OCR (A) Biology A-level

6.1.2 - Patterns of inheritance

Flashcards

Define phenotype.

Define phenotype.

The expression of an organism's genetic constitution e.g. low metabolism, combined with its interaction with the environment e.g. diet.

How can meiosis bring about genetic variation?

How can meiosis bring about genetic variation?

- Random arrangement of chromosomes during lining up.
- Crossing over of chromatids before the first division.

How does random fertilisation bring about genetic variation?

How does random fertilisation bring about genetic variation?

Gametes are haploid cells, meaning they only contain half of a person's DNA. As this is determined by meiosis, every gamete contains different DNA. Therefore the same two individuals can produce genetically different offspring.

Define monogenic inheritance.

Define monogenic inheritance.

Where one phenotypic characteristic is controlled by a single gene.

Draw a genetic diagram for monogenic inheritance.

Draw a genetic diagram for monogenic inheritance.

Parental phenotypes	Brown eyes	Blue eyes
Parental genotypes	Bb	bb
Gametes	B b	b b
Offspring genotypes (draw a punnet square)	Bb, Bb, bb, bb	
Offspring phenotypes	2:2 brown eyes:blue eyes	

Define dihybrid inheritance.

Define dihybrid inheritance.

Where two phenotypic characteristics are determined by two different genes present on two different chromosomes at the same time.

Draw a genetic diagram for dihybrid inheritance.

Draw a genetic diagram for dihybrid inheritance.

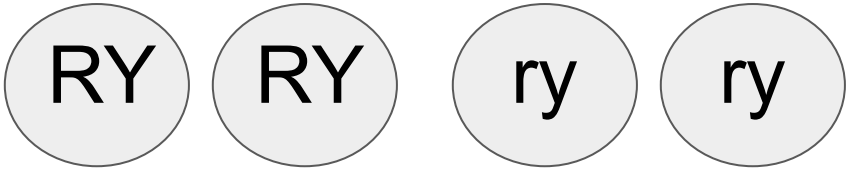
Parental phenotypes

Round yellow seeds | Wrinkled green seeds

Parental genotypes

RRYY | rryy

Gametes



Offspring genotypes (draw a punnet square)

RrYy

Offspring phenotypes

Round yellow seeds

What is meant by sex-linkage?

What is meant by sex-linkage?

Where an allele is located on one of the sex chromosomes, meaning its expression depends on the sex of the individual.

Draw a genetic diagram for sex-linked inheritance.

Draw a genetic diagram for sex-linked inheritance.

Parental phenotypes	Carrier female	Normal male
Parental genotypes	X^AX^a	X^AY
Gametes	X^A X^a	X^A Y
Offspring genotypes (draw a punnet square)	X^AX^A, X^AX^a, X^AY, X^aY	
Offspring phenotypes	Normal female, carrier female, normal male, colour-blind male	

What is meant by multiple alleles?

What is meant by multiple alleles?

A gene with more than two alleles.

Draw a genetic diagram for multiple allelic inheritance.

Draw a genetic diagram for multiple allelic inheritance.

Parental phenotypes	Blood group A Group B
Parental genotypes	I^AI^O I^BI^O
Gametes	
Offspring genotypes (draw a punnet square)	I^AI^B, I^AI^O, I^BI^O, I^OI^O
Offspring phenotypes	Group AB, group A, group B, group O

What is meant by codominant alleles?

What is meant by codominant alleles?

Two dominant alleles that both contribute to the phenotype, either by showing a blend of both characteristics, or the characteristics appearing together.

Draw a genetic diagram for codominant inheritance.

Draw a genetic diagram for codominant inheritance.

Parental phenotypes — Red flower — White flower

Parental genotypes — C^RC^R — C^WC^W

Gametes — C^R C^R — C^W C^W

Offspring genotypes (draw a punnet square) — C^RC^W

Offspring phenotypes — Pink flower

What is meant by autosomal linkage?

What is meant by autosomal linkage?

Where two or more genes are located on the same (non-sex) chromosome. In this case, only one homologous pair is needed for all four alleles to be present. For genes that aren't linked, two homologous pairs are needed.

What is meant by epistasis?

What is meant by epistasis?

Where two non-linked genes interact, with one gene either masking or suppressing the other gene.

What is the chi-squared test?

What is the chi-squared test?

A statistical test to find out whether the difference between observed and expected data is due to chance or a real effect. Can be used to compare expected phenotypic ratios with observed ratios.

How is a chi-squared test performed?

How is a chi-squared test performed?

The formula results in a number, which is then compared to a critical value (for the corresponding degrees of freedom). If the number is greater than or equal to the critical value, we conclude there is no significant difference and the results occured due to chance.

How can the number of genes coding for a characteristic influence variation?

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- Discontinuous variation= characteristic determined by one gene (monogenic inheritance)
- Continuous variation= characteristic determined by more than one gene (polygenic inheritance)

What is stabilising selection?

What is stabilising selection?

Occurs when environmental conditions stay the same. Individuals closest to the mean are favoured, and any new characteristics are selected against. Results in low diversity.

What is directional selection?

What is directional selection?

Occurs when environmental conditions change. Individuals with phenotypes suited to the new conditions will survive and pass on their genes. Over time the mean of the population will move towards these characteristics.

What is genetic drift?

What is genetic drift?

A change in a population's allele frequencies that occurs due to chance rather than selective pressures. In other words, it is caused by 'sampling error' during reproduction.

What is meant by a genetic bottleneck?

What is meant by a genetic bottleneck?

Where a catastrophic event dramatically reduces the size of a population, thereby decreasing the variety of alleles in the gene pool and causing large changes in allele frequencies.

What is meant by the founder effect?

What is meant by the founder effect?

When a small number of individuals become isolated, forming a new population with a limited gene pool, with allele frequencies not reflective of the original population.

What is the Hardy-Weinberg principle?

What is the Hardy-Weinberg principle?

Allows us to estimate the frequency of alleles in a population, as well as if allele frequency is changing over time.

Explain the Hardy-Weinberg equation for calculating allele frequency.

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The frequencies of each allele for a characteristic must add up to 1.0. The equation is therefore; **p + q = 1**

Where p= frequency of the dominant allele, and q= frequency of the recessive allele.

Explain the Hardy-Weinberg equation for calculating genotype frequency.

Explain the Hardy-Weinberg equation for calculating genotype frequency.

The frequencies of each genotype for a characteristics must add up to 1.0. The equation is therefore; $\mathbf{p^2 + 2pq + q^2 = 1}$

Where p^2= frequency of homozygous dominant, 2pq= frequency of heterozygous, and q^2= frequency of homozygous recessive.

Define speciation.

Define speciation.

Where a population is split and isolated, there are different selective pressures on the two groups. If the genetic makeup changes to the extent the two groups can not longer interbreed, they have become separate species.

What is meant by allopatric speciation?

What is meant by allopatric speciation?

Speciation resulting from a physical barrier e.g. river, mountain range. The environments occupied by the two groups are different, and therefore different alleles are favoured.

What is meant by sympatric speciation?

What is meant by sympatric speciation?

Speciation resulting from a non-physical barrier e.g. a mutation that no longer allows two organisms to produce fertile offspring. Any changes in anatomy or behaviour may also prevent breeding.

What is artificial selection?

What is artificial selection?

Humans choose particular organisms to breed together in order to produce a desired characteristic in the offspring.

Give examples of artificial selection in plants and animals.

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- Plants= seeds used from plants that produce larger fruit and vegetables.
- Animals= cows with higher milk yield are chosen and selectively bred.

Why is it important to keep a resource of genetic material when selective breeding?

Why is it important to keep a resource of genetic material when selective breeding?

Allows any traits that were accidentally bred out to be reintroduced, or to revert back to a point before any negative traits were introduced.

Give some ethical issues around the use of artificial selection.

Give some ethical issues around the use of artificial selection.

- Anatomical changes in animals e.g. respiratory issues in pugs.
- Higher susceptibility to disease in both plants and animals.