

Sexual and Asexual Reproduction and Genetic Inheritance

GCSE Biology

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Sexual and Asexual Reproduction

Sexual Reproduction:

- ▶ Involves fusion of male and female gametes (sperm and egg in animals, pollen and egg in plants).
- ▶ Leads to genetic variation in offspring.
- ▶ Gametes are formed by meiosis.

Asexual Reproduction:

- ▶ Involves only one parent, no fusion of gametes.
- ▶ Offspring are genetically identical clones.
- ▶ Only mitosis is involved.

Meiosis

Process:

- ▶ Occurs in reproductive organs to form gametes.
- ▶ Genetic information is copied, and the cell divides twice to form four gametes.
- ▶ Each gamete has a single set of chromosomes (haploid, 23 in humans).
- ▶ Gametes are genetically different.

Fertilisation:

- ▶ Restores normal chromosome number (diploid, 46 in humans).
- ▶ Zygote divides by mitosis, leading to cell differentiation in the embryo.

Advantages and Disadvantages of Sexual and Asexual Reproduction

Sexual Reproduction:

- ▶ Produces variation in offspring.
- ▶ Variation gives survival advantages in changing environments.
- ▶ Can be used in selective breeding to improve species.

Asexual Reproduction:

- ▶ Requires only one parent, more efficient.
- ▶ Faster than sexual reproduction.
- ▶ Many offspring can be produced when conditions are favorable.

DNA and the Genome

Key Points:

- ▶ DNA is a polymer forming a double helix.
- ▶ Chromosomes contain genetic material.
- ▶ A gene is a section of DNA coding for a protein.
- ▶ The genome is the entire DNA of an organism.

Human Genome Project:

- ▶ Helps identify genes linked to diseases.
- ▶ Aids understanding of inherited disorders.
- ▶ Used in tracing human migration history.

DNA Structure

Composition:

- ▶ Made up of four nucleotides (A, T, C, G).
- ▶ Three bases code for an amino acid.
- ▶ DNA polymer consists of repeating nucleotide units.

Mutations:

- ▶ Changes in DNA sequence can alter proteins.
- ▶ Some mutations have no effect, others change protein function.

Genetic Inheritance

Key Terms:

- ▶ **Allele:** Different versions of the same gene.
- ▶ **Genotype:** Combination of alleles an individual has.
- ▶ **Phenotype:** The expressed characteristics.

Dominant and Recessive Alleles:

- ▶ Dominant alleles are expressed if at least one copy is present.
- ▶ Recessive alleles are only expressed if two copies are present.

Homozygous and Heterozygous:

- ▶ Homozygous: Two identical alleles.
- ▶ Heterozygous: Two different alleles.

Inherited Disorders

Examples:

- ▶ **Polydactyly:** Extra fingers or toes, caused by a dominant allele.
- ▶ **Cystic Fibrosis:** A disorder of cell membranes, caused by a recessive allele.

Sex Determination

Key Information:

- ▶ Human cells have 23 pairs of chromosomes.
- ▶ 22 pairs determine body characteristics.
- ▶ One pair determines sex (XX for females, XY for males).