How many chromosomes do you have?

Where did your chromosomes come from?

How many chromosomes do each of your parents have?

Why don't you have twice as many as them?

You have 46 Chromosomes but you really have 23 pairs of chromosomes

Because your parents are both the same species each chromosome in the pair carry the same traits

Traits are body structures. You can have different characteristics for each traits.

Trait = Eye Color

Characteristics = Brown, Blue, Green, Hazel

Call Alleles



One chromosome came from your mother and one came from your father

Alleles are different versions of the same gene



Pair # 1

Father's Chromosome

Eye Color

Hair Color

Skin Color

These are called Homologous Chromosomes

Note:

There is a difference between Homologous Chromosomes or Homologues and Sister Chromosomes or Chromatids.

Sister chromatids contain the same genes and same alleles, and homologous chromosomes contain the same genes but two copies of alleles, each of which might or might not be the same as each other.

Sister Chromatids are identical duplicate chromosomes made during replication. They separate from each other during Mitosis and Meiosis II

<u>Homologous Chromosome</u> are similar chromosomes that came from each parent. They separate from each other by disjunction during Meiosis I 22 pairs of chromosomes are Homologous and control everything about you, these are called : AUTOSOMES

You have one pair of chromosomes that determines your sex, these are called : SEX CHROMOSOMES

Females

Males

XX

XY



The female sex chromosomes are completely homologous

In males the Y chromosome is smaller and is missing some of the genetic information

This is why males suffer from some genetic problems more often than females.

Problems like Color Blindness and Hemophilia



All the eggs a female produces carry the X chromosome

Half the sperm carry the X chromosome and half carry the Y

The male determines the sex of the baby

There is a 50:50 chance of having a boy or a girl

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Females have 23 pairs of homologous chromosomes



Males have 22 pairs of complete homologous chromosomes and one pair that is non-homologous

There is a very precise and controlled method of producing sex cells to make sure each has exactly half of the person's genetic information

This process is called Meiosis



Meiosis

The process by which sex cells or Gametes are produced

Also called : Gametogenesis - Formation of Gametes

Spermatogenesis - Formation of Sperm

Oogenesis - Formation of Eggs

Reduction Division – Cutting the number of chromosomes in half

Mitosis – One cell produced two cells that have exactly the same chromosomes as the original

Meiosis – One cell produces new cells that have exactly half of the chromosomes as the original cell

These new cells are called Gametes Gametes are the Egg and the Sperm cells



Somatic Cell Body Cell Diploid Cell

Gamete Sex cell Monoploid Cell Haploid Cell Egg Sperm

Why bother cutting the number of chromosomes in half?

So when the egg and sperm come together – called Fertilization – the normal chromosome number is restored in the organism







At the end of meiosis II, each cell divides into two new daughter cells. Each daughter cell contains 23 chromosomes. None of the four daughter cells is genetically identical to the original parent cell.



Prophase I

During prophase I, two very important events occur that don't take place during prophase in Mitosis

1. Tetrads are formed

2. Crossing-over

TETRADS

Four homologous chromosome group together in a process call synapsis – This is important to ensure that the final sex cell have only half the genetic material

Chromosome from _ your mother

Copy of Chromosome from your mother Chromosome from your father

Copy of Chromosome from your father

Crossing-over

While in the form of a tetrad the four chromosomes are tangled together.

Pieces of DNA may break off and reattach



Crossing-over is the process where pieces of genetic material are exchanged between homologous chromosomes



This adds variation to the genetic information that is passed on to the offspring. This variation may be one of the driving forces behind evolution.

Crossing over during meiosis





Anaphase I

During Anaphase I, the tetrad breaks apart and pairs of chromatids separate

This process is called DISJUNCTION



Unfortunately separation doesn't always go as planned

Instead of splitting evenly, the tetrad may break apart unevenly causing one cell to have too many chromatid and one cell having too few







Non-Disjunction can occur during Anaphase I or Anaphase II but the result is the same.

Some of the Gametes will have 24 chromosomes and some will have only 22





Most common type is called Down's Syndrome

Down's Syndrome



The person has three chromosome # 21 instead of the normal pair





Down's Syndrome is found more often in women who become pregnant after the age of thirty-five.

The older the women the greater the chance of having a child with Down's Syndrome

To see if the baby a women is carrying has Down's Syndrome two tests can be run while she is pregnant

Amniocentesis





This is a Karyotype or Chromosome Map of a person with Down's Syndrome

Male or Female ?

Gametogenesis

Formation of Gametes or Sex Cells

Spermatogenesis – Formation of Sperm Takes place in the Testes in males Oogenesis – Formation of Eggs Takes place in the Ovaries in Females

The Testes and Ovaries are called Gonads they produce the sex cells for an organism



Spermatogenesis



Turning a haploid cell into a sperm takes 30 days

Oogensis







