Genetics, Inheritance & Selection

Question Paper

Level	O Level
Subject	Biology
Exam Board	Cambridge International Examinations
Topic	Inheritance
Sub Topic	Genetics, Inheritance & Selection
Booklet	Question Paper 1

Time Allowed: **60 minutes**

Score: **/50**

Percentage: **/100**

1 Genetic engineering can be used to introduce new characteristics into animals and plants.

Which characteristic is **not** likely to be introduced into a cereal crop plant by genetic engineers?

A resistance to bacterial diseases

B resistance to fungal diseases

C resistance to insecticides

D resistance to viral diseases

2 In the ABO blood group system, which alleles are codominant?

A I^A and I^B

B I^A and I^o

C I^B and I^o

D I^A, I^B and I^o

3 Two black female mice were mated with the same black male. One female had nine offspring, all of which were black. The other female had six black and two white offspring.

Which cross represents the parents of the all black family?

	female	male
A	bb	Bb
B	Bb	Bb
C	Bb	BB
D	BB	Bb

key

B = allele for black

b = allele for white

4 Which statement is evidence that genes are copied and passed on to the next generation?

A Asexual reproduction produces genetically identical offspring.

B Different alleles of a gene can produce variation in phenotype.

C Each species of a plant or animal has a fixed number of chromosomes.

D Sexual reproduction produces genetically different offspring.

5 Which statements describe an allele?

	an alternative form of a gene	copied during cell division	part of a DNA molecule
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key
✓ = yes
✗ = no

6 Which statements about genetic engineering to produce human insulin are correct?

1 The human insulin gene is cut out of human DNA.

2 The insulin gene is inserted into bacterial DNA.

3 The genetically engineered bacteria are cultured in large numbers.

4 These cultured bacteria are used in injections for diabetics.

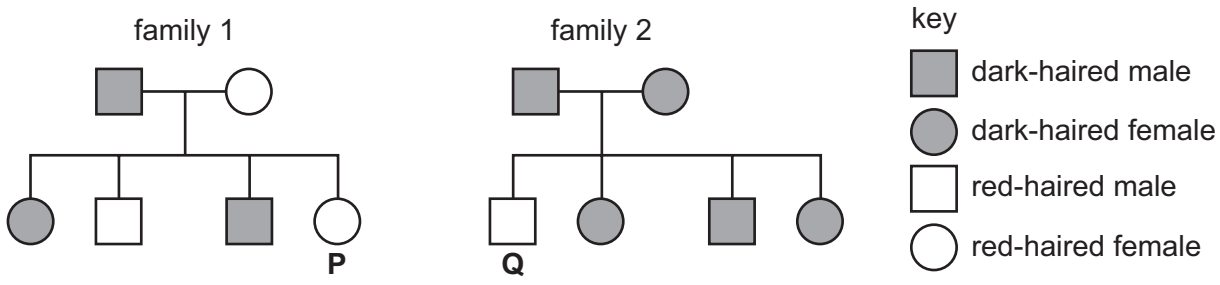
A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1, 2 and 4 only

D 2, 3 and 4 only

7 The diagram shows the pattern of inheritance of dark hair and red hair in two families.



If individuals **P** and **Q** have children together, which prediction can be made about the hair colour of these children?

A All the children will have dark hair.

B All the children will have red hair.

C Half the children will have dark hair.

D Three-quarters of the children will have dark hair.

8 Which of these may be heterozygous?

A a haploid cell

B an allele of a gene

C an organism with a dominant phenotype

D an organism with a recessive genotype

9 A red-flowered plant is crossed with a white-flowered plant. All the offspring have red flowers.

What is the genotype of these offspring?

A RR and Rr **B** RR only **C** Rr only **D** rr only

10 A person with Down's syndrome is born with 47 chromosomes in each cell, instead of 46.

What could cause this?

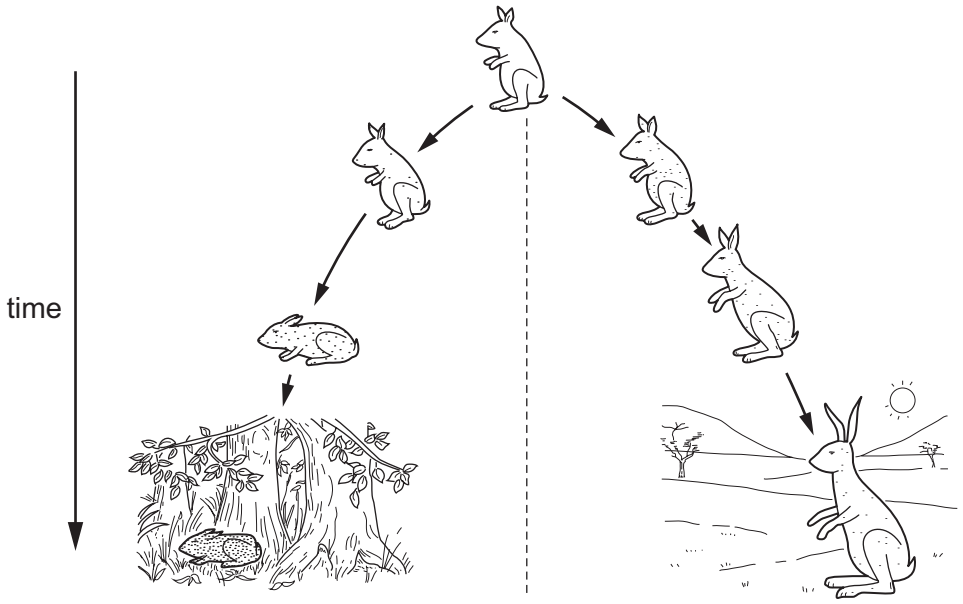
A A mutation happened during the production of the egg cell.

B More than one sperm fused with the egg at fertilisation.

C Radiation caused a change in structure of a gene in the father's sperm.

D The mother was exposed to harmful chemicals while she was pregnant.

11 The diagram shows a species becoming modified to survive in two different habitats.



Which process is responsible for these modifications?

A artificial selection

B conservation

C genetic engineering

D natural selection

12 Over time, a species of bird develops a more pointed beak. The more pointed shape of the beak helps the birds to catch small insects that may be hiding in cracks in the rocks.

What is a reason for the change in the shape of the birds' beaks?

A Birds develop more pointed beaks as they search for insects in cracks in the rocks.

B Individuals with less pointed beaks are better fitted to their environment and more likely to survive.

C Individuals with more pointed beaks are better able to compete for food.

D When reproducing, birds are more likely to seek out mates with less pointed beaks because these are better adapted.

13 In horses, red hair is dominant to brown.

A breeder crosses a number of heterozygous red-haired horses.

Approximately what percentage of the offspring will be red-haired?

A 25% **B** 50% **C** 75% **D** 100%

14 Which row in the table is correct?

	chromosome in mother's ovum	chromosome in father's sperm	sex of baby
A	X	X	male
B	X	Y	male
C	Y	X	female
D	X	Y	female

15 Which statement is correct?

A Evolution is natural selection.

B Evolution results in natural selection.

C Natural selection and evolution are independent of each other.

D Natural selection results in evolution.

16 Bacteria can be genetically engineered to produce human insulin by adding a human insulin gene to the bacterial DNA.

What is an advantage of this procedure?

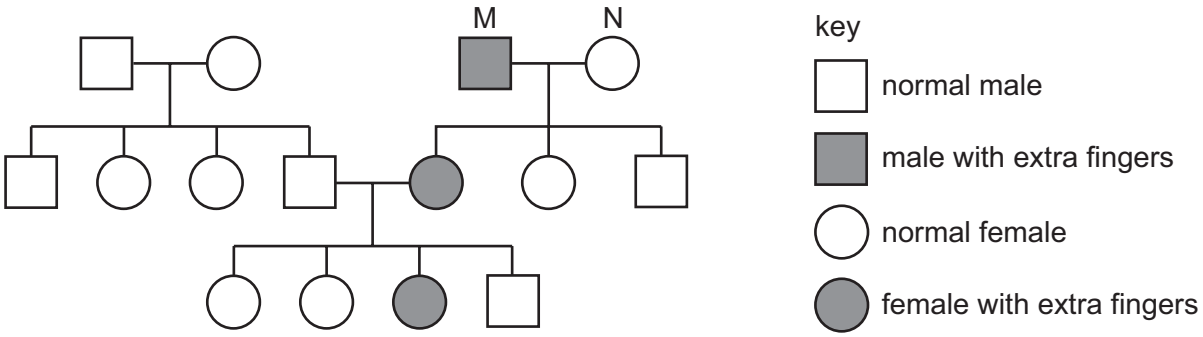
A The bacteria do not need a source of glucose.

B The bacteria grow faster than before being engineered.

C The insulin does not need to be purified before being injected into a patient.

D The insulin is unlikely to cause an immune response when injected into a patient.

17 The diagram shows the inheritance of the allele, E, for polydactyly (having extra fingers) which is dominant over the normal allele, e.



What are the genotypes of persons M and N?

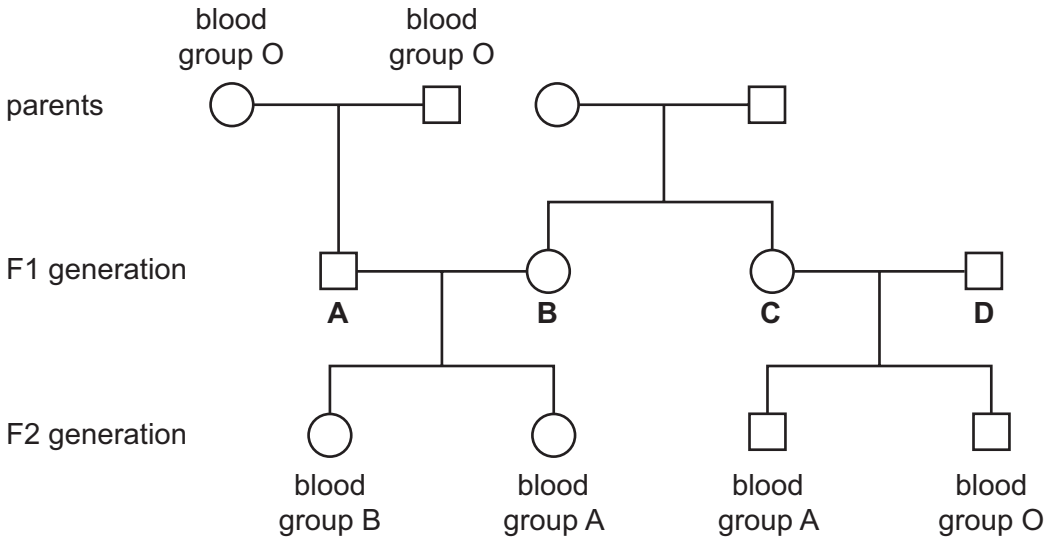
	M	N
A	EE	ee
B	Ee	Ee
C	Ee	ee
D	ee	ee

18 Which outcomes might farmers want to achieve by using artificial selection?

	increased	decreased
A	fertiliser use	pesticide use
B	growth rate	yield
C	pesticide use	growth rate
D	yield	fertiliser use

19 The diagram shows the blood group phenotypes of some members of a family.

Which member of the F1 generation must be heterozygous, with the codominant alleles?



20 Which statement about chromosomes is correct?

A Chromosomes are long DNA molecules called genes which are divided into sections.

B Chromosomes include a long molecule of DNA divided into sections called genes.

C Chromosomes include genes which are divided into sections called DNA molecules.

D Genes include long DNA molecules called chromosomes.

21 Which statement is **always** true of dominant alleles?

A They cannot undergo mutation.

B They give a greater chance of survival than recessive alleles.

C They give the same phenotype in heterozygotes and homozygotes.

D They occur more frequently in the population than recessive alleles.

22 What is the effect of environment on discontinuous variation, and what is an example of this type of variation in humans?

	environmental effect	example
A	large	ABO blood group system
B	large	height
C	small	ABO blood group system
D	small	height

23 In the inheritance of blood groups in humans, the MN system is controlled by a single gene. The gene has two alleles, M and N, that are co-dominant.

The offspring of two parents were two boys of blood group MN and M and a girl of blood group N.

What are possible genotypes of the parents?

	father's genotype	mother's genotype
A	MM	MN
B	MN	MN
C	NN	MM
D	NN	MN

24 The genotype for the height of an organism is written as Tt.

What conclusion may be drawn?

A The allele for height has at least two different genes.

B There are at least two different alleles of the gene for height.

C There are two different genes for height, each having a single allele.

D There is one allele for height with two different forms.

25 In a large family, half the children were blood group A and half were blood group B.

If the father was blood group O, what was the mother's blood group?

A A **B** B **C** AB **D** O

26 How many chromosomes are there in a zygote which develops into a baby with Down's syndrome?

A 23 **B** 24 **C** 46 **D** 47

27 Which statement describes an example of artificial selection?

A It has been found that some strains of bacteria produce antibiotics.

B It is common practice to mate bulls with cows that produce the most milk.

C It is possible to control caterpillars on food crops by releasing small wasps which lay their eggs in caterpillars and kill them.

D Mosquitoes have developed strains that are resistant to insecticides.

28 A scientist takes 4 pairs of samples from a wild cherry tree.

In which pair of samples could there be cells with different genotypes?

A two fruits

B two leaves

C two petals

D two root cuttings

29 Some genotypes that occur in blood groups are given.

Which genotype results in a phenotype that shows co-dominance?

A $I^A I^A$

B $I^A I^B$

C $I^B I^O$

D $I^O I^O$

30 A human cell contains all of the following.

Which is the smallest in size?

A gene

B nucleus

C X-chromosome

D Y-chromosome

31 The allele for white flowers is recessive to the allele for red flowers.

Which statement is **not** correct?

A An allele for red in the genotype will always be seen in the phenotype.

B Crossing two heterozygotes will produce an approximate 3 : 1 ratio.

C Red flowers are always heterozygous.

D White flowers are always homozygous.

32 What is a result of natural selection?

A dogs that are friendly to humans

B grapes that contain no seeds

C mosquitoes that are resistant to insecticides

D onion crops that have a pleasant taste

33 Two parents both have blood group A. Their first child has blood group O.

What is the probability that their second child will also have blood group O?

A 0.00 **B** 0.25 **C** 0.50 **D** 1.00

34 The table shows the genotypes and phenotypes for hair colour for the members of a family, but **one** phenotype is shown incorrectly.

	genotype		phenotype
family member	allele 1	allele 2	hair colour
mother	a	A	brown
father	A	A	brown
son 1	a	A	blonde
daughter 1	a	a	blonde
son 2	A	A	brown
daughter 2	A	a	brown

Which family member has the **incorrect** phenotype?

A daughter 1

B daughter 2

C son 1

D son 2

35 A gene is a unit of inheritance that controls the production of

A a chromosome.

B an allele.

C a protein.

D DNA.

36 A person has blood group A.

Which statement about his genotype is correct?

A At least one of his alleles is dominant.

B He must be heterozygous.

C He must be homozygous.

D His alleles are codominant.

37 In fruit flies, the allele for an ebony coloured body is recessive to the allele for a grey coloured body. In an investigation, an ebony-bodied fly was crossed with a grey-bodied fly.

What will be the body colour of the offspring if the grey-bodied fly was heterozygous?

A all ebony

B all grey

C half ebony and half grey

D three-quarters grey and one-quarter ebony

38 Which statement about dominant and recessive alleles is **not** correct?

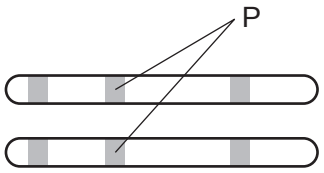
A A dominant characteristic is seen in the phenotype of a heterozygote.

B A homozygous genotype may be either dominant or recessive.

C Recessive phenotypes always have two recessive alleles.

D The phenotype of a homozygote is always dominant.

39 The diagram shows a pair of chromosomes from the same cell.



What do the lines labelled P point to?

A the site of an allele made up of two or more genes which are always the same

B the site of an allele made up of two or more genes which might be different

C the site of a gene made up of two or more alleles which are always the same

D the site of a gene made up of two or more alleles which might be different

40 The grids show the alleles and offspring of four pairs of parents.

Which grid shows codominance amongst the offspring?

A

♂ \ ♀	I^A	I^O
I^A	I^AI^A	I^AI^O
I^A	I^AI^A	I^AI^O

B

♂ \ ♀	I^A	I^O
I^A	I^AI^A	I^AI^O
I^O	I^AI^O	I^OI^O

C

♂ \ ♀	I^O	I^O
I^A	I^AI^O	I^AI^O
I^B	I^BI^O	I^BI^O

♂ \ ♀	I^A	I^B
I^A	I^AI^A	I^AI^B
I^O	I^AI^O	I^BI^O

41 What is the primary function of DNA?

A controls the absorption of nutrients

B controls the production of protein

C controls the rate of reproduction

D controls the rate of mutation

42 Two individuals are heterozygous for a particular gene.

Which statements about their offspring are correct?

1 Their offspring may show two phenotypes as a result of this gene.

2 Offspring with the recessive phenotype will be homozygous for this gene.

3 Their offspring have a 50 % chance of being heterozygous for this gene.

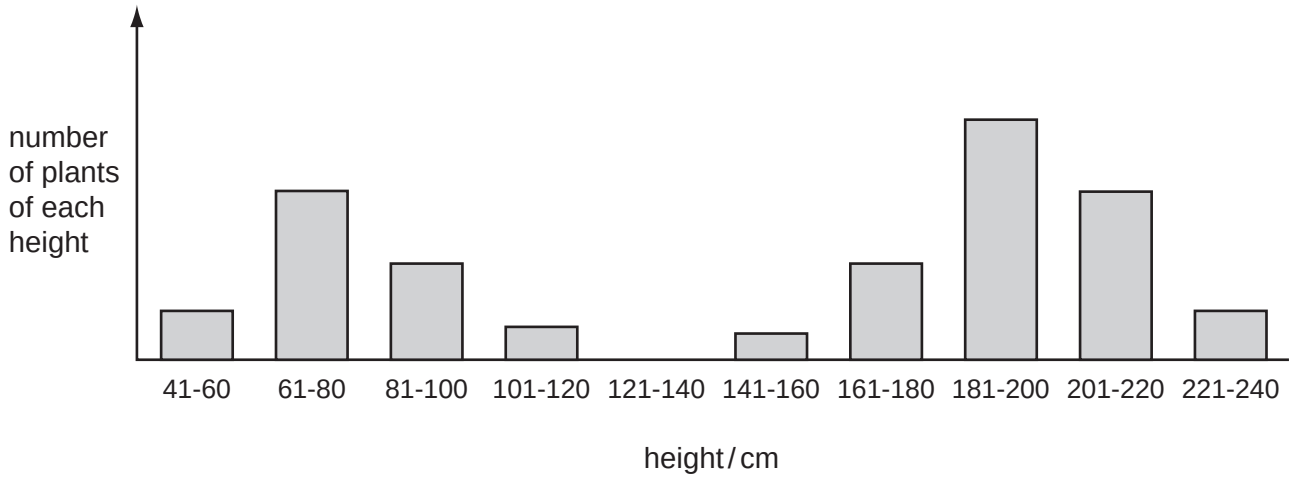
A 1, 2 and 3

B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

43 The heights of 500 pea plants of the same age were measured to the nearest 20 cm. The results are shown in the chart below.



Variation in height of these pea plants shows

A continuous variation only.

B discontinuous variation only.

C both continuous and discontinuous variation.

D neither continuous nor discontinuous variation.

44 One gene has two codominant alleles, A^E and A^F, and one recessive allele, A^G.

How many different genotypes and phenotypes are possible?

	genotypes	phenotypes
A	3	3
B	4	6
C	6	4
D	6	6

45 Some normal fruit flies are subjected to radiation in a laboratory. As a result, they produce offspring with unusual characteristics, such as white eyes.

What causes this?

A continuous variation

B discontinuous variation

C dominance

D mutation

46 What would be the genotype(s) of the offspring from a cross between two organisms with the genotype Tt?

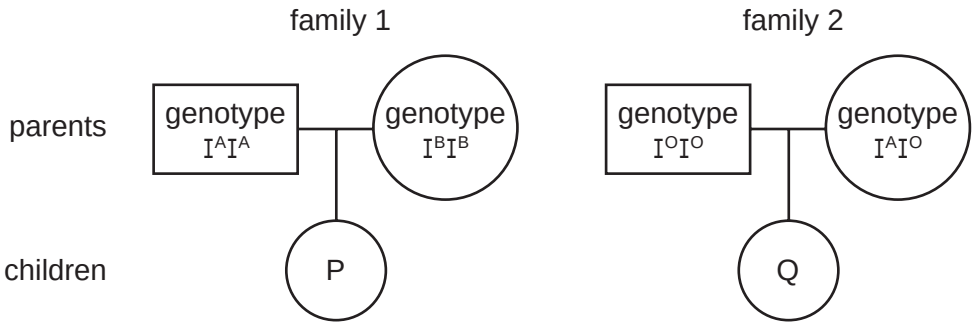
A all Tt

B half TT, half tt

C quarter TT, half Tt, quarter tt

D three quarters TT, quarter Tt

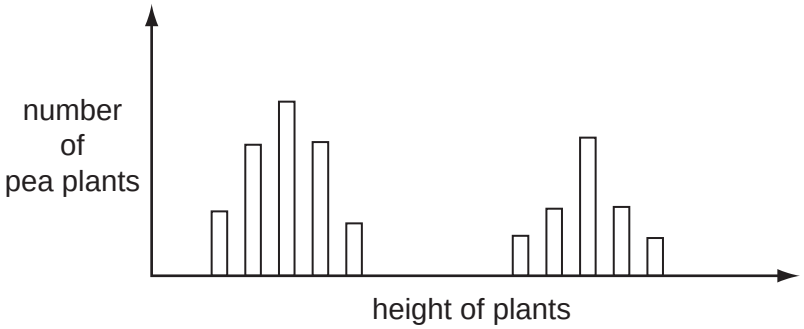
47 The diagram shows inheritance of blood groups in two different families.



For each of P and Q, what is the probability that they have a co-dominant genotype?

	P	Q
A	0.0	1.0
B	0.5	1.0
C	1.0	0.0
D	1.0	0.5

48 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

49 A man of blood group A, and his wife of blood group O, had two children, both of blood group A. The man concluded that he must be homozygous for the allele I^A, since he thought half his children would be of group O if he were heterozygous.

Why was his conclusion unsound?

A Blood group mutations are common.

B Genetic ratios are unreliable for small numbers.

C His wife might have been heterozygous.

D The expected ratio for a heterozygous father and group O mother is 3 group A: 1 group O.

50 A man is blood group A and his wife is blood group AB.

What are the possible blood groups of their children?

A A only

B AB only

C A and AB only

D A, B and AB