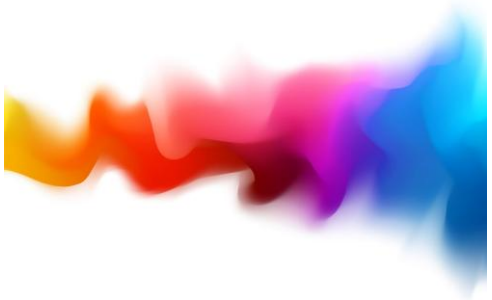


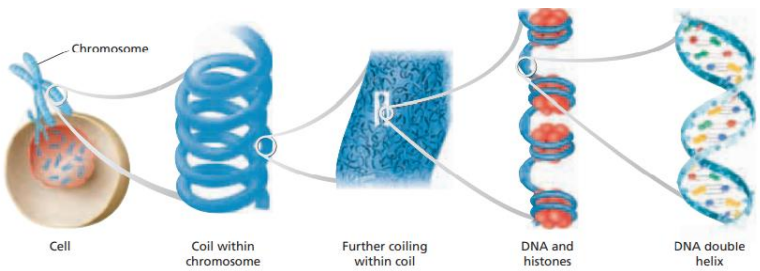
CHROMOSOME STRUCTURE

BESIR ZENELI

BY THE END OF THIS LESSON YOU WILL BE ABLE TO:

Define	Define what is a chromosome and from what parts is made
List	List some species with different numbers of chromosomes
Explain	Explain the difference between sex chromosomes and autosomes

CHROMOSOMES



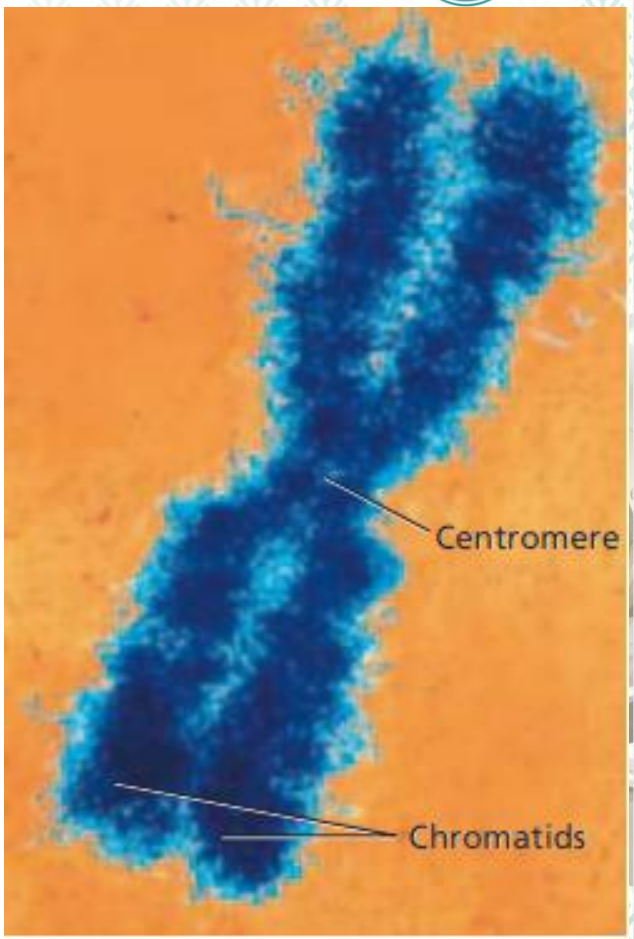
- During cell division, the DNA in a eukaryotic cell's nucleus is coiled into very compact structures called chromosomes.
- **Chromosomes are rod-shaped structures made of DNA and histone proteins.**

- **The chromosome consists of two identical halves, called a chromatid.**
- **Chromatids** form as the DNA makes a copy of itself before cell division. **When the cell divides**, each of the two new cells will receive one chromatid from each chromosome.
- **The two chromatids of a chromosome are attached at a point called a centromere.**

The centromere holds the two chromatids together until they separate during cell division.

- Between cell divisions, DNA is not so tightly coiled into chromosomes.

The less tightly coiled DNA-protein complex is called chromatin.



Chromosomes, such as this one isolated from a dividing human cell, consist of two identical chromatids. (TEM 12,542×)

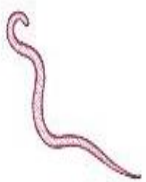
TABLE 8-1 Chromosome Numbers of Various Species

Organism	Number of chromosomes
Adder's tongue fern	1,262
Carrot	18
Cat	32
Chimpanzee	48
Dog	78
Earthworm	36
Fruit fly	8
Garden pea	20
Gorilla	48
Horse	64
Human	46
Lettuce	18
Orangutan	48
Sand dollar	52

CHROMOSOME NUMBER

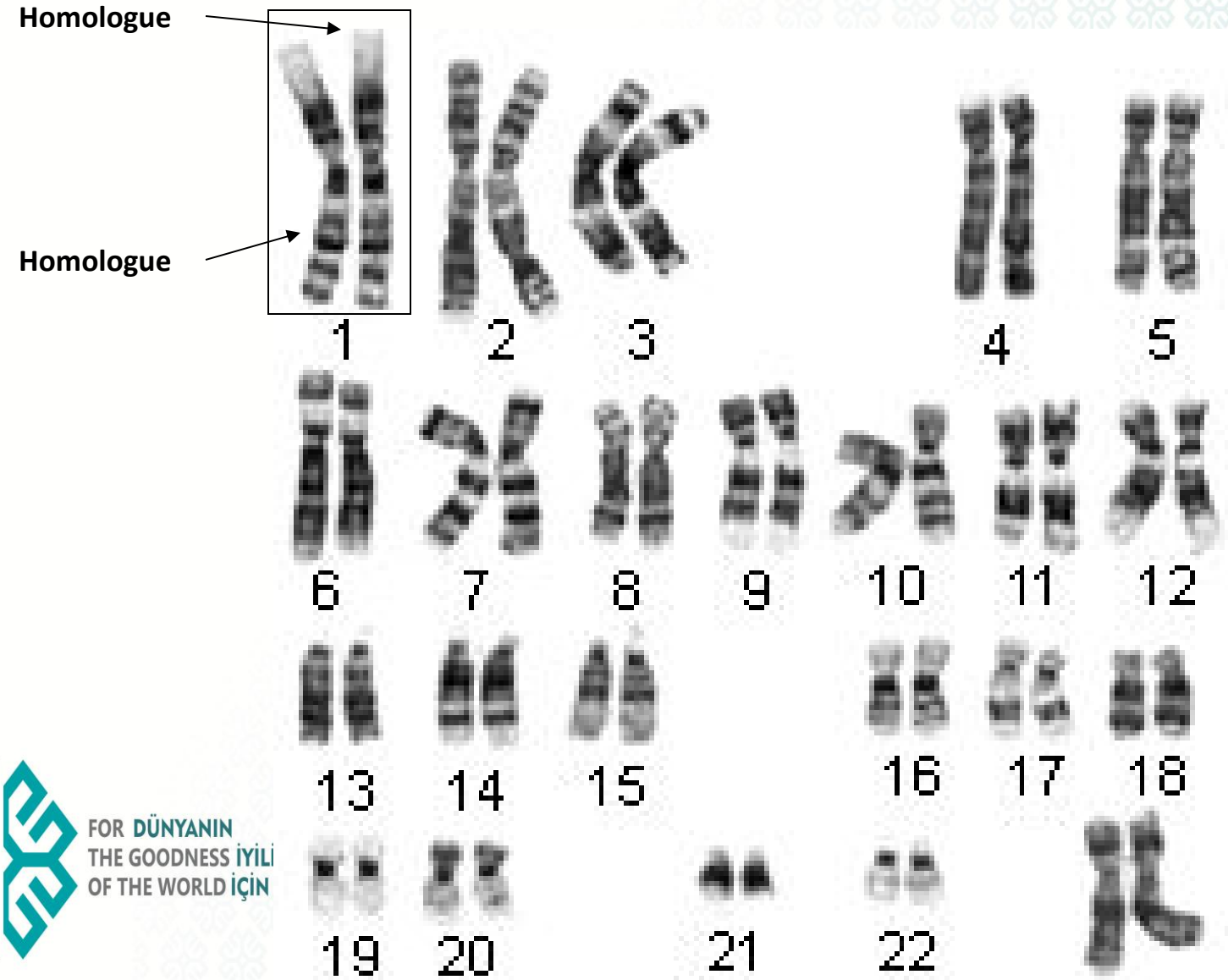
Each species has a characteristic number of chromosomes in each cell.

Some species of organisms have the same number of chromosomes. For example, potatoes, plums, and chimpanzees all have 48 chromosomes in each cell.

Species	*Parascaris equorum*	*Oryza sativa*	*Homo sapiens*	*Pan troglodytes*	*Canis familiaris*
Chromosome #	4	24	46	48	78
Common Name	 Roundworm	 Rice	 Human	 Chimpanzee	 Dog

HUMANS HAVE 23 SETS OF HOMOLOGOUS CHROMOSOMES

EACH HOMOLOGOUS SET IS MADE UP OF 2 HOMOLOGUES.



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SEX CHROMOSOMES AND AUTOSOMES

Human and animal chromosomes are categorized as:

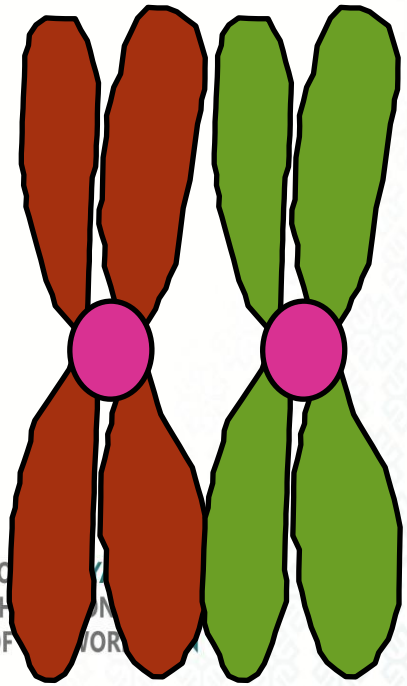
- sex chromosomes or
- autosomes

Sex chromosomes determine the sex of an organism, and they may also carry genes for other characteristics.

- **In humans, sex chromosomes are either X or Y.**
- **Females** normally have two X chromosomes **(XX),**
- **Males** normally have an X and a Y chromosome **(XY)**
- **All of the other chromosomes in an organism are called autosomes.**

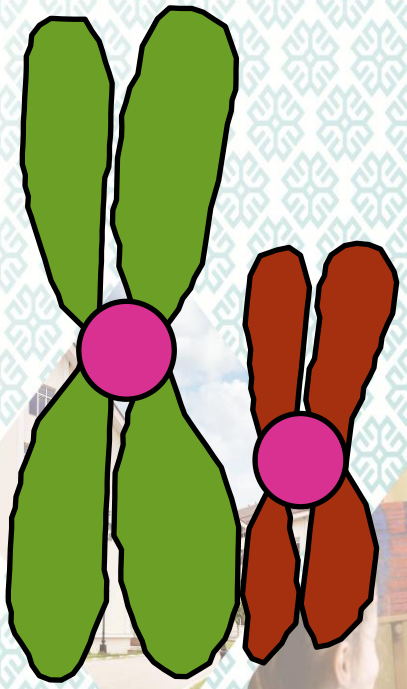
SEX CHROMOSOMES

The sex chromosomes code for the sex of the offspring.
If the offspring has two "X" chromosomes it will be a female.
If the offspring has one "X" chromosome and one "Y" chromosome it will be a male.



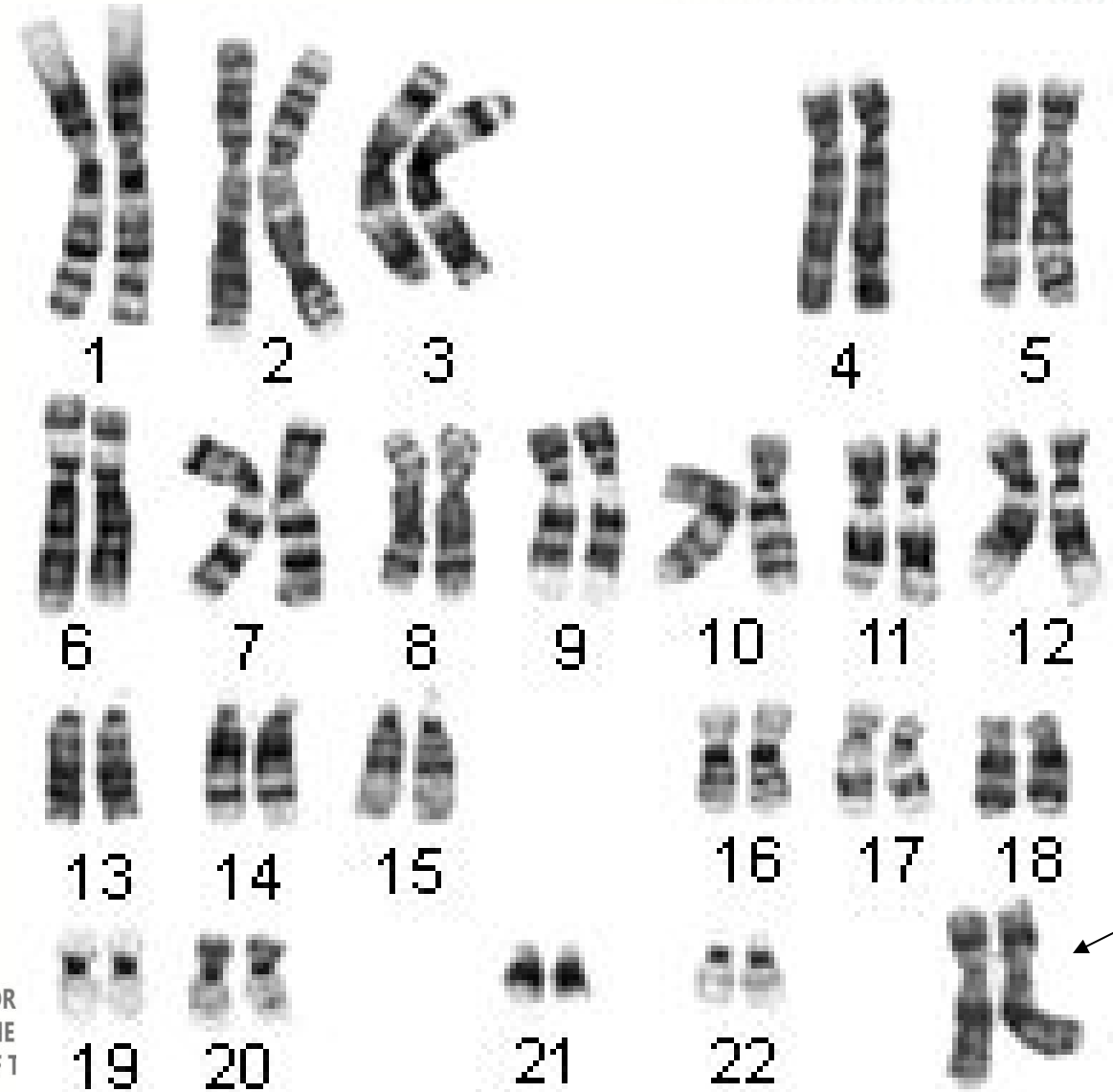
XX chromosome - female

In Humans the "Sex Chromosomes" are the 23rd set



XY chromosome - male

SEX CHROMOSOMES



"Sex Chromosomes" .....the 23rd set

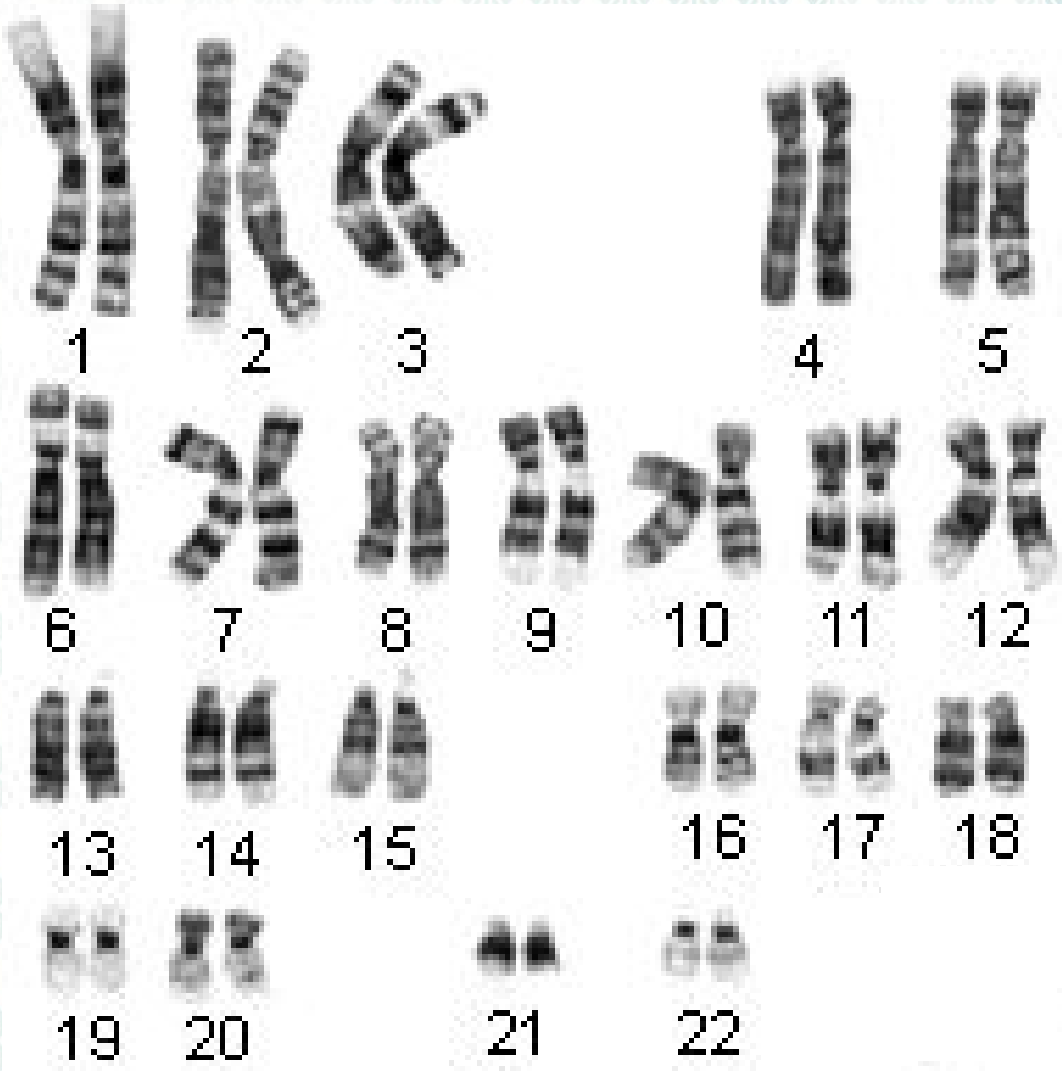
This person has 2 "X" chromosomes... and is a female.

AUTOSOMES

- Two of the 46 human chromosomes are **sex chromosomes,**
- the remaining 44 chromosomes are **autosomes**.
- **Autosomes exist in pairs in the somatic cells whereas singly in the gametic cells.**
- Every cell of an organism produced by sexual reproduction has two copies of each autosome.
- The organism receives one copy of each autosome from each parent.
- The two copies of each autosome are called homologous chromosomes, or homologues.
- **Homologous chromosomes are pair of chromosomes (maternal and paternal) that are similar in shape and size and carry genes for the same trait.**

AUTOSOMES CODE FOR MOST OF THE OFFSPRING'S TRAITS

In Humans the "Autosomes" are sets 1 - 22



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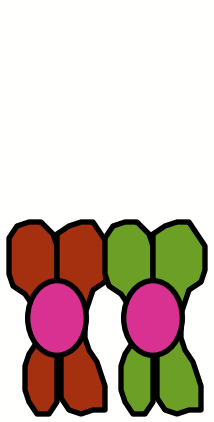
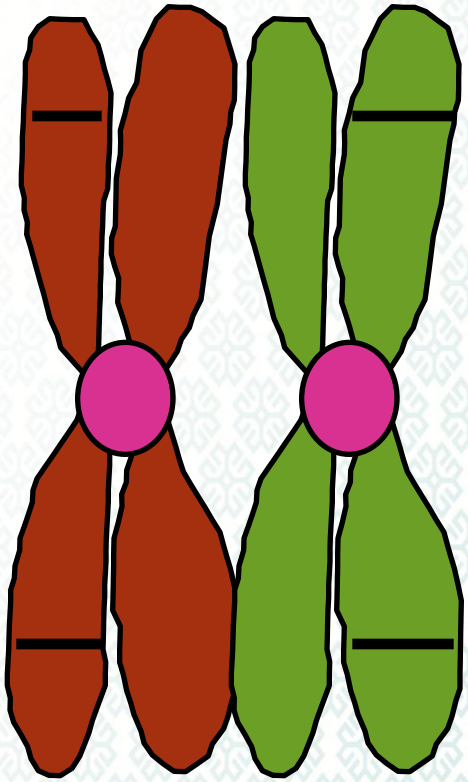
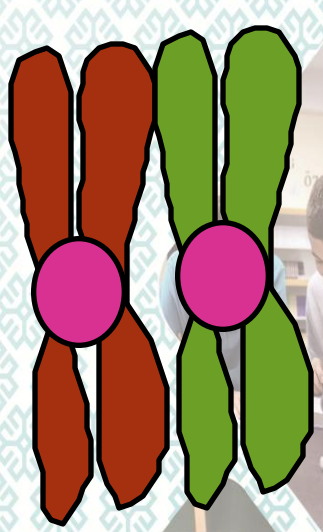
HOMOLOGOUS CHROMOSOMES

(Because a homologous pair consists of 4 chromatids it is called a "tetrad")







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THE KARYOTYPE

- The karyotype, is a photomicrograph of the chromosomes in a normal dividing cell found in a human.

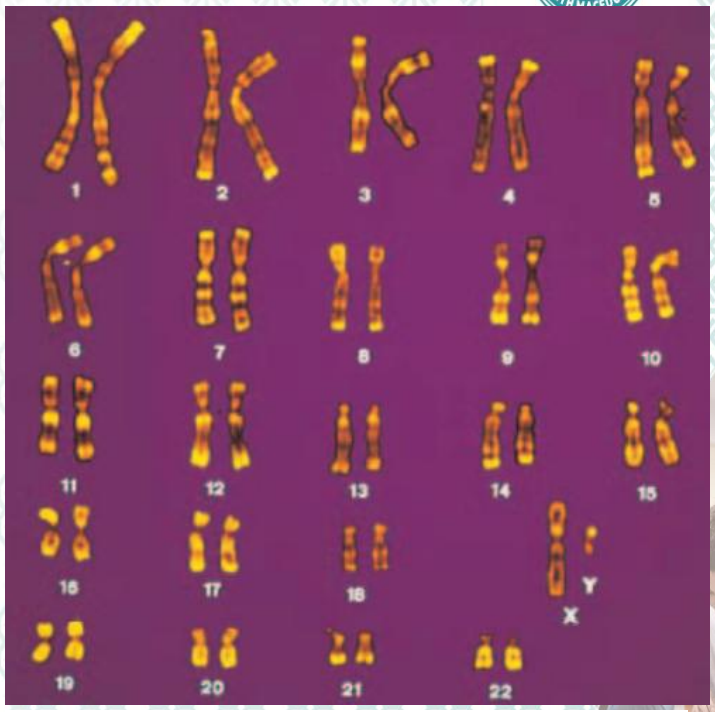

FIGURE 8-3

Karyotypes, such as this one, are used to examine an individual's chromosomes. Karyotypes are made from a sample of a person's blood. White blood cells from the sample are treated chemically to stimulate mitosis and to arrest mitosis in metaphase. The chromosomes are then photographed, cut out, and arranged by size and shape into pairs.

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SOMATIC CELLS AND SEX CELLS

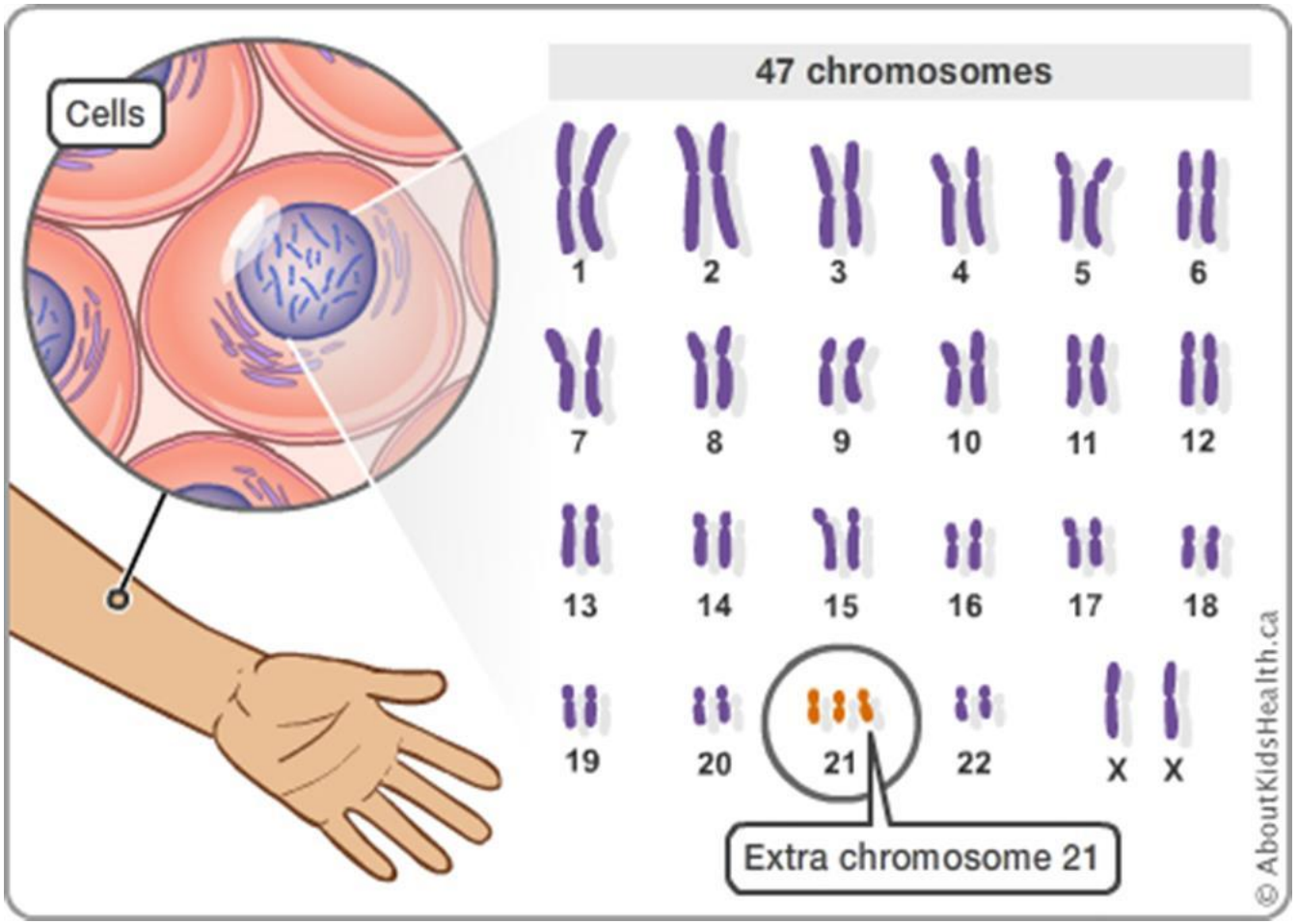
1. **Somatic Cells** (body cells), that have two sets of chromosomes are diploid (the symbol is **2n**).

   Ex. skin cells, brain cells, muscle cells etc.

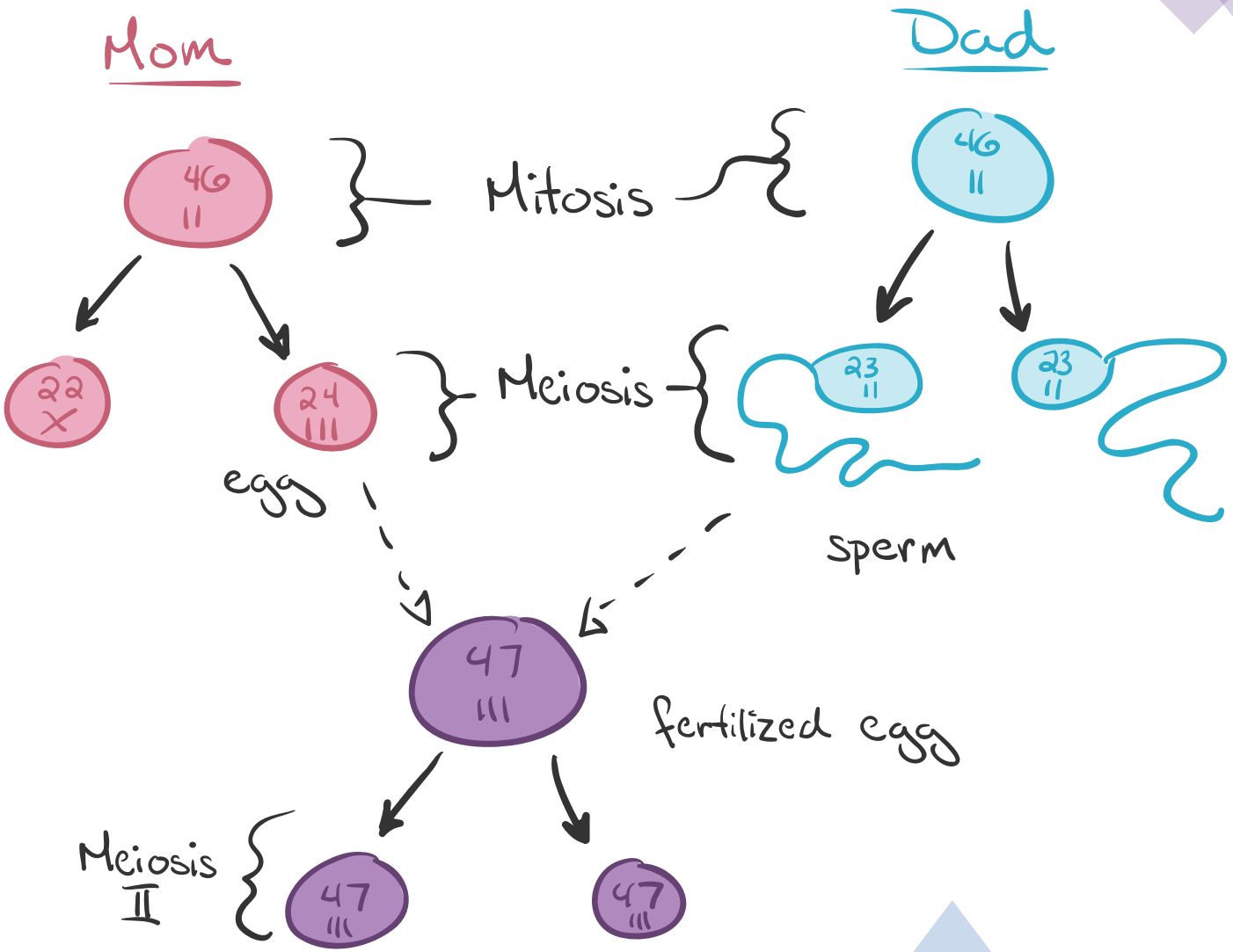
2. **Gametes** (sex cells) that have only one set of chromosomes are haploid cells (the symbol is **1n**).

   Ex. sperm cells and egg cells (**1n + 1n = 2n**)

Trisomy (Down Syndrome)



Trisonomy 21



Pablo Pineda :

https://www.youtube.com/watch?v=qL82jwMczWI

Down Syndrome:
https://www.youtube.com/watch?v=NqjGSDgeTUY