

# Edexcel Biology GCSE

Topics 3.12 to 3.19 - Inheritance

Flashcards



# What is a chromosome?



# What is a chromosome?

A long, coiled molecule of DNA that carries genetic information in the form of genes



# Define gene



## Define gene

A section of DNA that codes for a specific sequence of amino acids which undergo polymerisation to form a protein



# What are alleles?



# What are alleles?

## Different versions of the same gene



# Define genotype





## Define genotype

An organism's genetic composition,  
describes all alleles



# Define phenotype



## Define phenotype

An organism's observable characteristics due to interactions of the genotype and environment (which can modify the phenotype)



# Define homozygous



Define homozygous

Having two identical alleles of a gene

e.g. FF or ff



# Define heterozygous



Define heterozygous

Having two different alleles of a gene

e.g. Ff



# What is a dominant allele?





# What is a dominant allele?

Describes an allele that is always expressed

Represented with a capital letter e.g. F



# What is a recessive allele?



# What is a recessive allele?

An allele that is only expressed in the absence of a dominant allele

Represented with a small letter e.g. f



# What is monohybrid inheritance?



# What is monohybrid inheritance?

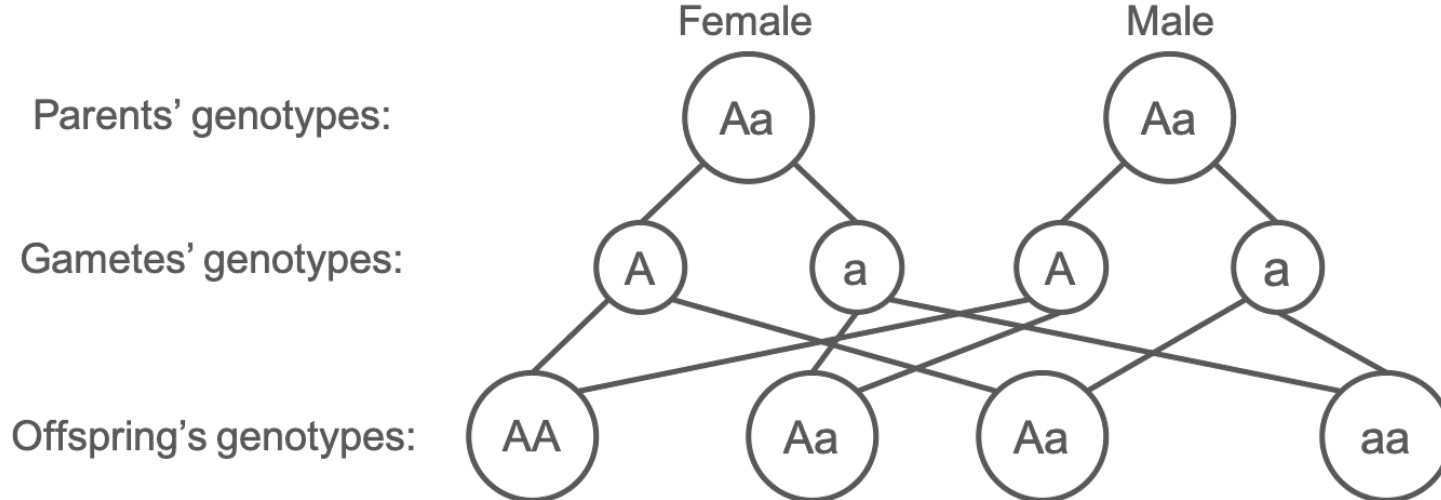
## The inheritance of a single gene



Imagine if ... parents who are both heterozygous for sickle cell anaemia (Aa) have a child. Draw a genetic diagram to illustrate this single gene inheritance.



Imagine if ... parents who are both heterozygous for sickle cell anaemia ( $Aa$ ) have a child. Draw a genetic diagram to illustrate this single gene inheritance.



A female who is homozygous recessive for cystic fibrosis (ff) has a child with a heterozygous male (Ff). Draw a punnett square to illustrate this single gene inheritance.





A female who is homozygous recessive for cystic fibrosis (ff) has a child with a heterozygous male (Ff). Draw a punnett square to illustrate this single gene inheritance.

		Female genotype	
		f	f
Male genotype	F	Ff	Ff
	f	ff	ff



PKU is a recessive condition. Two heterozygous parents ( $Pp$ ) have offspring. Predict the proportion of offspring that will have PKU.



PKU is a recessive condition. Two heterozygous parents ( $Pp$ ) have offspring. Using a punnett square, predict the proportion of offspring that will have PKU.

75% chance of normal phenotype

25% chance of PKU phenotype

		Female genotype	
		P	p
Male genotype	P	PP	Pp
	p	Pp	pp



What is the problem with single gene crosses?



What is the problem with single gene crosses?

Most characteristics are controlled by multiple alleles rather than just one



# What are sex chromosomes?



# What are sex chromosomes?

A pair of chromosomes that determine sex:

- Males have an X and a Y chromosome
- Females have two X chromosomes



Why does the inheritance of a Y chromosome mean that an embryo develops into a male?





Why does the inheritance of a Y chromosome mean that an embryo develops into a male?

Testes development in an embryo is stimulated by a gene present on the Y chromosome



A couple have a child. Using a punnett square, determine the probability of having offspring that is female.



A couple have a child. Using a punnett square, determine the probability of having offspring that is female.

50% chance of female (XX)

		Female genotype	
		X	X
Male genotype	X	XX	XX
	Y	XY	XY



Other than using a punnett square, how else can monohybrid inheritance be represented?



Other than using a punnett square, how else can monohybrid inheritance be represented?

Using a family pedigree



What is a sex-linked characteristic?  
(biology only/higher)



What is a sex-linked characteristic?  
(biology only/higher)

A characteristic that is coded for by an allele found on a sex chromosome.



Why are the majority of genes found on the X chromosome rather than the Y chromosome? (biology only/higher)





Why are the majority of genes found on the X chromosome rather than the Y chromosome?  
(biology only/higher)

The X chromosome is bigger than the Y chromosome so more genes are carried on it.



Why are men more likely to show the phenotype for a recessive sex-linked trait than women? (biology only/higher)



# Why are men more likely to show the phenotype for a recessive sex-linked trait than women?

(biology only/higher)

- Many genes are found on the X chromosome that have no counterpart on the Y chromosome
- Women (XX) have two alleles for each sex-linked gene whereas men (XY) often only have one allele  $\therefore$  only one recessive allele is required to produce the recessive phenotype in males

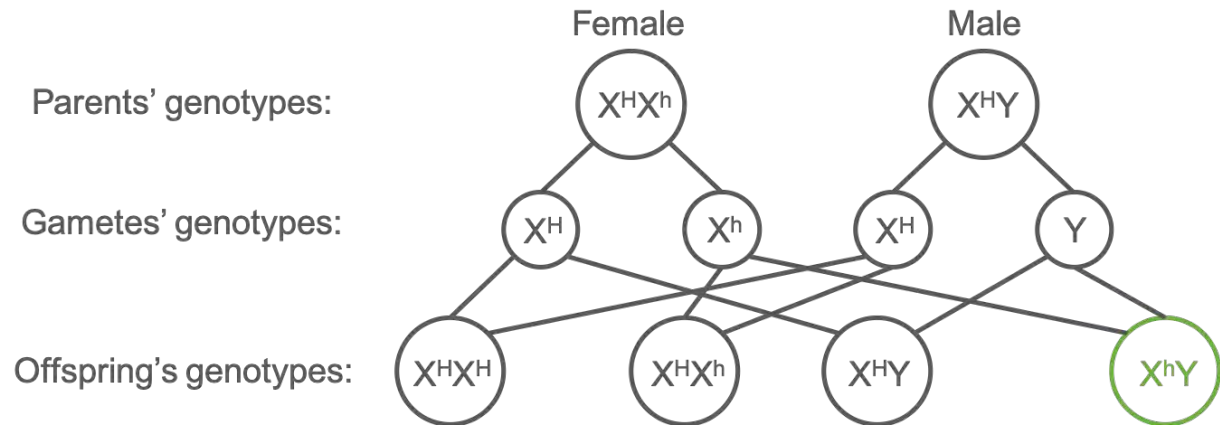


Haemophilia is a recessive X-linked condition. A carrier female and a normal male have a **son**. What is the probability of the child having haemophilia?  
(biology only/higher)



Haemophilia is a recessive X-linked condition. A carrier female and a normal male have a **son**. What is the probability of the child having haemophilia? (biology only/higher)

50% chance of haemophilia ( $X^hY$ )



Give an example of a characteristic that  
is determined by more than one allele  
(biology only)



Give an example of a characteristic that is determined by more than one allele (biology only)

Blood group is determined by three alleles:  $I^A$ ,  $I^B$ ,  $I^O$



Name the four different blood groups  
(biology only)





Name the four different blood groups (biology only)

A, B, AB, O



# What are codominant alleles? (biology only)



What are codominant alleles? (biology only)

Alleles that equally contribute to an organism's phenotype. They are expressed to an equal extent.



# Describe codominance in blood groups (biology only)



Describe codominance in blood groups (biology only)

- $I^A$  and  $I^B$  are codominant
- $I^A I^B$  gives the blood group AB



Why does  $I^A I^O$  give blood group A?  
(biology only)



Why does  $I^A I^O$  give blood group A? (biology only)

- $I^O$  is recessive to  $I^A$
- $I^A$  is dominant and is expressed giving blood group A



What are the possible genotypes for  
blood group B? (biology only)





What are the possible genotypes for blood group B?  
(biology only)

|<sup>B</sup> |<sup>O</sup>

|<sup>B</sup> |<sup>B</sup>



What is the genotype for blood group O?  
(biology only)



What is the genotype for blood group O?  
(biology only)

$ii$



A female with genotype  $I^B I^O$  and a male with genotype  $I^A I^O$  have a child. Use a punnett square to predict the potential phenotypes of the offspring  
(biology only)



A female with genotype  $I^B I^O$  and a male with genotype  $I^A I^O$  have a child. Use a punnett square to predict the potential phenotypes of the offspring  
**(biology only)**

		Female genotype	
		$I^B$	$I^O$
Male genotype	$I^A$	$I^A I^B$	$I^A I^O$
	$I^O$	$I^B I^O$	$I^O I^O$

25% AB ( $I^A I^B$ )

25% A ( $I^A I^O$ )

25% B ( $I^B I^O$ )

25% O ( $I^O I^O$ )

