

# Chapter 11 Meiosis Page 323

## Section 1: Chromosome Number

How many sets of genes are found in most adult organisms?

- Organisms with 2 parents must inherit a single copy of every gene from each parent.
- When this organism produces gametes, those 2 sets of genes must be separated so that each gamete contains just 1 set of genes.
- The number of chromosomes determines the organism

Organism	Chromosome number	Thus how many from each parent	Diploid Number	Haploid Number
Human	46	23	46	23
Fruit flies	8	4	8	4
Garden peas	14	7	14	7
Chimpanzees	48	24	48	24
Dog	78	34	78	34
Amoeba	50	25	50	25

Homologous

Chromosomes: the 2 sets of chromosomes from the male and female parent

**Diploid:** a cell that contains both sets of homologous chromosomes

- This means that a diploid cell has 2 complete sets of duplicated chromosomes and 2 complete set of genes from each parent
- This is called the 2N
- Examples: skin, hair, tooth, bone, all cells but reproductive gametes

**Haploid:** a cell that contains a single set of chromosomes

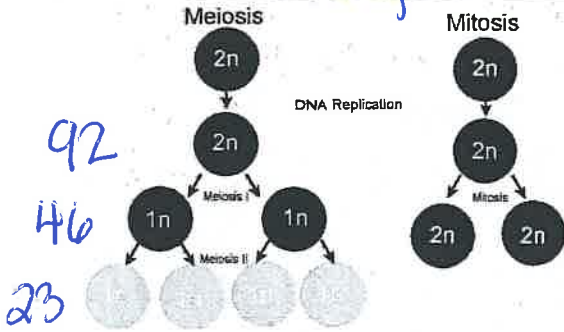
- This means that a haploid cell has 1 set of chromosomes total
- This is called the "N"
- Examples: Gametes
  - Females = egg (ovum, ootid) = oogenesis
  - Males = sperm = spermatogenesis

Practice

## ~Phases of Meiosis~

How are haploid (N) gamete cells produced from diploid (2N) cells?

Meiosis is a process in which the number of chromosomes per cell is cut in half through the separation of homologous chromosomes



- Meiosis produces gametes
- There are 2 distinct divisions of the nucleus
- Results in 4 haploid cells

Chromosomes number goes from:

92 → 46 → 23  
interphase    meiosis I    meiosis II

## MEIOSIS I

- This is the first division of the nucleus
- Must go through interphase
  - This means that the chromosomes get duplicated
  - Each replicated chromosome consists of 2 identical chromatids joined at the center

### PROPHASE I

- Pairing of homologous chromosomes occurs, each chromosome consists of 2 chromatids
- spindle fibers form and bind to centromere
- This pairing forms a tetrad
- These tetrads go through Crossing Over
  - produces exchange of genetic information
- Each replicated chromosomes pairs with its coresponding homologous pair
- Nuclear envelope/membrane dissolve



### METAPHASE I

- Paired homologous Chromosomes line up across the center of the cell
- spindle fibers have moved the tetrad to the center

### ANAPHASE I

- Homologous chromosomes seperate and move to opposite poles of the cell
- Chromosome number is reduced from 2n to n since the tetrad pair separated
- Each chromosome (now) consists of 2 sister chromatids

### TELOPHASE I & Cytokinesis

- nuclear membrane reforms around each cluster of chromosomes
- Cytokinesis follows by pinching the cytoplasm in half
- This results in creating 2 new cells
- These cells are different from each other
- Must now go through meiosis II to get the proper chromosome number

# MEIOSIS II

Start in interphase but Synthesis (DNA replication) does not occur

Why would this be important? need to get to the proper chromosome #

## PROPHASE II

- Chromosomes become Visible
- What do they look like? only X not XX  
(2 chromatids) Not (4 chromatids)

## METAPHASE II

- Chromosomes line up in the middle of each cell

## ANAPHASE II

- Centromere splits
- Sister chromatids separate and move to opposite poles of the cell

## TELOPHASE II & Cytokinesis

- nuclei form around each set of chromosomes (4 total)
- Each nuclear membrane reforms
- Cytoplasm divides in half creating 4 cells
- The end result of meiosis II 4 haploid daughter cells
- All are genetically different from each other
  - Creation of eggs for females
  - Creation of sperm for males
  - As humans there should be 23 chromosomes in each gamete cell
  - This is called the "N" amount

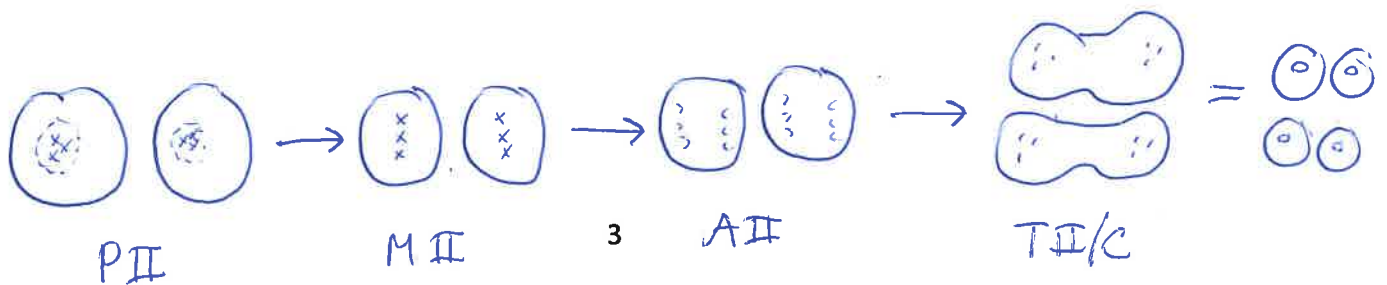
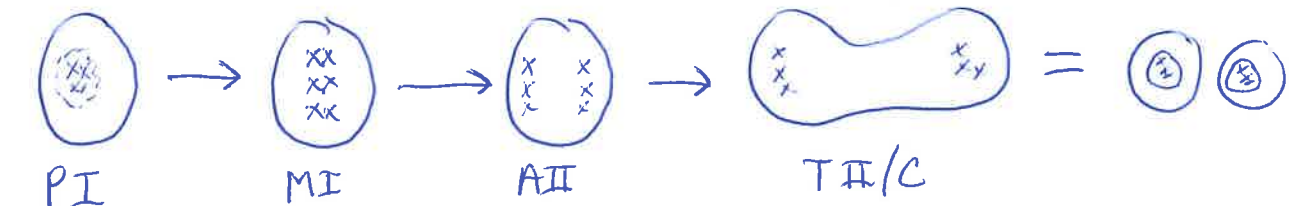
## ~Gametes to Zygotes~

-After the egg gamete gets fertilized by the sperm gamete

-This is called a zygote (a fertilized egg cell)

-This zygote will undergo many divisions by mitosis eventually forming a new organism

genetic variation =  $2^{23}$  combo = 64 trillion options of a kid  
8 million options you personally can give



## Comparing Mitosis and Meiosis

	MITOSIS	MEIOSIS
How many nuclear divisions?	1	2
How many DNA replications?	1	1
Total number of cells produced at the end of each process	2	4
How do the cells look to each other?	identical	different
What type of cells are made through this process?	body cells somatic cells	gametes (egg/sperm)
Why does each process occur?	heal, growth	make new organisms
How many chromosomes would a human have at the end of each process?	46 (2n)	23 (n)
What type of reproduction does this occur in?	asexual	sexual
How many sets of chromosomes (the word)?	diploid	haploid