



Student Checklist	Revised		Revised
Describe the features of sexual and asexual reproduction		Describe what variation is and the causes of it	
Explain the advantages and disadvantages of sexual and asexual reproduction		Explain the influence mutations have on the characteristics of a species	
Give names of organisms that reproduce sexually , asexually and using both		Explain the theory of evolution by natural selection	
Describe the process of Mitosis		Describe how new species form	
Describe the Process of Meiosis		Describe what selective breeding is	
Explain what happens during fertilisation of plants and animals		Explain how selective breeding can be used to develop organisms with desired traits	
Describe the structure of DNA and how it is stored in a cell		Describe what genetic engineering is	
Explain the term Genome and why the Human Genome Project is important		Explain how genetic engineering can be used to create organisms with new characteristics	
<b>(Triple Only)</b> Explain what complementary base pairing is with reference to DNA		Evaluate the benefits and risks related to natural selection and genetic engineering	
<b>(Triple Only)</b> Explain how the DNA bases are linked to amino acids and proteins		<b>(Triple Only)</b> Describe the different methods of cloning organisms	
<b>(Triple Only)</b> Describe how proteins are synthesised, folded and why shape is important		<b>(Triple Only)</b> Explain how each method (tissue culture, cuttings, embryo transplants and adult cell cloning) works	
<b>(Triple Only)</b> Explain what a mutation is and the effects they can cause		<b>(Triple Only)</b> Describe how Darwin came up with his theory of evolution and why it was only partially accepted.	
<b>(Triple Only)</b> Explain what non-coding DNA is and why it is important		<b>(Triple Only)</b> Describe other theories of evolution and the problems with them	
Describe how characteristics are controlled by one or more genes		<b>(Triple Only)</b> Describe the work of Alfred Russel Wallace and how new species can be formed	
Explain the terms; Gamete, Chromosome, Gene, Allele, Genotype, Phenotype, Dominant, Recessive, Heterozygous and Homozygous		<b>(Triple Only)</b> Describe how our knowledge of genetics has improved over time.	
Explain how to use punnet squares, genetic cross diagrams and family trees		Describe the causes of extinction	
Describe how chromosomes are arranged and how sex determination works		Describe how the fossil record formed and the evidence this gives us for evolution	
Describe the inheritance of cystic fibrosis and polydactyly		Explain how the rise of antibiotic resistance is evidence to support evolution	
Describe the process of embryo screening		Describe how organisms are named and classified in the Linnaean system	
Evaluate social, economic and ethical issues concerning embryo screening		Explain how the three-domain system has developed	
		Describe and interpret evolutionary trees	

### 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.

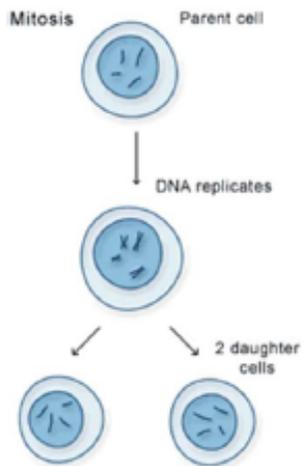
### 2. Meiosis

**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

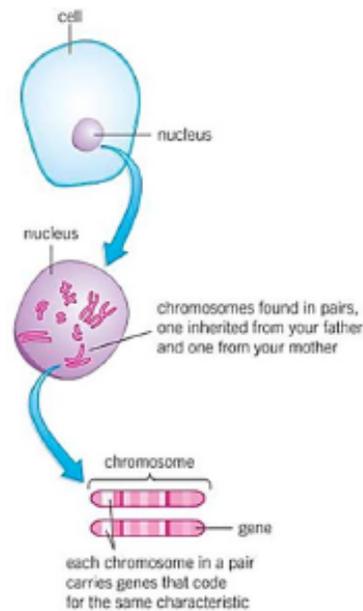
### 3. DNA

**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)

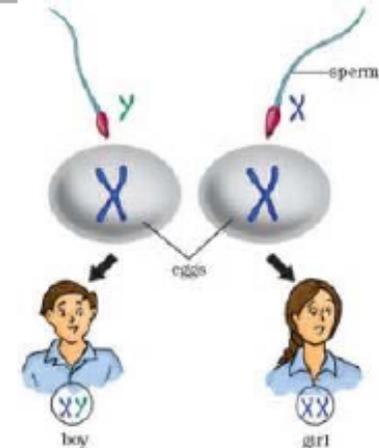
**Homozygous** – Having two of the same alleles (BB or bb)

B – dominant purple  
b- recessive white

		pollen ♂	
		B	b
pistil ♀	B	BB	Bb
	b	Bb	bb

### 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 Muscle/meat	Pest/disease resistance 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.

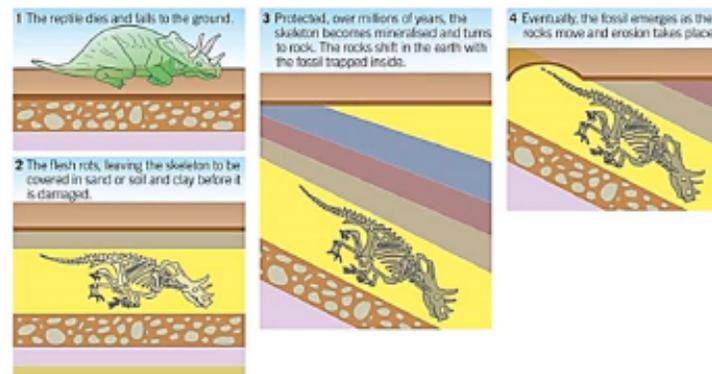
Individual organisms within a particular species may show a wide range of phenotype variation because of differences in their genes.

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

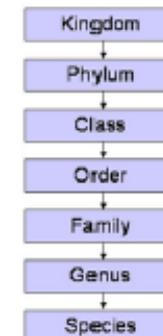
Bacteria can evolve rapidly because they reproduce at a fast rate. Mutations of bacterial pathogens produce new strains. Some strains might be resistant to antibiotics, and so are not killed. They survive and reproduce, so the population of the resistant strain rises.

## 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.)