

Science 30	Unit A: Biology
Lesson 10 - What Is Genetics?	84 mins

**What Is Genetics?**

<ul style="list-style-type: none"> <li>- The science of gene function and inheritance</li> <li>- The biological information needed to pass traits onto the next generation</li> </ul> <p><b>Chromosomes</b></p> <ul style="list-style-type: none"> <li>- DNA that come in bunches, splitting up the genetic code up between several groups</li> <li>- All cells have a complete set of chromosomes needed for all coding for a complete organism.</li> </ul> <p><b>Genes</b></p> <ul style="list-style-type: none"> <li>- Specific parts of a chromosome that actually codes for the production of a specific protein</li> </ul>	<ul style="list-style-type: none"> <li>- Included in your DNA (<b>D</b>eoxyribo<b>N</b>ucleic <b>A</b>cid)</li> <li>- DNA codes for Proteins... each protein has a different job that controls the organism.</li> </ul> <ul style="list-style-type: none"> <li>- Humans have 23 pairs (46 total)</li> <li>- Cats have 19 pairs</li> <li>- Dogs have 39 pairs</li> <li>- Fruit Fly... 4 pairs...</li> </ul> <ul style="list-style-type: none"> <li>- Each chromosome can have multiple genes</li> </ul>
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**Human Karyotype**

<ul style="list-style-type: none"> <li>- an image that organizes the chromosomes of a cell in relation to number, shape, and size</li> <li>- A pair will have the same size, shape, and banding (the way it stains), they will code for the same traits but may be a variation</li> <li>- The only exception is the sex chromosomes, males will have two different, females will have the same.</li> </ul> <p>Organise the Human Karyotype Puzzle</p>
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**Fruit Fly Karyotype**

The diagram illustrates the karyotype of a fruit fly. On the left, two fruit flies are shown: a male and a female. Next to each fly is a set of chromosomes. The male's sex chromosomes are labeled 'X' and 'Y', while the female's are labeled 'X' and 'X'. On the right, a detailed view of a chromosome is shown. It is a blue, cylindrical structure with horizontal bands. Labels indicate the 'banding pattern' (the bands themselves), 'size' (the length of the chromosome), and 'centromere position' (the central constriction where the two sister chromatids meet).

**centromere:** the region on a replicated chromosome that attaches the two identical copies during cell division

**The Role of Proteins (Watch Stated Clearly - What is a Gene?)**

<ul style="list-style-type: none"> <li>- Each protein has a different shape and job</li> </ul>	<ul style="list-style-type: none"> <li>- Each job allows for a different function in the organism to perform             <ul style="list-style-type: none"> <li>- Hormones are proteins that bind to cells to make that cell do something</li> <li>- Hemoglobin are proteins that can bind but not react with oxygen</li> </ul> </li> </ul>
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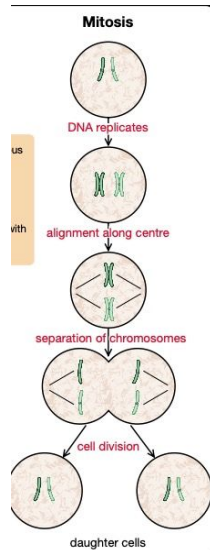
## Amniocentesis

- a prenatal test done to look at the karyotype of an unborn child
- Offered to give information about the genetics of an unborn child

- Not an exact science as the amniotic fluid only contains traces of cells not full sequences
- May give false positives... or negatives

## Division of Cells and Genetic Material

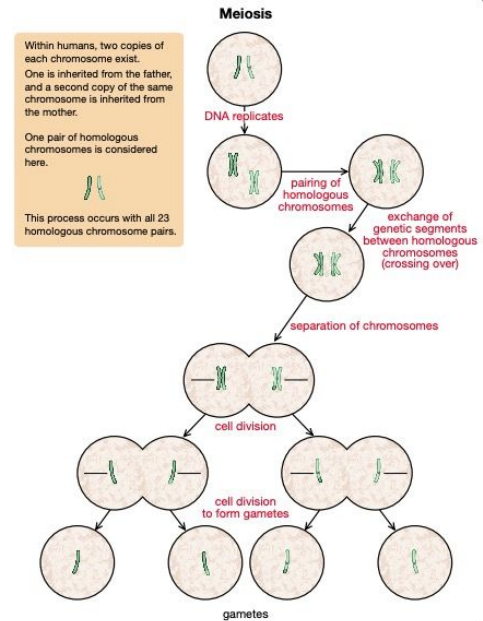
Mitosis (Making exact replicas) (diploid cells) (2n)  
"mi two sis."



Autosomal cell: a cell of the body not involved in sexual reproduction

Asexual Reproduction - cloning

Meiosis (making half cells) (haploid cells) (1n)  
"mei one sis"



Sex Cells - Gametes (sperm and ova)

## Fertilization

When two haploid (1n) cells come together to make 1 diploid (2n) cell

Sperm + Ovum = Zygote (1st cell of a fetus)

Pollen + Ovum = Zygote (1st cell of a seed)

# Science 30 - Lesson 10 - What Is Genetics?

Name: \_\_\_\_\_

## Organise the Human Karyotype Puzzle

- 1) Explain Why it is beneficial to have two sets of chromosomes? Where does each set of chromosomes come from?

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- 2) Describe what is different in terms of shape and size in the last pair of chromosomes.

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- 3) Is this individual a male or a female?

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- 4) Explain how a karyotype of an individual might be useful to scientists.

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## Practice Questions

- 5) Match the following terms with the analogy that best describes each term.

- DNA
- Chromosome
- Gene
- Karyotype
- Protein

- a) a cookbook with several recipes in it
- b) an entire library of cookbooks neatly arranged in order from the largest book to the smallest book
- c) the cake produced by following recipe instructions
- d) the letters and words in a recipe
- e) the instructions for making a cake

- 6) How many chromosomes are in a normal human autosomal cell? How many chromosomes are in a normal human gamete?

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- 7) Determine the gender of an individual who has two X chromosomes in each autosomal cell instead of an X and a Y chromosome.

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- 8) Dogs have 78 chromosomes, cats have 34 chromosomes, and goldfish have 94 chromosomes. Explain why the usual number of chromosomes in autosomal cells for any species is always an even number.

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9) Describe what would happen if the process of meiosis did not occur and two cells with two sets of chromosomes combined to produce a new child. Why is meiosis necessary?

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10) Sexual reproduction creates beneficial genetic diversity (crossover and new pairs for offspring). List some possible advantages of asexual reproduction.

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