

### 1. Reproduction

**Asexual reproduction** – Involves only one parent and no fusion of gametes. Offspring are genetically identical.

**Clone** - An organism produced asexually from another organism to which they are genetically identical.

**Sexual reproduction** – The fusion of male and female gametes to produce genetically different offspring.

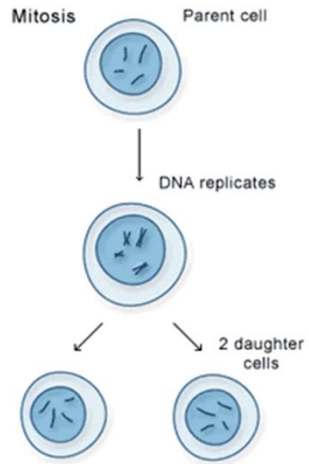
### 2. Meiosis

**Sperm** – Male gamete

**Egg** – Female gamete

**Gamete** – Sex cell

**Meiosis** – How cells divide in reproductive organs to form gametes.



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1. Copies of the genetic information are made
2. The cell divides twice to form four gametes, each with a single set of chromosomes
3. All gametes are genetically different from each other

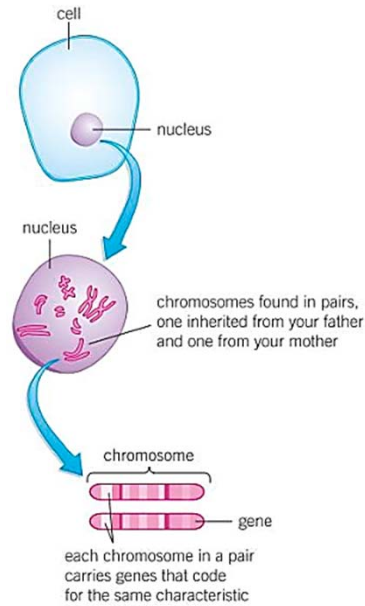
### 3. DNA

**Chromosome** – Tightly coiled structure made of DNA

**DNA** – Chemical that carries genetic information

**Gene** – Small section of DNA that codes for a particular sequence of amino acids to make a specific protein.

**Genome** – All the genetic material of an organism



### 5. Inherited disorders

Some disorders are inherited.

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

### 4. Genetic inheritance

**Genotype** – The genes that are present in an organism

**Phenotype** – the physical characteristics of an organism

**Allele** – Different version of a gene

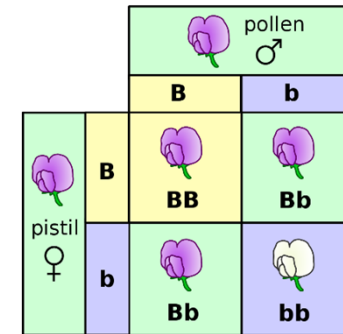
**Recessive** – An allele that only shows the characteristics when there are two copies – (b)

**Dominant** – An allele that always shows the characteristics (B)

**Heterozygous** – Having two different alleles (Bb)

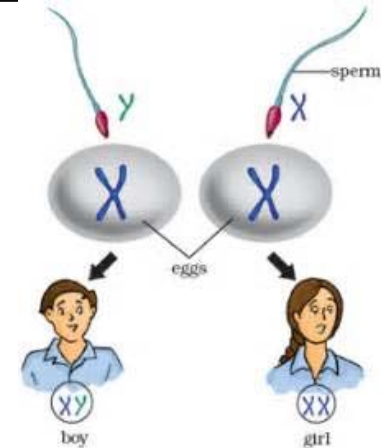
**Homozygous** – Having two of the same alleles (BB or bb)

B – dominant purple  
b- recessive white



### 6. Sex determination

- Ordinary human body cells contain 23 pairs of chromosomes.
- 22 pairs control characteristics only, but one of the pairs carries the genes that determine sex.
- In females the sex chromosomes are the same (XX).
- In males the chromosomes are different (XY)



## 7. Causes of Variation

- the genes they have inherited (genetic causes)
- the conditions in which they have developed (environmental causes)
- a combination of genes and the environment



## 3. Selective breeding Method

- 1) Decide which characteristics are important
  - 2) Choose parents that show these characteristics
  - 3) Select the best offspring from parents to breed the next generation
  - 4) Repeat the process continuously
- What are some characteristics that farmers may select for?

In cows	In crops
Milk yield	Pest/disease resistance
Muscle/meat	Crop yield

4. Genetic engineering – is a process which involves modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic.

### Advantages

Can produce animals that make human proteins to treat disease.  
Can produce crops that can be resistant to pests to increase food production in poor countries.

### Disadvantages

Some people are concerned of risks with GM crops.  
Some people think it's wrong to create new life forms or move genes between different species.

## 2. Evolution

### What is Darwin's theory of evolution?

All species of organisms arise through natural selection of small inherited variations that increase the individual's ability to compete, survive and reproduce.

### The three main stages of natural selection.

Individual organisms within a particular species may show a wide range of phenotype variation because of differences in their genes.



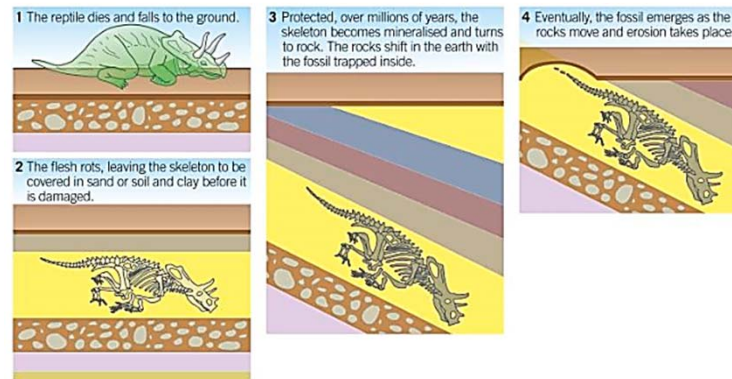
Individuals with characteristics most suited to the environment are more likely to survive to breed successfully



The genes that have enabled these individuals to survive are then passed on to the next generation.

## 5. Evidence of evolution

### Formation of Fossils



Not a complete fossil record :

- Not the right conditions for a fossil to form
- A lot of fossils have still not been found
- Soft-bodied organisms means that they left little fossil trace

### Antibiotic resistance - Rapid Evolution

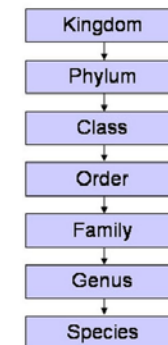
Bacteria can evolve rapidly because they reproduce at a fast rate. Mutations of bacterial pathogens produce new strains. Some strains might be resistant to antibiotics, and so are not killed. They survive and reproduce, so the population of the resistant strain rises.

## 7. Classification

### **Define the term species.**

Group of living organisms consisting of similar individuals that can breed to produce fertile offspring.

### **Linnaeus's System of Classification**



### **The 'new' Three-domain system**

- Archaea (primitive bacteria usually living in extreme environments)
- Bacteria (true bacteria)
- Eukaryota (which includes protists, fungi, plants and animals.)