

Regents Biology

* Class Notes*

(pp.417-422, 428-435, 457-467, 441-446)

North Salem High School

MISSION: *Engage students to continuously learn, question, define and solve problems through critical and creative thinking.*

Meiosis

(Sexual Reproduction)

(pp.417-422, 428-435, 457-467, 441-446)

Now that you know how the body makes new, genetically identical cells, we will now take look at how your body makes the cells that make a baby. Sex cells or gametes are genetically different or unique and contain only HALF the number of chromosomes normally found in body cells.

Let's get to work!

If you have any problems – please sign up for extra help after school.

**Collea
Room W-19**

SEXUAL REPRODUCTION

** All cells come from pre-existing cells.*
(However, sometimes one cell comes from two cells)

I. MEIOSIS (pp. 417-422)

Upon completion of this section the student will:

1. Recognize that each species has a characteristic number of chromosomes.
2. Recognize that chromosomes exist in pairs in body cells.
3. Define the following terms correctly:
homologous chromosomes, diploid, haploid (monoploid), gametes, and gonads.
4. Define the term *gametogenesis*.
5. Explain **HOW** and **WHY** the chromosome number is cut in half in cells produced by meiosis.
6. Recognize that meiosis only occurs in the *gonads* (sex organs) and results in the production of *gametes* (sex cells).
7. Describe the first meiotic division and explain the following terms:
tetrad, synapsis, crossing over and disjunction.
8. Explain how nondisjunction may result in *Down's Syndrome* or polyploidy.
9. Describe how the second meiotic division is just like mitosis **WITHOUT** replication.
10. Explain **HOW** and **WHY** the cells formed as the result of meiosis show variation from each other and their parent cell.
11. Compare and contrast the processes of *spermatogenesis* and *oogenesis*.
12. Compare and contrast the structure of a *sperm* and *egg cell*.

VOCABULARY

asexual reproduction
sexual reproduction
meiosis
chromosome
homologous chromosome
testes
haploid
progesterone
somatic cells (body cells)
polar bodies

synapsis
crossing over
tetrad formation
disjunction
nondisjunction
ovaries
testosterone
karyotype
sperm

gametogenesis
spermatogenesis
oogenesis
gametes (sex cells)
gonad
diploid (2n)
estrogen
Down's Syndrome
egg

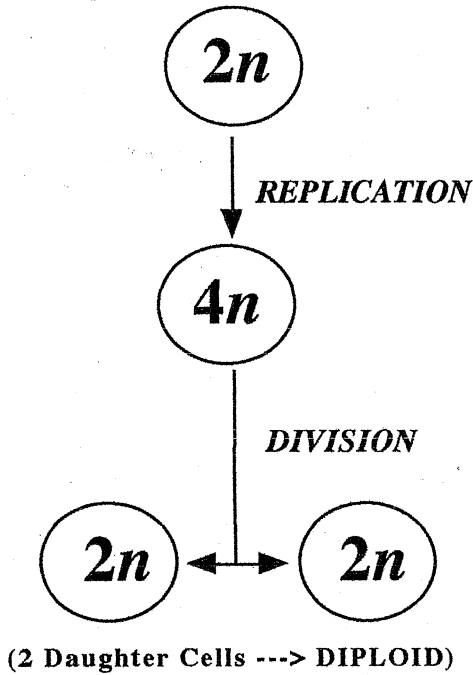
A. ASEXUAL vs. SEXUAL REPRODUCTION

ASEXUAL

- (1) Involves only _____ cell/parent.
- (2) Daughter cells or offspring are genetically _____ to original cell or parent.



(Original Cell ---> DIPLOID)

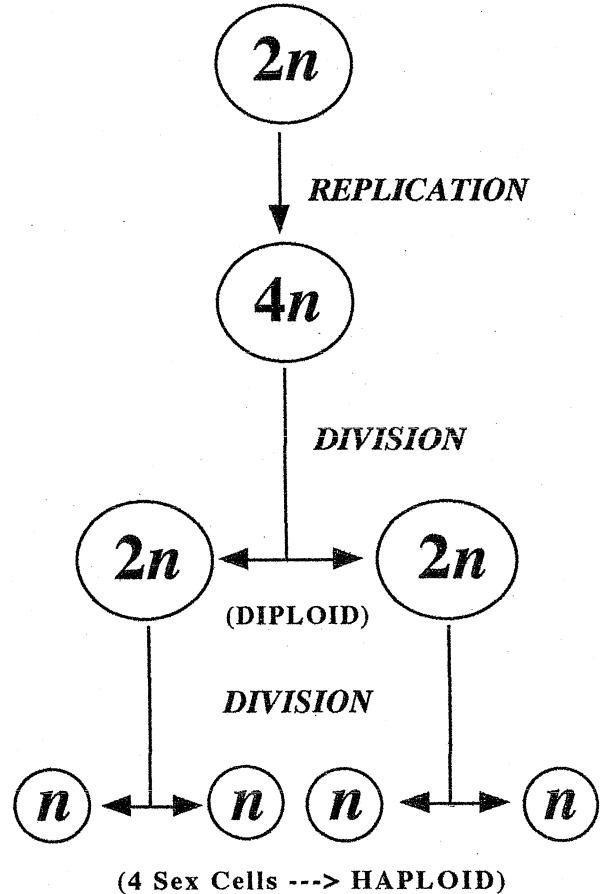


SEXUAL

- (1) Involves _____ cells/parents.
- (2) Daughter cells or offspring are genetically _____ from original cell or parent.



(Original Cell ---> DIPLOID)



MALES: _____

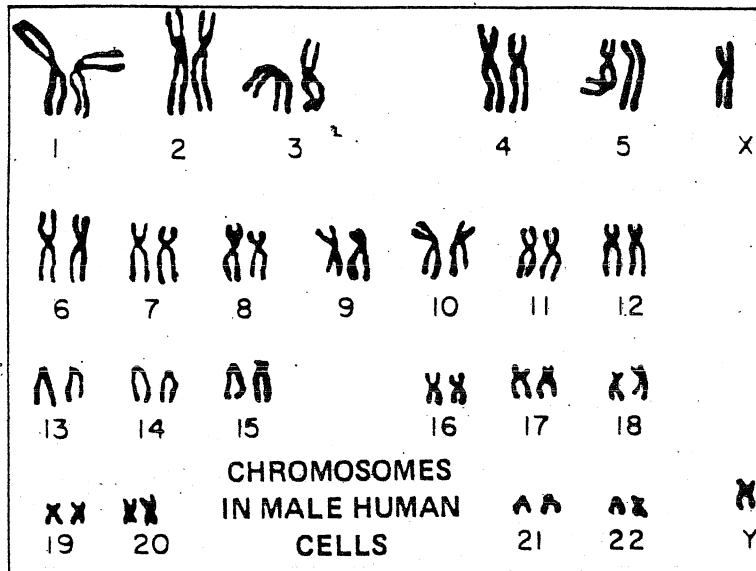
FEMALES: _____

B. MEIOTIC CELL DIVISION

1. BACKGROUND INFORMATION

- Different organisms have a different amounts of DNA and so have different number of chromosomes that make up that species. The characteristic number of chromosomes found in any given species is called the _____ number.
- The diploid chromosome number for humans (*Home sapien*) is _____.
- _____ chromosomes came from your mother's egg and _____ chromosomes came from your father's sperm.
- The 46 chromosomes consists of 23 _____ pairs.
- These homologous chromosomes are separated by _____.

The 23 homologous pairs of chromosomes in a human cell.

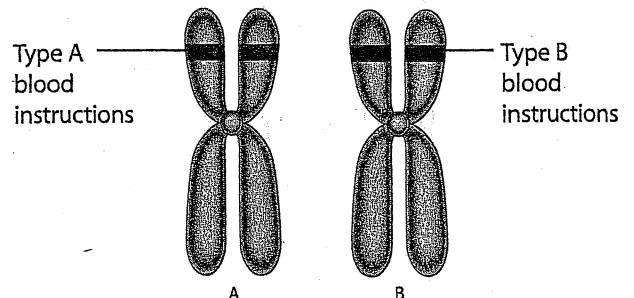


The two chromosomes of each homologous pair contain the same AMOUNT of DNA and so are of similar size and shape. However, since one came from your mother and the other came from your father, each chromosome will differ in the specific information or GENES they carry.

FOR EXAMPLE: Chromosome A, from your mother, may carry the gene to make the protein that will give you Type A blood. Chromosome B, from your father, may carry the gene to make the protein that will give you type B blood.

Your blood type is just one of many **TRAITS** coded in the genes of these two chromosomes.

Homologous chromosomes with different genes.



C. STAGES OF MEIOSIS (IPMAT ---> PMAT)

Stage Name:

Stage Description:

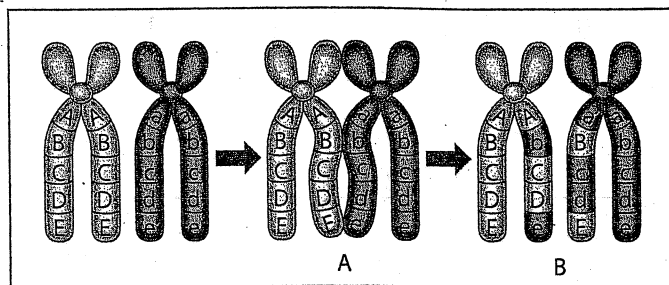
(1) INTERPHASE-I

- DNA _____ occurs.
(Single-Stranded Chromosome ----> Double-Stranded Chromosome)

(2) PROPHASE-I

- Double-Stranded _____ chromosomes pair up in a process called _____ forming a group of _____ chromatids called a _____.
- During _____, chromosome strands *twist* around each other and _____ DNA segments (*genes*) in a process called _____.

CROSSING OVER



When homologous chromosome line up in pairs during meiosis, their strands may connect or cross over (A) and then separate. The separation of paired homologous chromosomes at the end of synapsis is called *disjunction*. The resulting chromosomes carry different genes.

(3) METAPHASE-I

- _____ line up in the _____ of the cell.

(4) ANAPHASE

- _____ separate and _____ chromosomes move to opposite sides of the cell

(5) TELOPHASE

- Nuclear membrane reforms around each nuclei.

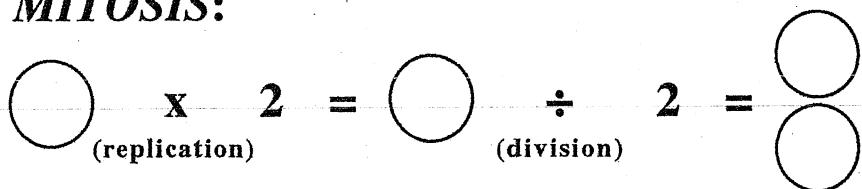
CYTOKINESIS results in the formation of 2 cells with half the number of chromosomes. However, each chromosome is already in the replicated form ---> **DOUBLE-STRANDED**

MEIOSIS-II

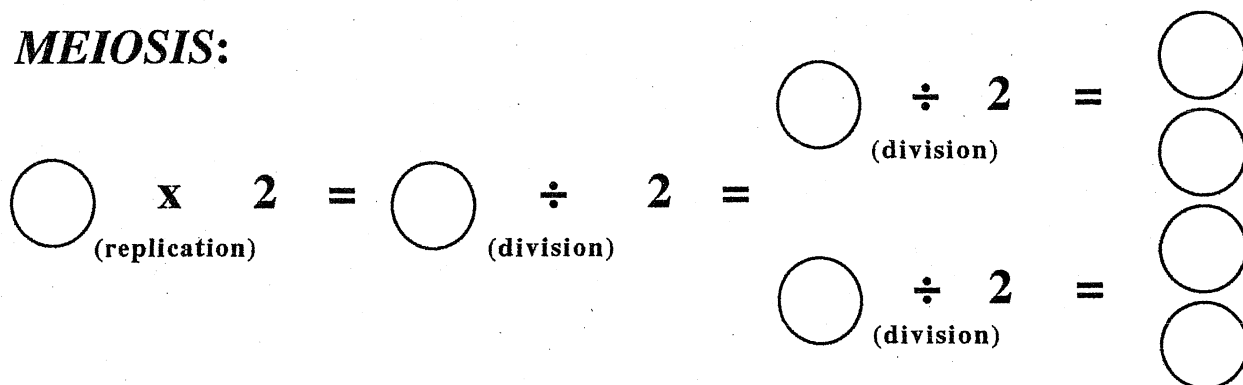
The second phase of Meiosis is just like MITOSIS but **without** Interphase (replication) and with **HALF** the number of chromosomes resulting in **HAPLOID GAMETES**.

D. THE MATH OF MITOSIS AND MEIOSIS IN HUMANS

(1) MITOSIS:



(2) MEIOSIS:



E. COMPARISON OF MITOSIS AND MEIOSIS

MITOSIS	MEIOSIS
<ul style="list-style-type: none"> Occurs in the growth and repair of body cells as well as in ASEXUAL reproduction. Involves ONE replication followed by ONE cell division. Cells produced contain the _____ number of chromosomes. 	<ul style="list-style-type: none"> Occurs in the production of sex cells or GAMETES. Involves ONE replication followed by TWO cell divisions. Cells produced contain _____ the number of chromosomes.

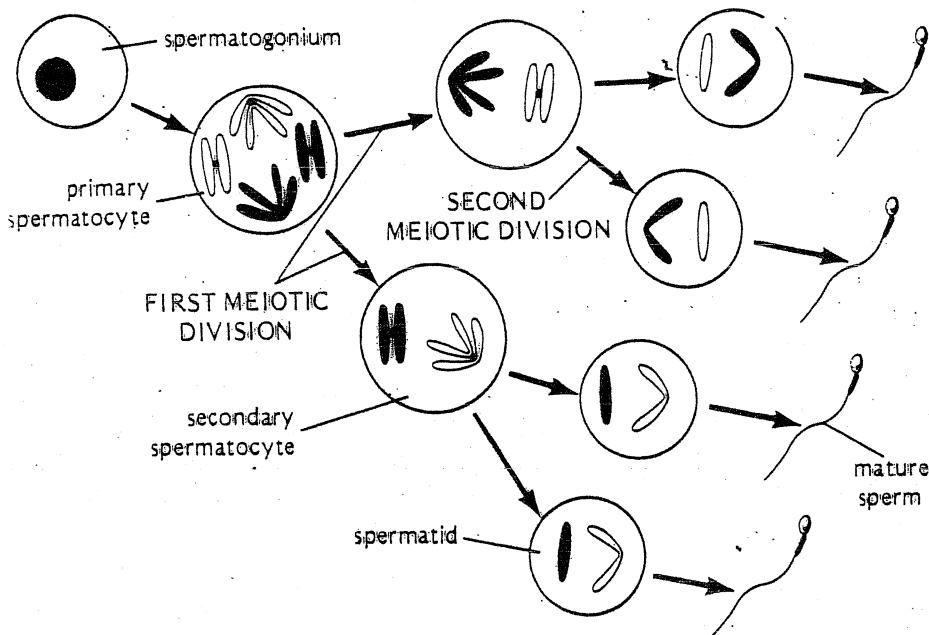
II. GAMETOGENESIS (pp. 428-435)

(GAMETE = sex cells) (GENESIS = creation)

A. SPERMATOGENESIS

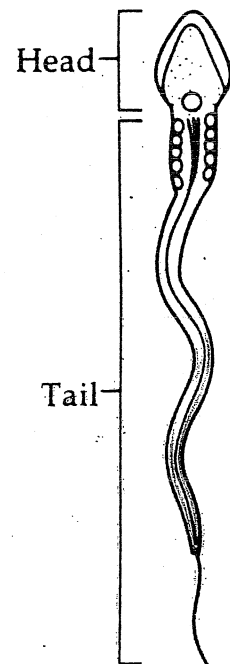
(SPERM = sperm) (GENESIS = creation)

- The production of _____ in the _____ of men.
- Under the influence of the male sex hormone _____.
- Results in the formation of _____ functional sperm cells capable of movement.



SPERM STRUCTURE

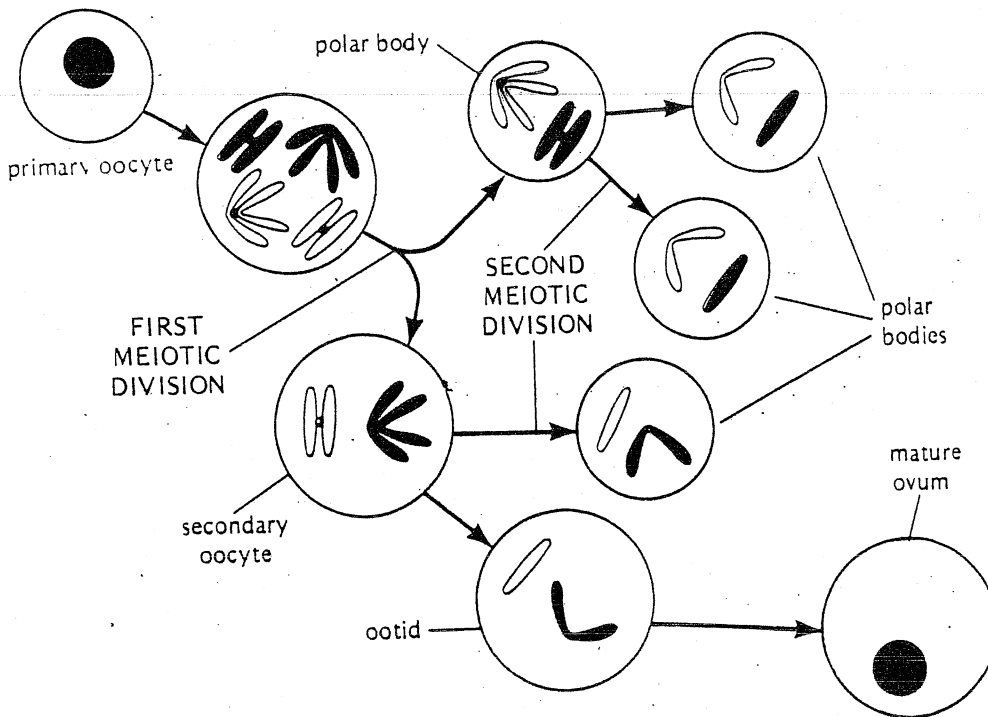
- Designed to carry the man's 23 chromosomes to the egg.



B. OOGENESIS

(OO = egg) (GENESIS = creation)

- The production of _____ or _____ in the _____ of women.
- Under the influence of the female sex hormone _____.
- Results in the formation of _____ functional egg cell and _____ non-functional _____.

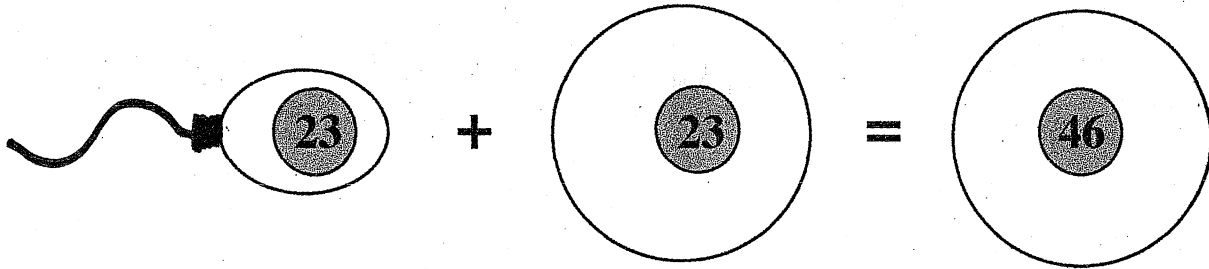


C. COMPARISON OF SPERM AND EGG

SPERM	EGG
<ul style="list-style-type: none"> • contain 23 chromosomes • made up of a head, neck and a tail. • motile (can move) 	<ul style="list-style-type: none"> • contain 23 chromosomes • has a YOLK to nourish the developing embryo. • non-motile (cannot move)

III. **FERTILIZATION** = union of sperm and egg

• **SPERM** (haploid; n) + **EGG** (haploid; n) \dashrightarrow **ZYGOTE** (diploid; $2n$)



A. TWO TYPES OF FERTILIZATION

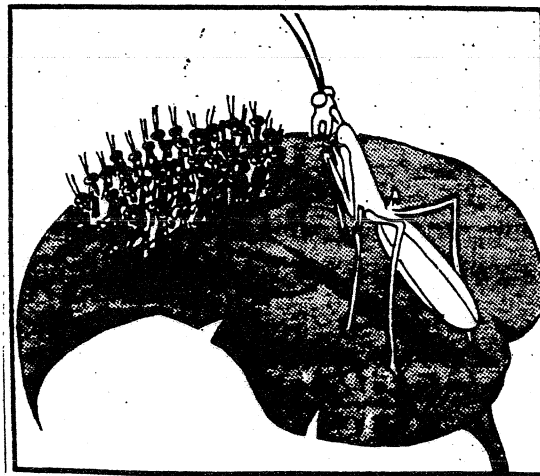
(1) **INTERNAL FERTILIZATION** - _____

(2) **EXTERNAL FERTILIZATION** - _____

• In this process, the female produces a **LARGE** number of eggs because:

(a) _____

(b) _____



"Of course, long before you mature, most of you will be eaten."

MEIOSIS and **FERTILIZATION** maintain the **DIPLOID** chromosome number of a species from generation to generation

