AQA Biology A-level

7.1 - Inheritance

Flashcards

Define genotype.

Define genotype.

The genetic constitution of an organism.

Define phenotype.

Define phenotype.

The expression of an organism's genetic constitution, combined with its interaction with the environment.

What is an allele?

What is an allele?

Different forms of a particular gene, found at the same locus (position) on a chromosome. A single gene could have many alleles.

How many alleles per gene do diploid organisms carry?

How many alleles per gene do diploid organisms carry?

Two.

What is meant by a dominant allele?

What is meant by a dominant allele?

An allele whose characteristic will always appear in the phenotype, whether one or two are present.

What is meant by a recessive allele?

What is meant by a recessive allele?

An allele whose characteristic only appears in the phenotype if no dominant allele is present, meaning two must be present.

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.

What is meant by homozygous and heterozygous?

What is meant by homozygous and heterozygous?

Homozygous= both alleles are dominant, or both alleles are recessive.

Heterozygous= one allele is dominant, the other is recessive.

Define monohybrid inheritance.

Define monohybrid inheritance.

Where one phenotypic characteristic is controlled by a single gene.

Draw a Punnett square to show a monohybrid cross with parental genotypes of GG and gg.

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	G	G
g	Gg	Gg
g	Gg	Gg

What % of these offspring will express the characteristic determined by allele G?

What % of these offspring will express the characteristic determined by allele G?

100%; all potential offspring genotypes are Gg meaning none of them will express the recessive allele.

Draw a Punnett square to show a monohybrid cross with parental genotypes of Gg and Gg.

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	G	g
G	GG	Gg
g	Gg	gg

What % of these offspring should express the characteristic determined by allele G?

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75%; only one of the combinations results in expression of the recessive allele.

Draw an example of a genetic diagram.

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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 Punnett square to show a dihybrid cross with parental genotypes of RrGg and RrGg.

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	RG	Rg	rG	rg
RG	RRGG	RRGg	RrGG	RrGg
Rg	RRGg	RRgg	RrGg	Rrgg
rG	RrGG	RrGg	rrGG	rrGg
rg	RrGg	Rrgg	rrGg	rrgg

How many of these offspring should have the same phenotype as their parents?

How many of these offspring should have the same phenotype as their parents?

9 (out of 16)

6 will match their parents on one characteristic, but differ on the other.

1 will differ on both characteristics.

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.

Why are males more likely to express a recessive sex-linked allele?

Why are males more likely to express a recessive sex-linked allele?

Most sex-linked alleles are located on the X chromosome. Therefore males only get one copy of the allele, so will express this characteristic even if it's recessive. Since females get two alleles, this is less likely.

Which parent do males inherit sex-linked characteristics from?

Which parent do males inherit sex-linked characteristics from?

Their mother, since the Y chromosome can only come from their father. Therefore if the mother is heterozygous for sex-linked alleles, she is a carrier and may pass on the trait on.

Draw a Punnett square to show a sex-linked cross with parental genotypes of X^HX^h and X^HY.

Draw a Punnett square to show a sex-linked cross with parental genotypes of X^HX^h and X^HY.

	X^H	X^h
X^H	X^HX^H	X^HX^h
Y	X^HY	X^hY

Describe the four possible phenotypes of these offspring.

Describe the four possible phenotypes of these offspring.

Normal female, carrier female, normal male, affected male.

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.

Draw a Punnett square to show a multiple alleles cross with parental genotypes of I^AI^O and I^BI^O.

Draw a Punnett square to show a multiple alleles cross with parental genotypes of I^AI^O and I^BI^O.

	I^A	I^O
I^B	I^AI^B	I^BI^O
I^O	I^AI^O	I^OI^O

If I^A and I^B are codominant and I^O is recessive, which alleles could the offspring express?

If I^A and I^B are codominant and I^O is recessive, which alleles could the offspring express?

AB, A, B, O

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.

Define the two types of epistasis.

Define the two types of epistasis.

Recessive epistasis= where two homozygous recessive alleles mask expression of another allele.

Dominant epistasis= where one dominant allele masks expression of multiple other alleles.

Draw a Punnett square to show an epistasis cross with parental genotypes of AABB and aabb.

Draw a Punnett square to show an epistasis cross with parental genotypes of AABB and aabb.

	AB	Ab	aB	ab
AB	AABB	AABb	AaBB	AaBb
Ab	AABb	AAbb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	aaBb
ab	AaBb	Aabb	aaBb	aabb

Genotypes BB or Bb allow expression of gene A, while genotype bb masks gene A. With this in mind, what % of the offspring will have gene A masked?

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25%

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.

What are the criteria for the chi-squared test?

What are the criteria for the chi-squared test?

- Data placed in discrete categories
- Large sample size
- Only raw count data allowed i.e. not percentages
- No data values equal zero

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 a significant difference between the observed and expected data and that the results did not occur due to chance.

How can we use a chi-squared test in relation to the content of this topic?

How can we use a chi-squared test in relation to the content of this topic?

We can compare expected phenotypic ratios with observed ratios to test our understanding of how different genes and alleles are inherited.