

# *MEIOSIS: GAMETE CELL DIVISION*

- Recall that **GAMETES** are the **REPRODUCTIVE (SEX)** cells of the body.
- "The **BIRDS** and the **BEEES**" - The Basics
- **SEXUAL REPRODUCTION** occurs when two different individuals ( 1 male & 1 female) produce a **HYBRID OFFSPRING** (a combination of both parents) by each contributing 1 **GAMETE** cell.
- Male cell: **SPERM CELL**
- Female cell: **EGG CELL**
- **FERTILIZATION** occurs when the two cells meet and form **ONE** new cell called the **ZYGOTE**. (This is the very **FIRST** cell of any sexually reproducing organism)
- The zygote will then divide **OVER AND OVER** again **VIA MITOSIS** until it grows into fully developed individual.

- In order for a sexually reproducing organism's chromosome number to stay the same generation after generation (for example: Humans- 46 chromosomes) the gamete's chromosome number must be **HALF** of the normal number.
- (Human gamete - 23 chromosomes)
- To make such cells requires a different type of cell division called **MEIOSIS**
- There are many important **SIMILARITIES** and **DIFFERENCES** between **MITOSIS & MEIOSIS**

## **SIMILARITIES:**

- The order of phases ( **P > M > A > T** ) and major events that occur at each are the same for the most part
  - PROPHASE- formation of chromosomes, centrioles, & spindle fibers
  - METAPHASE- chromosomes line up on equator
  - ANAPHASE- pulling apart of chromosomes
  - TELOPHASE- separation completes, cytokinesis occurs

## **DIFFERENCES:**

- Meiosis goes through **TWO** sets of division (not **ONE**):  
**MEIOSIS I and II**
- Meiosis produces **FOUR** daughter cells (not **TWO**)
- Daughter cells have been reduced to **HAPLOID (N)** cells (**23 chromosomes**) instead of **DIPLOID (2N)** (**46 chromosomes**)
- Daughter cells are **NOT IDENTICAL** to the **PARENT** cell or **EACH OTHER**

# MEIOSIS I:

**PROPHASE I:** Same as prophase of mitosis EXCEPT

- Once chromosome are formed, they **PAIR UP** with their **MATCHING COUNTERPART.**
- \***REMEMBER!** You have 2 copies of each of the 23 chromosomes (1 from mom, 1 from dad), this adds up to make 46 total.
- This is called a **HOMOLOGOUS PAIR**
- **CROSSING OVER** occurs between the homologous chromosomes
- (**GENES** can **FLIP-FLOP** from one chromosome to its partner)
- Crossing over creates endless gene combinations and **GREATLY** increases **GENETIC DIVERSITY**

## **METAPHASE I:**

Same as metaphase of mitosis EXCEPT. . .

- **HOMOLOGOUS PAIRS** line up in the middle, instead of **INDIVIDUAL** chromosomes.

## **ANAPHASE I:**

- **SISTER CHROMATIDS** are **NOT** pulled apart
- **HOMOLOGOUS PAIRS** are pulled apart  
**"BUTTERFLIES"** are still intact

## **TELOPHASE I:**

Same as telophase of mitosis EXCEPT. . .

- At this point the **CHROMOSOME NUMBER** has been reduced from **46 to 23** in the daughter cells. (From **DIPLOID** to **HAPLOID**)

# Meiosis II

## Anaphase (MITOSIS)

- The events that take place in **MEIOSIS II** are exactly the same as **MITOSIS**, **EXCEPT** that there are only **23** chromosomes being separated **INSTEAD of 46.**

**Check out this website for a good animation on the difference between Mitosis and Meiosis:**

<http://highered.mcgraw-hill.com/olc/dl/120074/bio17.swf>

<http://www.sumanasinc.com/webcontent/animations/content/mitosis.html>

<http://www.sumanasinc.com/webcontent/animations/content/meiosis.html>

- **GAMETOGENESIS:** The making of gametes
- GAMETE - SEX CELL (SPERM OR EGG)
- GENESIS - TO MAKE OR CREATE

2 TYPES:

- SPERMATOGENESIS - Makes MALE sperm cells
- OÖGENESIS - Makes the FEMALE egg cells

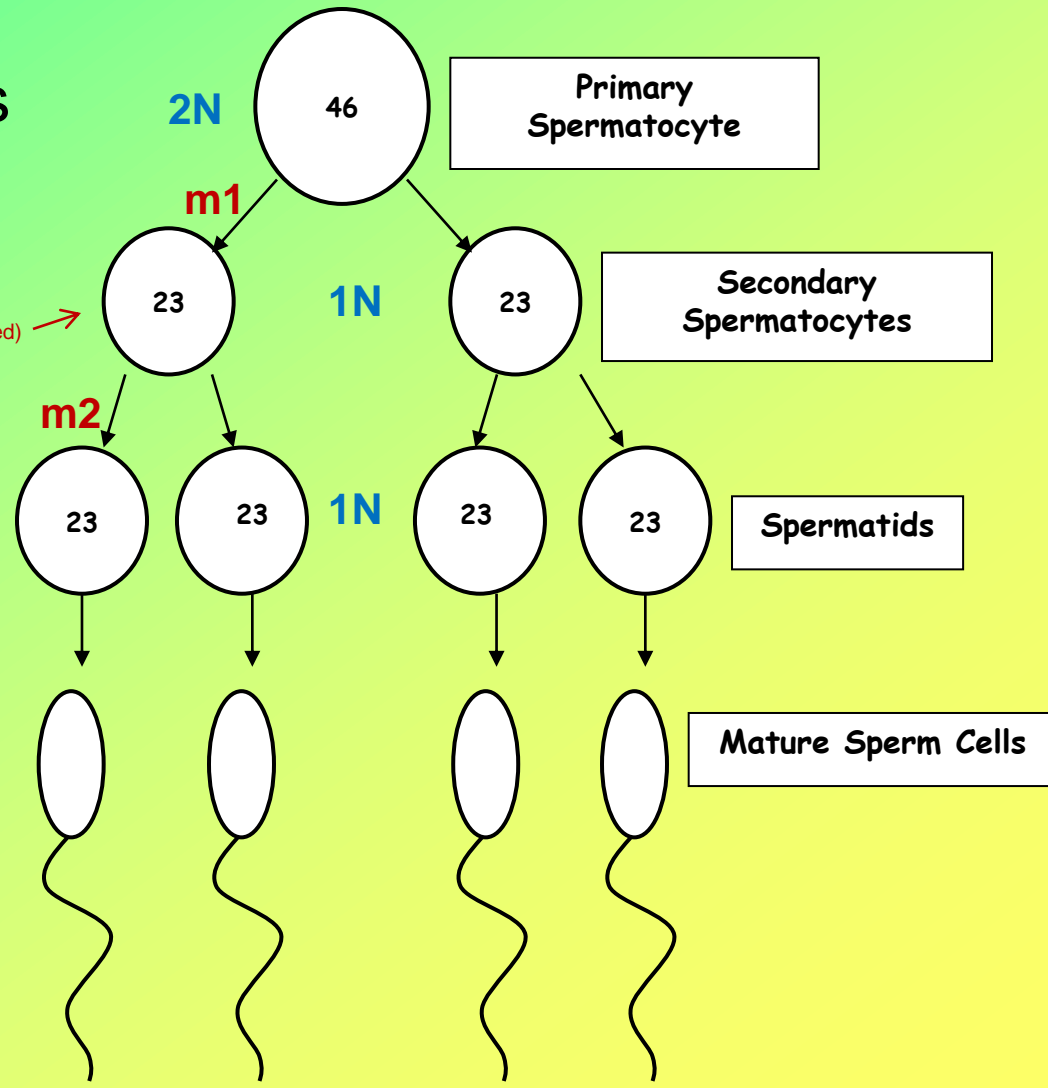
Both processes use MEIOSIS as their type of cell division, **HOWEVER** the results are quite different.

# SPERMATOGENESIS

- Happens in the TESTES
- GERM CELLS in the testes are DIPLOID (2N, 46) just like the rest of the body cells. (1 chromosome = 1 pair of sister chromatids – still connected)

- Initial germ cells are called PRIMARY SPERMATOCYTES

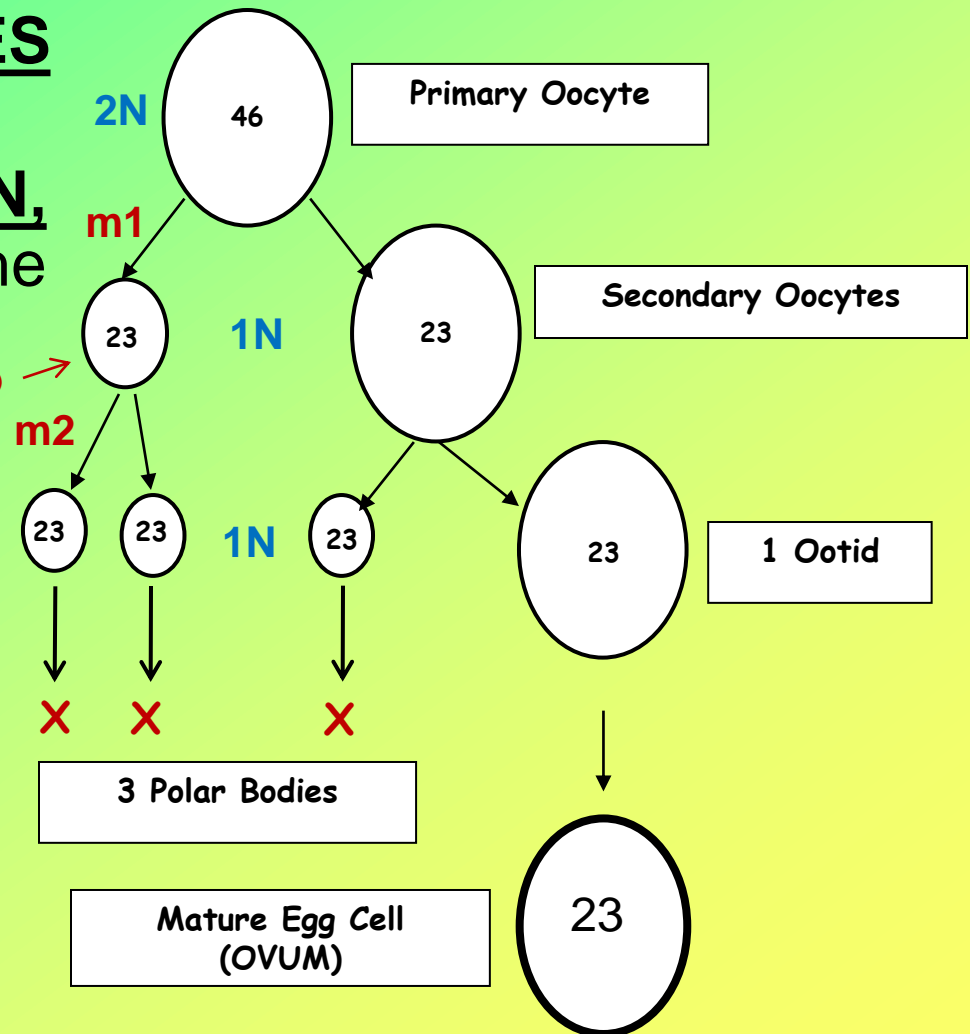
1 round of spermatogenesis produces FOUR healthy sperm cells. Every sperm cell contains a unique combination of genes. (NO TWO ARE ALIKE!)





# OOGENESIS:

- Happens in the OVARIES
- GERM CELLS in the ovaries are DIPLOID (2N, 46) just like the rest of the body cells.
- Initial germ cells are called PRIMARY OOCYTES
- 1 round of Oogenesis produces **ONE** healthy egg cell (OVUM), and **THREE POLAR BODIES**. The polar bodies serve **NO PURPOSE** in the body.



Sperm production begins at puberty and continues throughout life. An average of 300,000,000 sperm cells are made every day.

Females start releasing ONE mature egg every month beginning at puberty and ending at MENOPAUSE (late 40s to 50s) .

Why the difference?!  
Why do males make so much sperm and females make so few eggs?

