

Biology 6: Inheritance, Variation, Evolution

Section 1a: Sexual and Asexual Reproduction

1 Sexual Reproduction	Reproduction involving the fusion of gametes .
2 Gamete	A sex cell that contains half the genetic information of a body cell. E.g. sperm and egg in animals, pollen and ovaries in plants.
3 Meiosis	The type of cell division that produces gametes . Four daughter cells are produced from one original cell. Each cell is genetically different. Each daughter cell has half the genetic information of a body cell.
4 Fertilisation	Fusion of gametes . Restores the full number of chromosomes.
5 Asexual Reproduction	Reproduction involving only one parent and no gametes . No mixing of genetic information so genetically identical clones are produced. Only mitosis is involved.
6 Mitosis	Cell division that produces two identical daughter cells with the full amount of chromosomes.

Section 1b: Mitosis and Meiosis

	Mitosis	Meiosis
7 Number of daughter cells produced	2	4
8 Variation in cells produced	Genetically identical to each other and parent cell	Different to each other and parent cell
9 Purpose	Growth, repair, asexual reproduction	Produce gametes for sexual reproduction
10 Number of chromosomes	Full amount (pairs of chromosomes)	Half (single chromosomes)

Section 1c: Advantages and Disadvantages of Different Types of Reproduction

	Advantages	Disadvantages
11 Sexual Reproduction	Produces variation . Offspring are more likely to survive changes to the environment and disease.	Requires a mate . Slower way of producing offspring.
12 Asexual Reproduction	Produce lots of offspring quickly . No mate needed.	Offspring are less likely to survive environmental changes or diseases.

Section 2: Genetic Diseases

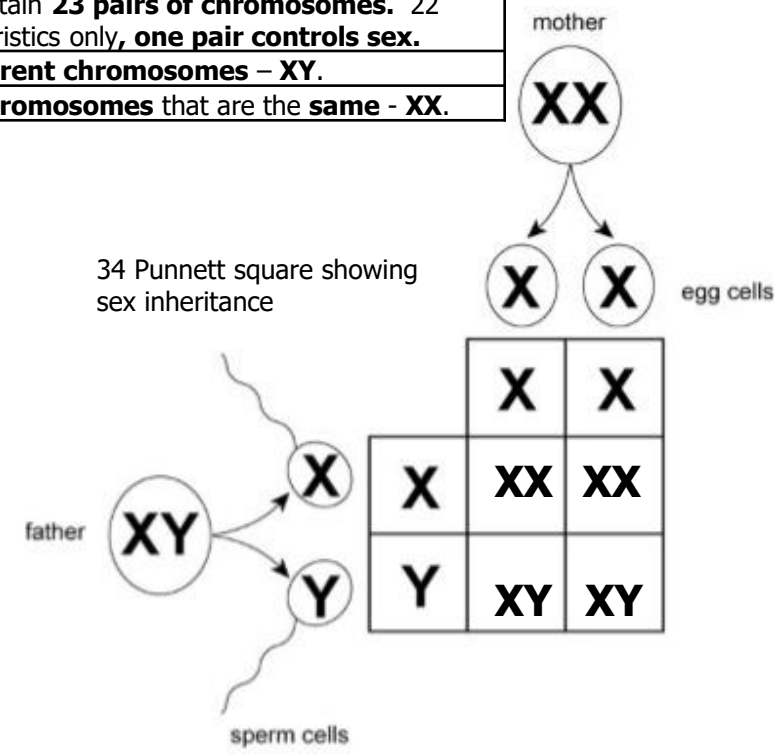
	Polydactyly	Cystic Fibrosis
13 Problem	Extra fingers and toes	Disorder of cell membranes. Causes sticky mucus on lungs.
14 Caused by...	Dominant allele	Recessive allele
15 Genotype of people with disease	PP or Pp	cc
16 Genotype of people without disease	pp	CC or Cc
17 Does the disease have carriers?	No	Yes – genotype Cc

Section 3: Genetics Key Terms

18 DNA	Genetic material . DNA is a polymer made up of two strands forming a double helix . The DNA makes up chromosomes.
19 Gene	A gene is a small section of DNA on a chromosome. Each gene codes for a particular sequence of amino acids , which make a protein .
20 Chromosome	A long coil of DNA . Found in the nucleus.
21 Genome	The entire genetic material of that organism .
22 Allele	Different versions of the same gene – dominant and recessive.
23 Dominant	A dominant allele is always expressed . Only one copy is needed.
24 Recessive	Only expressed if two copies are present .
25 Homozygous	Both alleles for a gene are the same (i.e. both are dominant or both are recessive).
26 Heterozygous	Both alleles for a gene are different (i.e. one is dominant, the other is recessive).
27 Genotype	The alleles present for a particular gene .
28 Phenotype	The physical feature expressed for a particular gene .
29 Single gene characteristics	Some characteristics are controlled by only one gene e.g. fur colour in mice, colour blindness in humans.
30 Multiple gene characteristics	Most characteristics are controlled by many genes e.g. height.

Section 4: Gender Inheritance

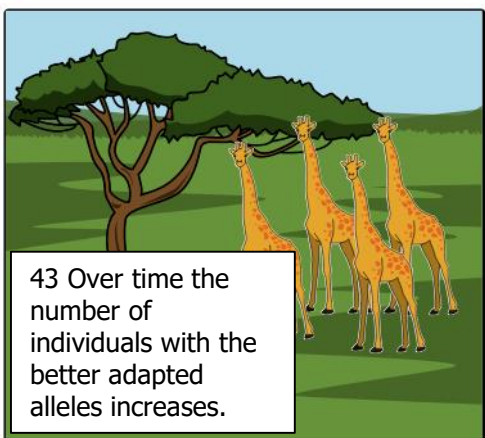
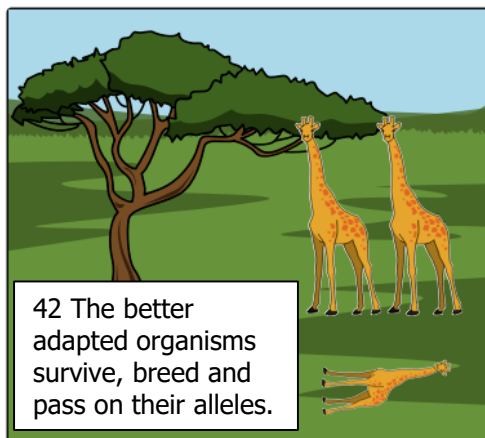
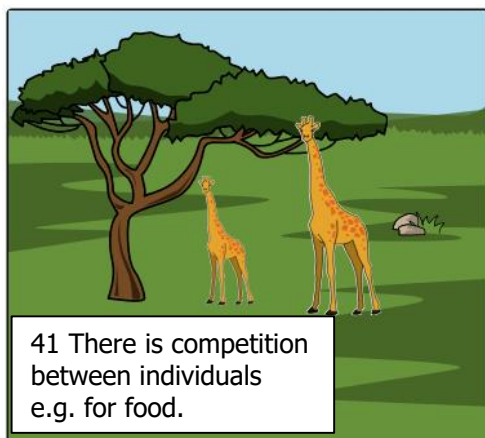
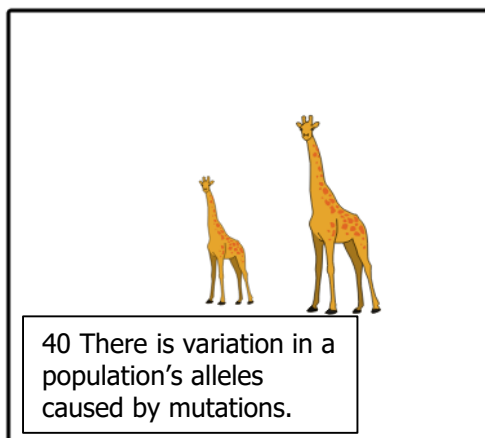
31 Human Chromosomes	Human body cells contain 23 pairs of chromosomes . 22 pairs control characteristics only, one pair controls sex .
32 Males	Males have two different chromosomes – XY .
33 Females	Females have two chromosomes that are the same - XX .



Section 5: Variation and Evolution Key Terms

35 Variation	The differences between organisms. Can be caused by genes (e.g. eye colour), the environment (e.g. scars) or both the environment and genes (e.g. weight). All variation in genes is caused by mutations .
36 Mutation	Mutations are changes in genes . Most have no effect on the phenotype. Occasionally mutations have a positive effect on phenotype and organisms with these mutations are more likely to survive.
37 Evolution	The change in the genes of a population over time . Occurs through natural selection.
38 Natural selection	The process by which the individuals best adapted to the environment survive and pass on their genes .
39 Speciation	Occurs when two populations are so different that they can no longer breed to produce fertile offspring . Two new species are formed.

Section 5a: Natural Selection



Section 6: Selective Breeding

44 Selective Breeding (Artificial Selection)	The process by which humans breed plants and animals for particular genetic characteristics .
45 Inbreeding	Selective breeding can lead to 'inbreeding' where some breeds are particularly prone to disease or inherited defects .

46 Process of selective breeding:

1. Choose parents with correct characteristics from the population.
2. Breed them together.
3. Choose the offspring with the desired characteristics and breed them together.
4. Continue over many generations.

47 Examples of desired characteristics:

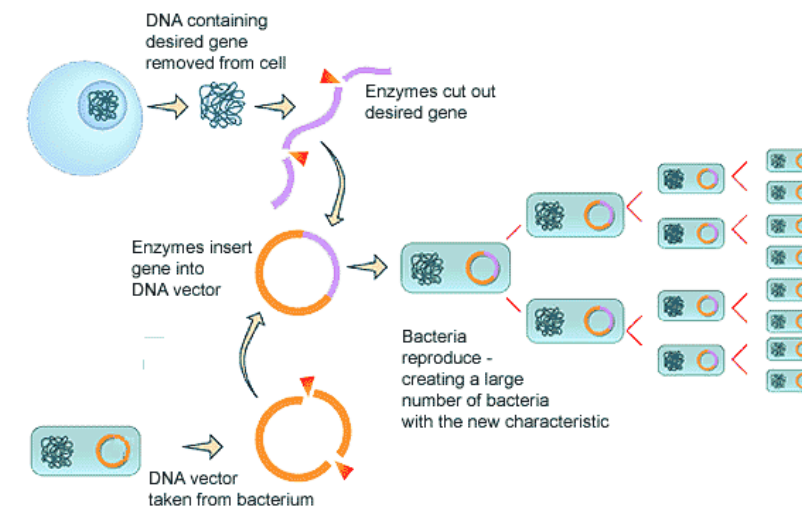
- Disease resistance in food crops.
- Animals which produce more meat or milk.
- Domestic dogs with a gentle nature.
- Large or unusual flowers.

Section 7: Genetic Engineering

48 Genetic Engineering	A process which involves modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic.
49 GM Crop	Crops that have been produced by genetic engineering.
50 Vector	Something that can carry a gene into another organism e.g. bacterial plasmid or virus .

51 Process of genetic engineering:

1. **Genes** are cut out by **enzymes**.
2. The gene is **inserted into a vector** (either a bacterial plasmid or virus).
3. The vector is used to **insert the gene** into the required cells
4. Genes are transferred to the cells of animals, plants or microorganisms at an **early stage** in their development so that they develop with desired characteristics.



52 Examples of genetic engineering:

- Bacterial cells have human **insulin gene** inserted into them so that they produce insulin for diabetics.
- Plants that have had genes inserted that make them **resistant to disease, insects or herbicides**.