23 Q: 34

Sickle cell anaemia is determined by the gene Hb. Hb^A is the allele for normal blood. Hb^S is the allele for sickle cell anaemia.

Which combination of parents could result in some children with resistance to malaria and some with all normal red blood cells?

A $Hb^A\ Hb^A$ $Hb^A\ Hb^A$

B $Hb^A\ Hb^A$ $Hb^A\ Hb^S$

C $Hb^A\ Hb^A$ $Hb^S\ Hb^S$

D $Hb^S\ Hb^S$ $Hb^S\ Hb^S$

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29. 0610_w16_qp_21 Q: 32

Hb^A is the allele for normal haemoglobin and Hb^S is the allele for abnormal haemoglobin that causes sickle-shaped red blood cells.

Which row correctly matches a genotype to its phenotype?

	genotype	person has sickle-cell anaemia	person has resistance to malaria
A	$Hb^A\ Hb^A$	✗	✓
B	$Hb^S\ Hb^A$	✓	✗
C	$Hb^S\ Hb^A$	✗	✓
D	$Hb^S\ Hb^S$	✗	✗

SN	Paper	Q. No.	Answer
01	0610_m22_qp_22	34	B
02	0610_m21_qp_22	35	C
03	0610_s21_qp_21	35	D
04	0610_s21_qp_23	35	B
05	0610_w21_qp_21	33	C
06	0610_w21_qp_23	34	C
07	0610_m20_qp_22	35	A
08	0610_s20_qp_21	33	B
09	0610_w20_qp_23	33	A
10	0610_m19_qp_22	34	A
11	0610_s19_qp_21	34	D
12	0610_s19_qp_22	34	A
13	0610_w19_qp_23	32	C
14	0610_m18_qp_22	29	B
15	0610_s18_qp_21	33	B
16	0610_s18_qp_22	33	A
17	0610_s18_qp_23	33	C
18	0610_w18_qp_21	33	C
19	0610_w18_qp_22	33	B
20	0610_w18_qp_23	33	A
21	0610_m17_qp_22	32	B
22	0610_s17_qp_22	35	A
23	0610_s17_qp_23	34	D
24	0610_w17_qp_21	33	D
25	0610_w17_qp_21	34	B
26	0610_w17_qp_23	34	B
27	0610_s16_qp_23	33	C
28	0610_s16_qp_23	34	B
29	0610_w16_qp_21	32	C