AQA Biology GCSE

6.1 - Reproduction

Flashcards

What is sexual reproduction?

What is sexual reproduction?

- Type of reproduction.
- Involves the production of gametes by meiosis.
- A gamete from each parent fuses to form a zygote.
- Genetic information from each gamete is mixed so the resulting zygote is unique.

What are gametes?

What are gametes?

- Sex cells (sperm cells and egg cells in animals, pollen and egg cells in flowering plants).
- Haploid (half the number of chromosomes).

What is meiosis?

What is meiosis?

- Form of cell division involved in the formation of gametes (non-identical haploid cells) in reproductive organs.
- Chromosome number is halved.
- Involves two divisions.

What must occur prior to meiosis?

What must occur prior to meiosis?

Interphase - copies of genetic information are made during this process.

What happens during the first stage of meiosis?

What happens during the first stage of meiosis?

- Chromosome pairs line up along the cell equator.
- The pair of chromosomes are separated and move to opposite poles of the cell (the side to which each chromosome is pulled is random, creating variation).
- Chromosome number is halved.

What happens during the second stage of meiosis?

What happens during the second stage of meiosis?

- Chromosomes line up along the cell equator.
- The chromatids are separated and move to opposite poles of the cell.
- Four unique haploid gametes are produced.

Why is meiosis important for sexual reproduction? (2)

Why is meiosis important for sexual reproduction? (2)

- It increases genetic variation.
- It ensures that the zygote formed at fertilisation is diploid.

Describe fertilisation and its resulting outcome

Describe fertilisation and its resulting outcome

Gametes join together to restore the normal number of chromosomes and the new cell then divides by mitosis (which increases the number of cells).

As the embryo develops, cells differentiate.

What is the advantage of sexual reproduction?

(biology only)

What is the advantage of sexual reproduction? (biology only)

It creates genetic variation in offspring, increasing the probability of a species adapting to and surviving environmental changes.

Natural selection can be speeded up by humans in selective breeding to increase food production.

Describe the disadvantages of sexual reproduction (2)

(biology only)

Describe the disadvantages of sexual reproduction (2) (biology only)

- Two parents are required. This makes reproduction difficult in endangered populations or in species which exhibit solitary lifestyles.
- More time and energy is required so fewer offspring are produced.

What is asexual reproduction?
(biology only)

What is asexual reproduction? (biology only)

- Type of reproduction.
- Involves mitosis only.
- Produces genetically identical offspring known as daughter cells.

Describe the advantages of asexual reproduction (3)

(biology only)

Describe the advantages of asexual reproduction (3) (biology only)

- Only one parent is required.
- Lots of offspring can be produced in a short period of time, enabling the rapid colonisation of an area and reducing competition from other species.
- Requires less energy and time as do not need a mate.

What is the disadvantage of asexual reproduction?

(biology only)

What is the disadvantage of asexual reproduction? (biology only)

No genetic variation (except from spontaneous mutations) reducing the probability of a species being able to adapt to environmental change.

Describe the circumstances in which Malarial parasites reproduce sexually and asexually

Describe the circumstances in which malarial parasites reproduce sexually and asexually

Sexual reproduction in the mosquito.

Asexual reproduction in the human host.

Describe the circumstances in which fungi reproduce sexually and asexually

Describe the circumstances in which fungi reproduce sexually and asexually

Asexual reproduction by spores.

Sexual reproduction to give variation.

Describe the circumstances in which plants reproduce sexually and asexually

Describe the circumstances in which plants reproduce sexually and asexually

Sexual reproduction to produce seeds.

Asexual reproduction by runners (e.g. strawberry plants) or bulb division (e.g. daffodils).

What is DNA?

What is DNA?

A double-stranded polymer of nucleotides, wound to form a double helix.

The genetic material of the cell found in its nucleus.

Define genome

Define genome

The entire genetic material of an organism.

Why is understanding the human genome important?

Why is understanding the human genome important?

The whole human genome has been studied and is important for the development of medicine in the future.

- Searching for genes linked to different types of disease.
- Understanding and treating inherited disorders.
- Tracing human migration patterns from the past.

What is a chromosome?

What is a chromosome?

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

How many chromosomes do human body cells have?

How many chromosomes do human body cells have?

46 chromosomes (23 pairs)

How many chromosomes do human gametes have?

How many chromosomes do human gametes have?

23 chromosomes

Define gene

Define gene

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

What are the monomers of DNA?
(biology only)

What are the monomers of DNA? (biology only)

Nucleotides

What are DNA nucleotides made up of?

(biology only)

What are DNA nucleotides made up of? (biology only)

- Common sugar
- Phosphate group
- One of four bases: A, T, C or G

State the full names of the four bases found in nucleotides

(biology only)

State the full names of the four bases found in nucleotides (biology only)

- **A**denine
- **T**hymine
- **C**ytosine
- **G**uanine

Describe how nucleotides interact to form a molecule of DNA (biology only) (higher only)

Describe how nucleotides interact to form a molecule of DNA (biology only)

- Sugar and phosphate molecules join to form a sugar-phosphate backbone in each DNA strand.
- Base connected to each sugar.
- Complementary base pairs (A pairs with T, C pairs with G) joined by weak hydrogen bonds.

Explain how a gene codes for a protein (biology only)

Explain how a gene codes for a protein (biology only)

- A sequence of three bases in a gene forms a triplet.
- Each triplet codes for an amino acid.
- The order of amino acids determines the structure (i.e. how it will fold) and function of protein formed.

Why is the ‘folding’ of amino acids important in proteins such as enzymes? (biology only) (higher only)

Why is the ‘folding’ of amino acids important in proteins such as enzymes?
(biology only) (higher only)

The folding of amino acids determines the shape of the active site which must be highly specific to the shape of its substrate.

What is protein synthesis?
(biology only) (higher only)

What is protein synthesis?

(biology only) (higher only)

The formation of a protein from a gene.

What are the two stages of protein synthesis?

(biology only) (higher only)

What are the two stages of protein synthesis? (biology only) (higher only)

1. Transcription
2. Translation

What does transcription involve?

(biology only) (higher only)

What does transcription involve?

(biology only) (higher only)

The formation of mRNA from a DNA template.

Outline transcription

(biology only) (higher only)

Outline transcription (biology only) (higher only)

1. DNA double helix unwinds.
2. RNA polymerase binds to a specific base sequence of non-coding DNA in front of a gene and moves along the DNA strand.
3. RNA polymerase joins free RNA nucleotides to complementary bases on the coding DNA strand.
4. mRNA formation complete. mRNA detaches and leaves the nucleus.

What does translation involve?

(biology only) (higher only)

What does translation involve?

(biology only) (higher only)

A ribosome joins amino acids in a specific order dictated by mRNA to form a protein.

Outline translation
(biology only) (higher only)

Outline translation (biology only) (higher only)

1. mRNA attaches to a ribosome.
2. Ribosome reads the mRNA bases in triplets. Each triplet codes for one amino acid which is brought to the ribosome by a tRNA molecule (carrier molecule).
3. A polypeptide chain is formed from the sequence of amino acids which join together.

What is a mutation?

(biology only) (higher only)

What is a mutation? (biology only) (higher only)

A random change in the base sequence of DNA which results mostly in no change to the protein coded for, or genetic variants of the protein (slight alteration but appearance and function remain).

Mutations occur continuously.

Describe the effect of a gene mutation in coding DNA

(biology only) (higher only)

Describe the effect of a gene mutation in coding DNA (biology only) (higher only)

- If a mutation changes the amino acid sequence, protein structure and function may change (an enzyme may no longer fit its substrate binding site or a structural protein may lose its strength).

- If a mutation does not change amino acid sequence, there is no effect on protein structure or function.

What is non-coding DNA?

(biology only) (higher only)

What is non-coding DNA?

(biology only) (higher only)

DNA which does not code for a protein but instead controls gene expression.

Describe the effect of a gene mutation in non-coding DNA (biology only) (higher only)

Describe the effect of a gene mutation in non-coding DNA (biology only) (higher only)

Gene expression may be altered, affecting protein production and the resulting phenotype.

What are alleles?

What are alleles?

Different versions of the same gene.

What is a dominant allele?

What is a dominant allele?

A version of a gene where only one copy is needed for it to be expressed.

What is a recessive allele?

What is a recessive allele?

A version of a gene where two copies are needed for it to be expressed.

What is meant when an organism is homozygous?

What is meant when an organism is homozygous?

When an organism has two copies of the same allele (two recessive or two dominant).

What is meant when an organism is heterozygous?

What is meant when an organism is heterozygous?

When an organism has two different versions of the same gene (one dominant and one recessive).

What is the genotype?

What is the genotype?

The genes present for a trait

What is the phenotype?

What is the phenotype?

The visible characteristic.

How are dominant alleles represented in a punnett square?

How are dominant alleles represented in a punnett square?

They are represented using uppercase letters.

How are recessive alleles represented in a punnett square?

How are recessive alleles represented in a punnett square?

They use the lowercase version of the same letter as the dominant allele.

Draw a Punnett square for a cross between a homozygous recessive blue eyed female (bb) with a heterozygous brown eyed male (Bb)

Draw a Punnett square for a cross between a homozygous recessive blue eyed female (bb) with a heterozygous brown eyed male (Bb)

	B	b
b	Bb	bb
b	Bb	bb

50% brown eyes	Bb
50% blue eyes	bb

Draw a Punnett square for a cross between a homozygous dominant red flower (RR) with a homozygous recessive white flower (rr)

Draw a Punnett square for a cross between a homozygous dominant red flower (RR) with a homozygous recessive white flower (rr)

	R	R
r	Rr	Rr
r	Rr	Rr

100% Red flowers	Rr

Draw a Punnett square for a cross between two heterozygous cystic fibrosis carriers (Ff)

Draw a Punnett square for a cross between two heterozygous cystic fibrosis carriers (Ff)

	F	f
F	FF	Ff
f	Ff	ff

25% healthy	FF
50% carriers	Ff
25% have CF	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 is an inherited disorder?

What is an inherited disorder?

A disorder caused by the inheritance of certain alleles.

Give 2 examples of inherited disorders

Give 2 examples of inherited disorders

- Polydactyly (having extra fingers or toes) - caused by a dominant allele.
- Cystic fibrosis (a disorder of cell membranes) - caused by a recessive allele.

How are embryos screened for inherited disorders?

How are embryos screened for inherited disorders?

During IVF, one cell is removed (from an 8 cell embryo) and tested for disorder-causing alleles. If the cell doesn't have any indicator alleles, then the originating embryo is implanted into the uterus.

What are the ethical issues concerning embryo screening?

What are the ethical issues concerning embryo screening?

- It could lead to beliefs in society that being disabled or having a disorder is less human or associated with inferiority.
- The destruction of embryos with inherited disorders is seen by some as murder as these would go on to become human beings.
- It could be viewed as part of the concept of designer babies as it may be for the parents convenience or wishes rather than the child's wellbeing.

What are the economic issues concerning embryo screening?

What are the economic issues concerning embryo screening?

- Costs of hospital treatment and medication will need to be considered if it is known that a child will have an inherited disorder and financial support explored if necessary.

What are the social issues concerning embryo screening?

What are the social issues concerning embryo screening?

- Social care for children with inherited disorders may need to be considered if parents are unable to provide care.
- If an embryo is found to have an inherited disorder and is terminated, this can prevent a child and its parents from potential suffering in the future due to the disorder.

What is gene therapy?

What is gene therapy?

The insertion of a normal allele into the cells of a person with an inherited disorder to functionally replace the faulty allele.

What are the ethical concerning gene therapy?

What are the ethical issues concerning gene therapy?

- Some people believe that it is going against and ‘playing God’.
- The introduced genes could enter sex cells and so be passed to future generations.

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

What is a sex-linked characteristic?

What is a sex-linked characteristic?

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?

Why are the majority of genes found on the X chromosome rather than the Y chromosome?

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?

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

- 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 ∴ 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?

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?

50% chance of haemophilia (X^hY)