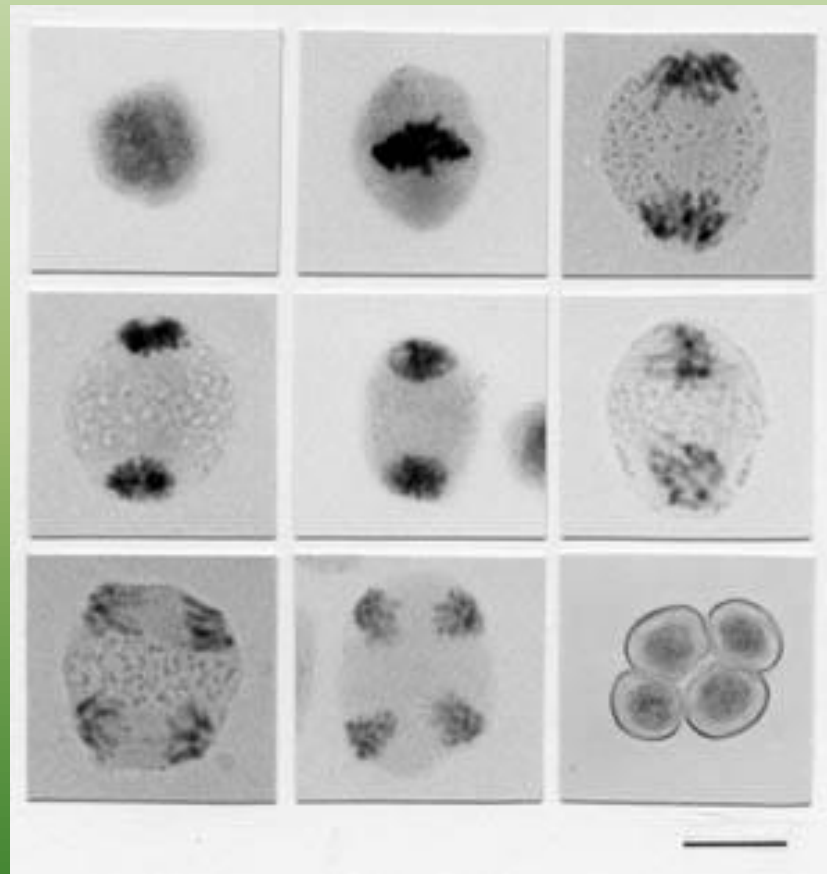


The background features a vertical gradient from light green at the top to dark green at the bottom. On the left side, there are several vertical stripes in shades of grey and white. Scattered across the left and bottom-right areas are several solid blue circles of varying sizes. The word "GAMETOGENESIS" is written in a dark blue, serif font, positioned to the right of a cluster of circles.

# GAMETOGENESIS

# MEIOSIS - GENERAL

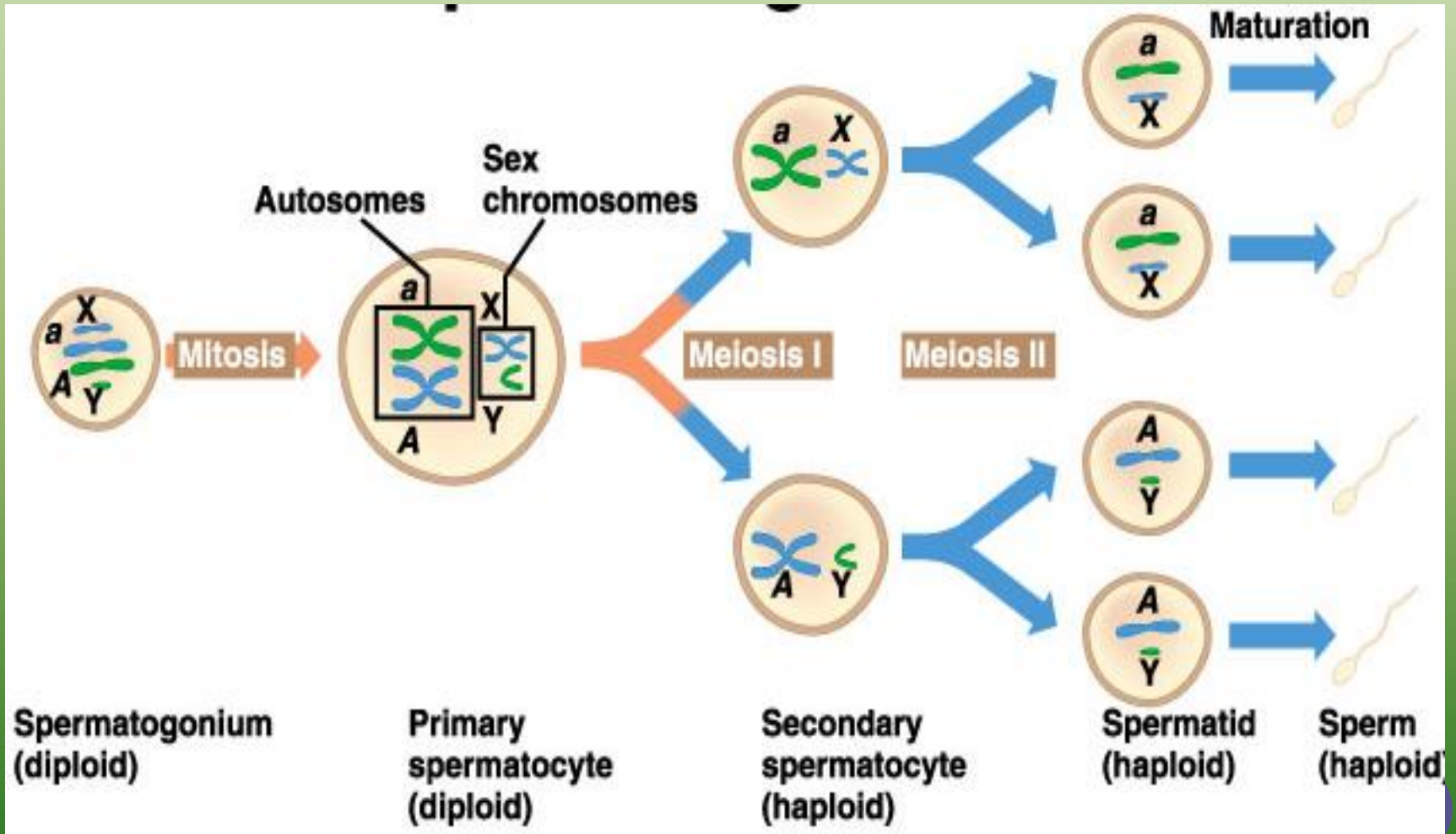


# GAMETOGENESIS

- = making of gametes
- Two types:
  1. Spermatogenesis
  2. oogenesis



Spermatogenesis = meiosis in males  
Produce 4 sperm cells



# SPERMATOGENESIS

- **WHAT:** Spermatogenesis = meiosis in males  
Produce 4 sperm cells
- **WHERE:** occurs in seminiferous tubules of testes.
- **WHO:** germ cells → Spermatogonia ( $2n$ ) .
  - Have the ability to undergo mitosis (to replace themselves) & meiosis (make sperm cells)
  - **Will not undergo meiosis until puberty.**

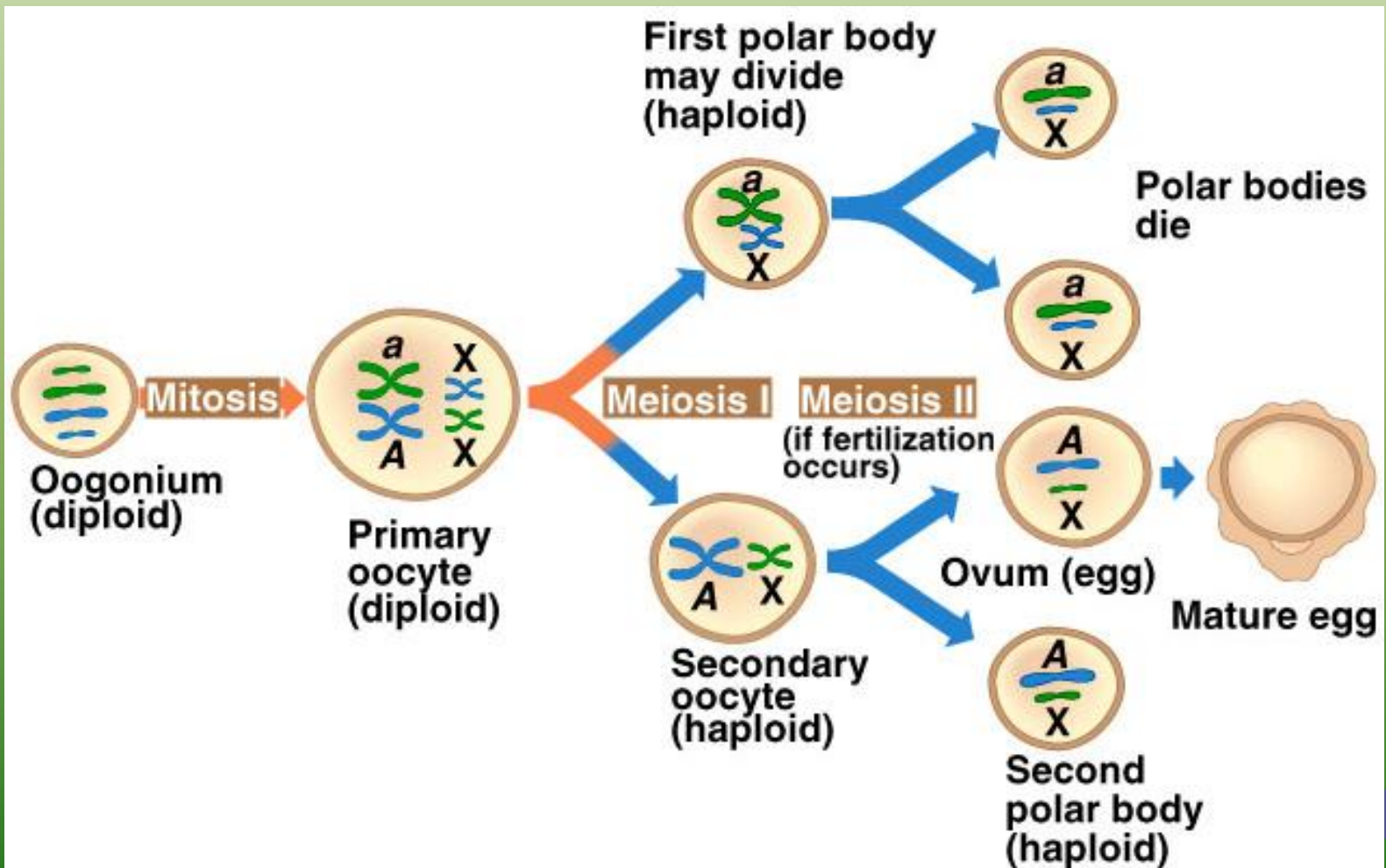


# SPERMATOGENESIS - STEPS

- **INTERPHASE:** Spermatogonium ( $2n$ ) grows & replicates its chromosomes. Is now called a **primary ( $1^\circ$ ) spermatocyte ( $2n$ )**.
- **MEIOSIS I:**  $1^\circ$  spermatocyte divides  $\rightarrow$  forms two **secondary ( $2^\circ$ ) spermatocytes ( $1n$ )**.
- **MEIOSIS II:** each  $2^\circ$  spermatocytes divides  $\rightarrow$  each forms two **spermatids ( $1n$ )**.
  - Total of 4 **spermatids ( $1n$ )**
- Spermatids undergo period of maturation to form **spermatozoa (sperm)**.



# OOGENESIS



# OOGENESIS

- **WHAT:** meiosis in females

Produce only 1 mature egg cell, 3 polar body cell  
(can not use these)

- **WHERE:** occurs in ovaries

- **WHO:** germ cells → Oogonia( $2n$ ) .

- Oogonia divide by mitosis up to the 3rd month post-conception
- Meiosis I occurs BEFORE birth, Meiosis II occurs over many years





# OOGENESIS

## BEFORE BIRTH

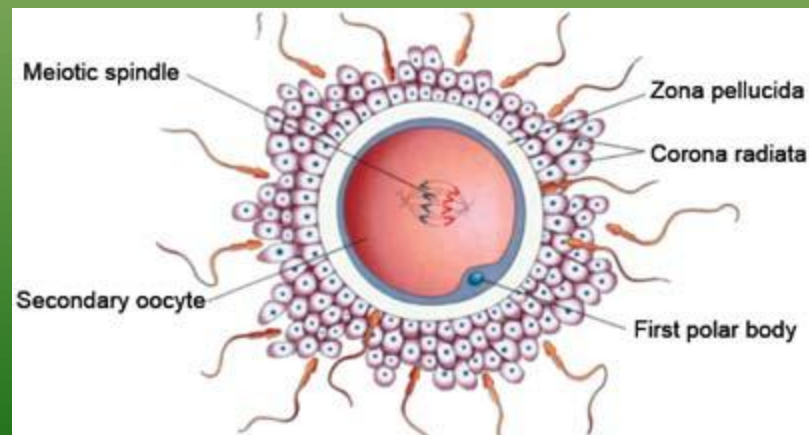
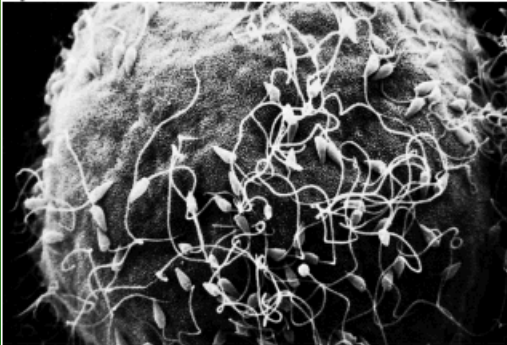
- **INTERPHASE:** Oogonia (2N) grow & replicate chromosomes
  - developing into **primary (1°) oocytes** (2n)
  - ~1 million 1° oocytes are in the ovaries
- **MEIOSIS I:** 1° oocytes divide → BUT PAUSE in prophase I until puberty
  - Only about 400,000 remain
- **Beginning at puberty** & continuing until menopause, one or a few complete meiosis I → forming a large **secondary (2°) oocyte** & a very small **1st polar body** (unequal cytokinesis).



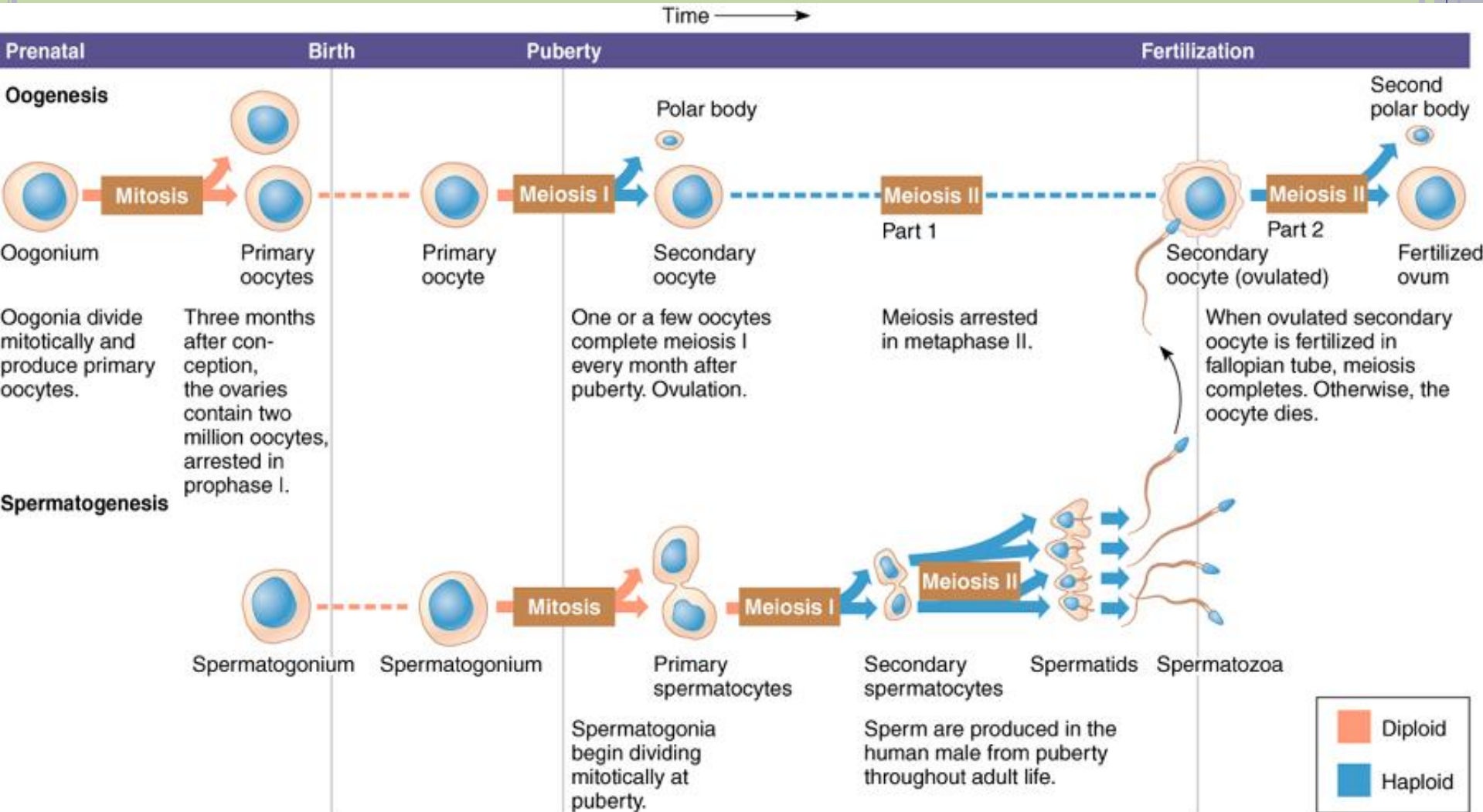
# OOGENESIS

- **MEIOSIS II:** 2° oocyte begins → but is **PAUSED** in **Metaphase II**.
  - The 2° oocyte is ovulated monthly
- Meiosis II will not be completed unless **a sperm enters the 2° oocyte's outer membrane**.
  - At completion of meiosis II, **1 large ovum & 3 small polar bodies** are produced
  - All polar bodies degenerate. Thus, only 1 functional cell results (ovum).

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**Sperm Cells on the Surface of an Egg Cell**



# Comparison of Oogenesis & Spermatogenesis



# GAMETOGENESIS

## Spermatogenesis

- sperm are continually produced from puberty till death.
- spermatogenesis begins at puberty and is completed right away
- is a continuous process (spermatogonium -> sperm takes 74 days).

## Oogenesis

- a woman is born with all the primary oocytes she is ever going to produce.
  - when she is 40 years old, her oocytes are 40 years old
- oogenesis begins before birth, but is not completed until fertilization occurs (sperm stimulates completion of meiosis II).
- oogenesis is not a continuous process (halted twice - prophase I & metaphase II).
- women ovulate over short period of lifetime (puberty to menopause). She will ovulate ~ 400 secondary oocytes in her lifetime.



1



## HORSE FERTILIZATION



2

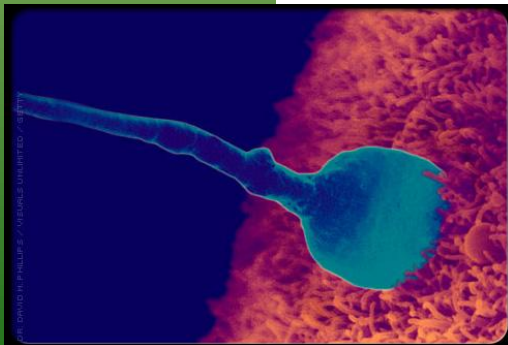
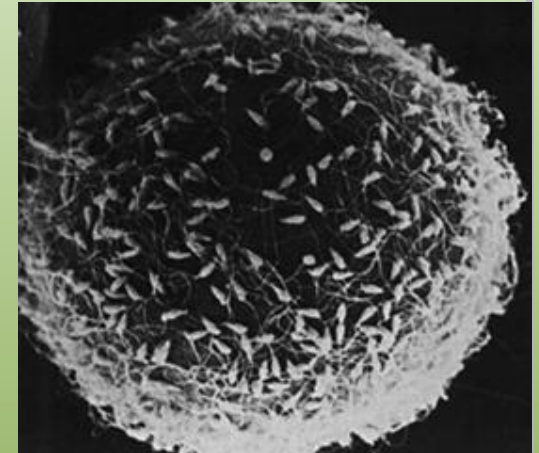
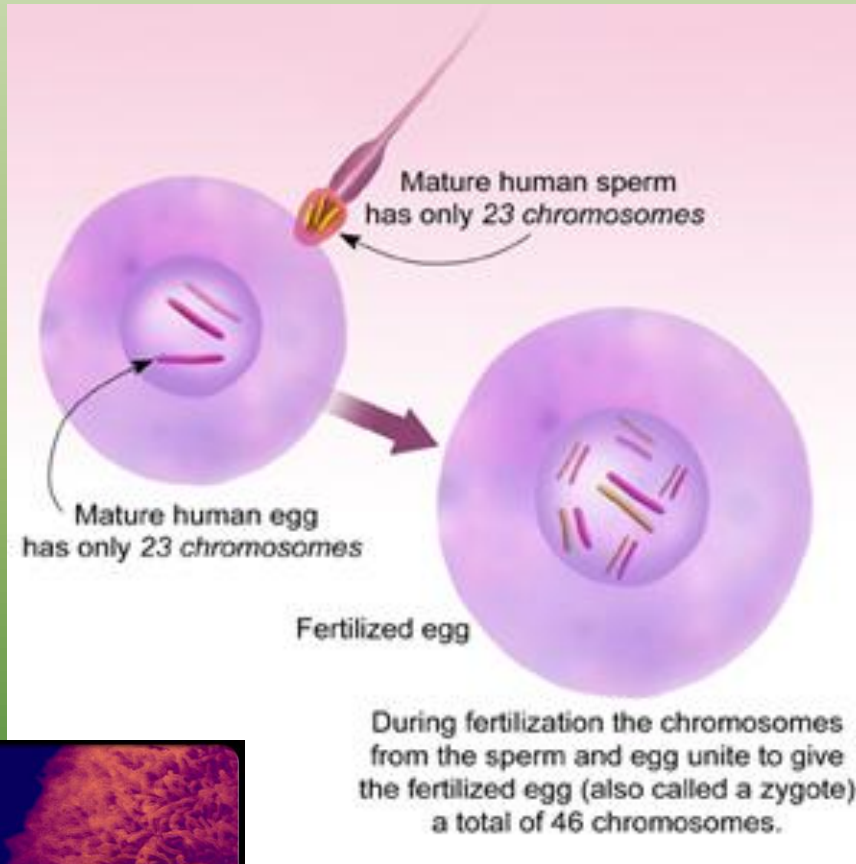


3





# FORMING A ZYGOTE





2 cells



3D embryo



5 cells



20 cells



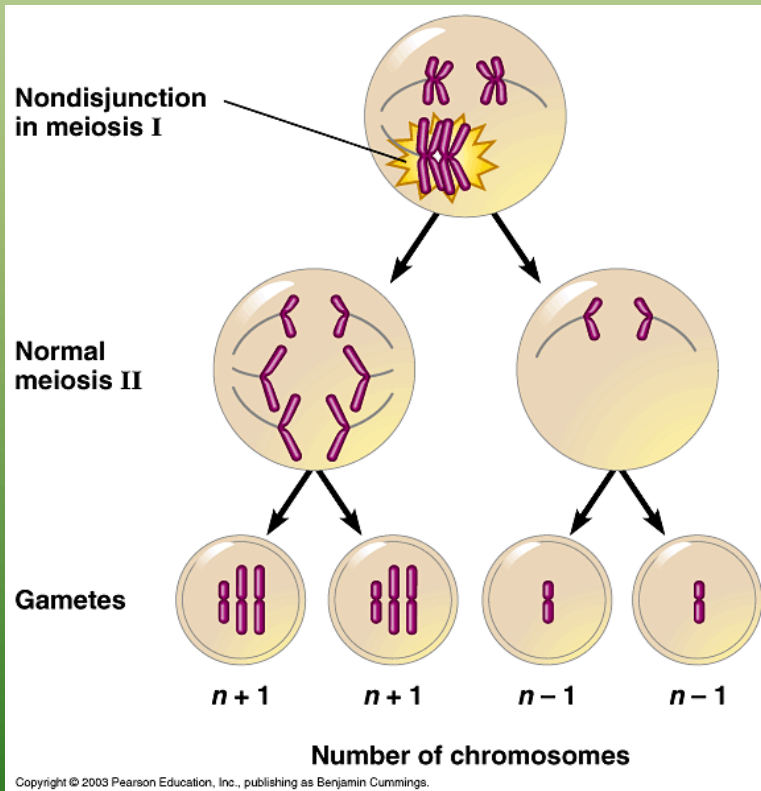


**WHAT HAPPENS IF  
CHROMOSOMES DON'T  
SEPARATE?**

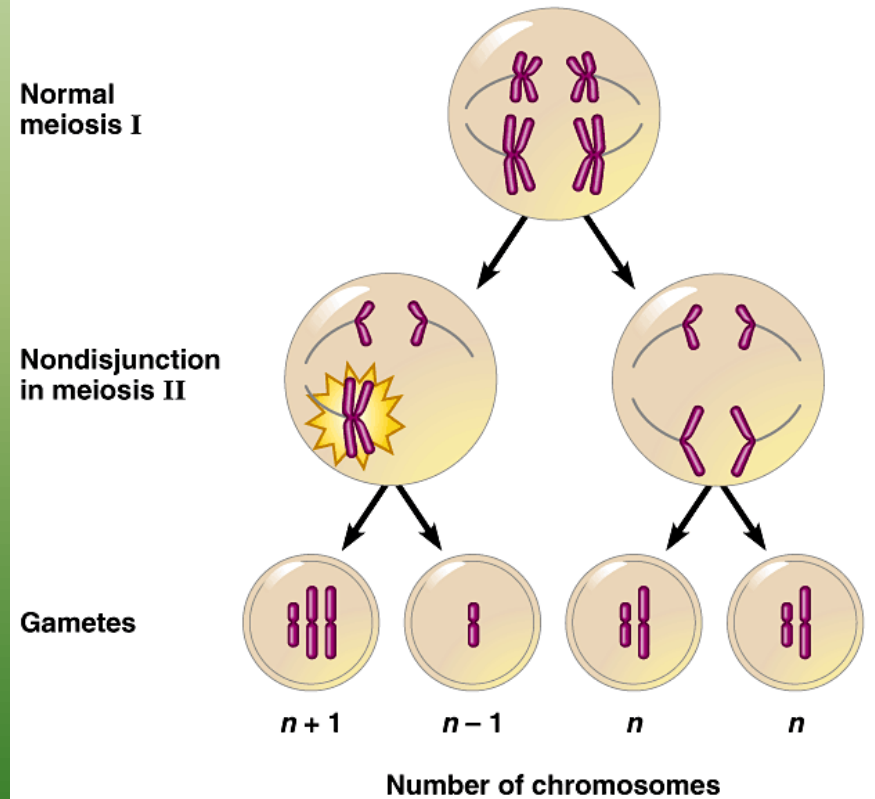


# NONDISJUNCTION

## Meiosis I



## Meiosis II



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