CORNELL NOTES
Directions: You must create a minimum of 5 questions in this column per page (average). Use these to study your notes and prepare for tests and quizzes. Notes will be stamped after each assigned sections (if completed) and turned in to your teacher at the end of the Unit for scoring.

UNIT 3: Genetics
Chapter 6: Meiosis and Mendel

I. Chromosomes and Meiosis (6.1)

A. You have many types of specialized cells in your body

1. **Cells** can be divided into _____ **types**

a. _____ **Cells**- body cells. Make up most of your body tissues and organs.

b. _____ **Cells**- cells in your reproductive organs, the ovaries and testes

1). Can develop into _____ (called **sex cells**)

2). Form _____ and _____ cells

2. Gametes have DNA that is passed to offspring in _____

B. Each species has characteristic number of chromosomes per cell.

1. Chromosome number does not seem to be linked to _____ of organism.

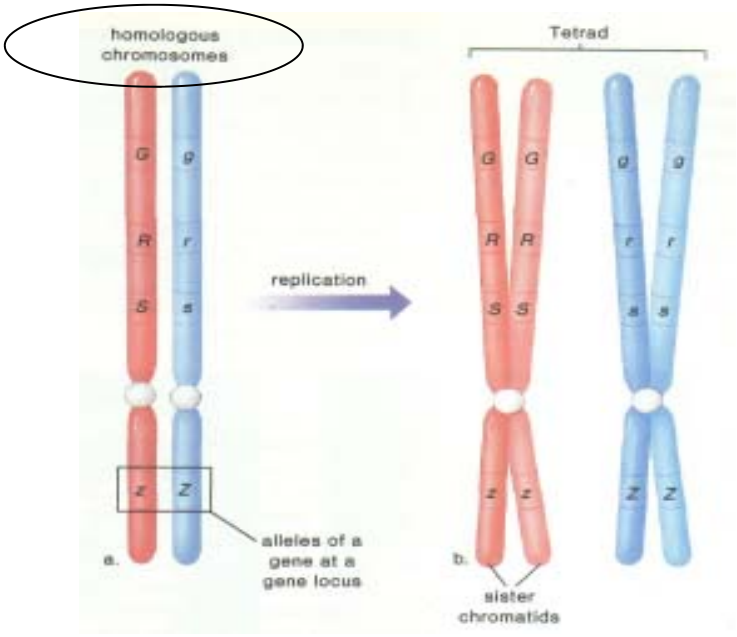
2. Organisms differ from each other because of way genes are _____, not because they have **different genes**.

II. You cells have autosomes and sex chromosomes

A. Your body has _____ **pairs of chromosomes**

1. Each pair referred to as _____ **pair**

2. **Homologous chromosomes** are two chromosomes- one from _____ and one from _____



B. **Autosomes**- chromosome pairs ____-____ are called autosomes (are _____)

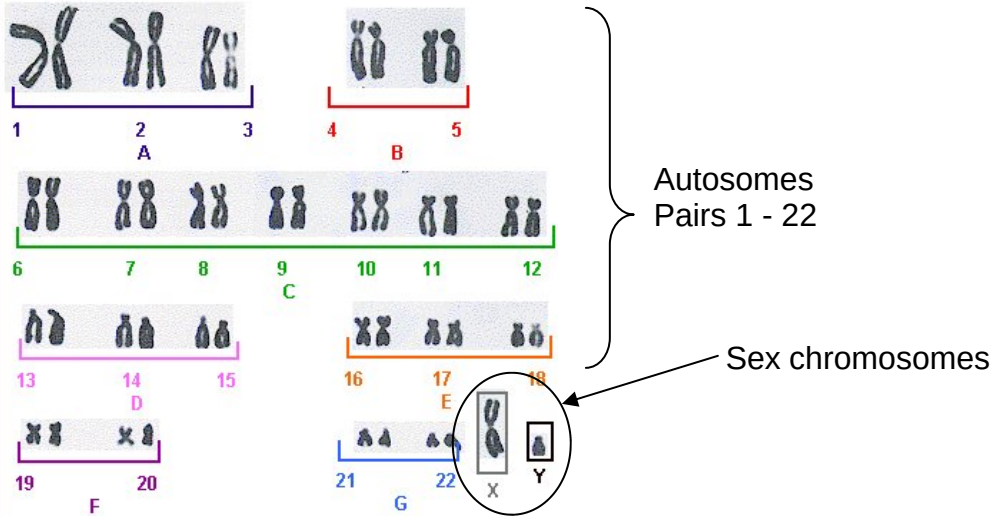
C. _____ **chromosomes**- <u>pair</u> of chromosomes

1. Directly control development of **sexual characteristics**

2. Very different in humans (_____ homologous)

a. **X chromosome-** _____

b. **Y-chromosome-** _____



D. Body cells are _____; gametes are _____

1. sexual reproduction involves _____ of <u>two gametes</u>

a. results in **genetic mixture** of _____ <u>parents</u>

b. Fusion of egg and sperm called _____

c. **Egg** and **sperm** only have _____ **usual number of chromosomes**

2. Diploid and Haploid cells

a. **Body cells** are _____ (two copies of each chromosome)

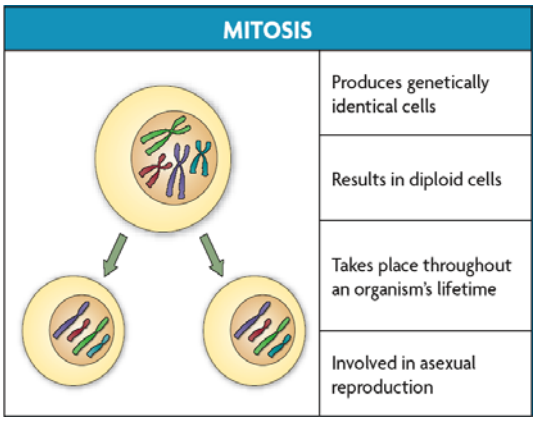
b. **Gametes** are _____ (have one copy of each chromosome)

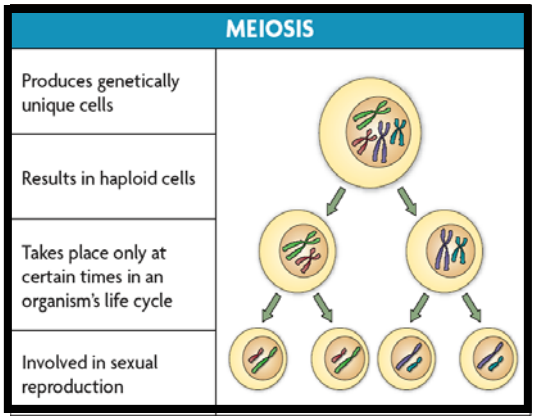
3. Maintaining the correct number of chromosomes is important to _____ of organisms

4. **Germ cells (sex cells)** undergo process of _____ to form **gametes**

a. diploid cell divides into _____ cell

b. Sometimes called _____ **division**





II. Process of Meiosis (6.2)

A. Cells go through _____ **rounds of division** in meiosis

1. **Meiosis produces** ____ **haploid cells** from one diploid cell

2. Process involves two rounds of _____ _____- **Meiosis I** and **Meiosis II**.

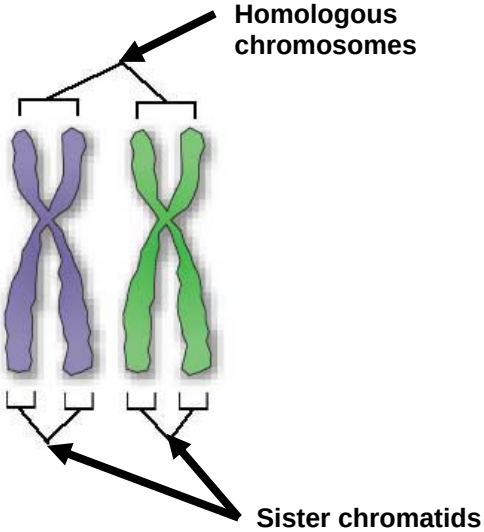
B. Homologous Chromosomes and sister Chromatids

1. Need to distinguish between the two to understand meiosis

2. _____ **chromosomes**- two separate chromosomes- one from mother, one from father.

a. very similar to each other- **same** _____ and **carry same** _____

b. Each half of duplicated chromosome is called a _____. (together called **sister chromatids**)



1). Homologous chromosomes divided in _____

2). Sister chromatids not divided until _____

C. **Meiosis I** (first of _____ phases)

1. Occurs after DNA has been _____

2. Divides homologous chromosomes in _____ **phases**

D. **Meiosis II** (second of two phases)

1. Divides sister _____ in **four phases**

2. DNA is _____ replicated between meiosis I and meiosis II

E. Meiosis differs from mitosis in significant ways.

1. **Meiosis** has ____ **cell divisions** while **mitosis has** ____.

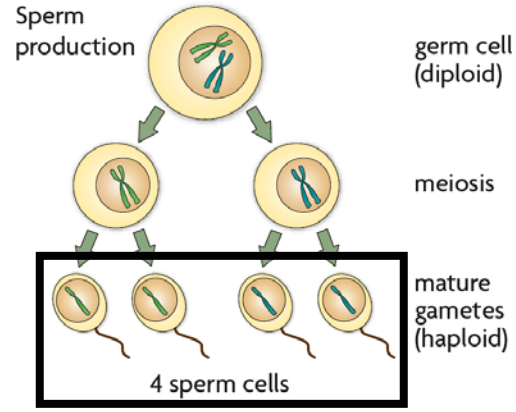
2. In mitosis, homologous chromosomes never pair up

3. **Meiosis** results in _____ cells; **mitosis** results in _____ cells.

F. Haploid cells develop into mature _____

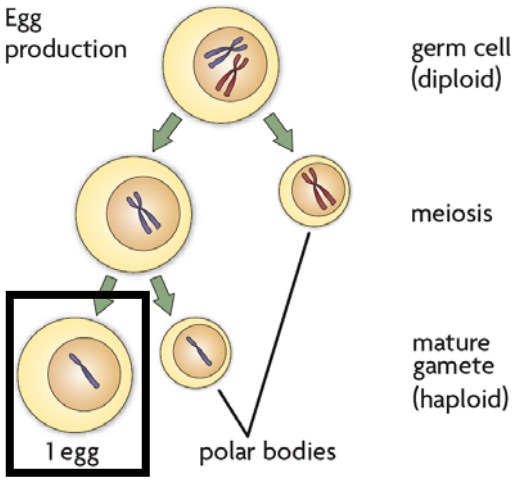
1. _____- production of mature gametes

2. Differs between the sexes



a. **Males** produce 4 equal _____ cells

b. **Females** produce _____ large egg and smaller polar bodies that are eventually broken down



III. Mendel and Heredity (6.3)

A. **Mendel laid the groundwork for genetics**

1. _____ are distinguishing characteristics that are inherited.

2. **Genetics** is the study of **biological inheritance patterns** and variation.

3. Gregor Mendel showed that traits are inherited as _____ _____

4. Many in Mendel's day thought traits were _____.

B. Mendel's data revealed _____ **of inheritance**

1. Mendel studied plant variation in a monastery garden

2. Mendel made _____ key decisions in his experiments

a. **Control over** _____

b. Use of _____ plants

c. Observation of "_____-____" traits (only appear two alternate forms)

3. Experimental design

a. Mendel chose _____ **plants** because reproduce quickly and could control how they mate

b. Crossed purebred white-flowered with purebred purple-flowered pea plants.

1). Called **parental**, or ____ - _____

2). Resulting plants (first filial or ___ - _____) all had purple flowers

c. Allowed F_1 generation to self-pollinate

1). Produced _____ **generation** that had both plants with purple and white flowers)

2). Trait for white had been "_____", it did not disappear.

d. He began to observe **patterns**- Each cross yielded similar ratios in F_2 generation (_____ **had purple, and** _____ **white**)

FIGURE 6.10 MENDEL'S MONOHYBRID CROSS RESULTS			
F_2 TRAITS	DOMINANT	RECESSIVE	RATIO
Pea shape	5474 round	1850 wrinkled	2.96:1
Pea color	6022 yellow	2001 green	3.01:1
Flower color	705 purple	224 white	3.15:1
Pod shape	882 smooth	299 constricted	2.95:1
Pod color	428 green	152 yellow	2.82:1
Flower position	651 axial	207 terminal	3.14:1
Plant height	787 tall	277 short	2.84:1

4. Mendel made three important conclusions

a. **Traits are inherited as** _____ **units** (explained why individual traits persisted without being blended or diluted over successive generations)

b. Two other key conclusions collectively called the _____ ____ _____

1). Organisms **inherit two copies** of each **gene**, one from each _____

2). **Organisms donate only** _____ **copy** of each gene in their gametes (two copies of each gene _____, or separate, during gamete formation.

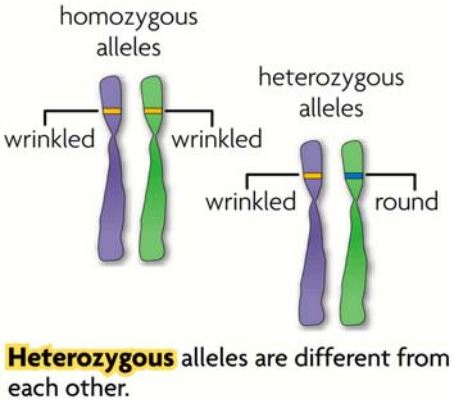
IV. Traits, Genes, and Alleles (6.4)

A. The **same gene** can have **many** _____

1. _____- a "piece" of DNA that provides a set of instructions to a cell to make a certain _____.

a. Most genes exist in many forms (called _____)

b. You have <u>two alleles</u> for each _____`



2. **Homozygous**- means two of _____ allele

3. **Heterozygous**- two _____ alleles

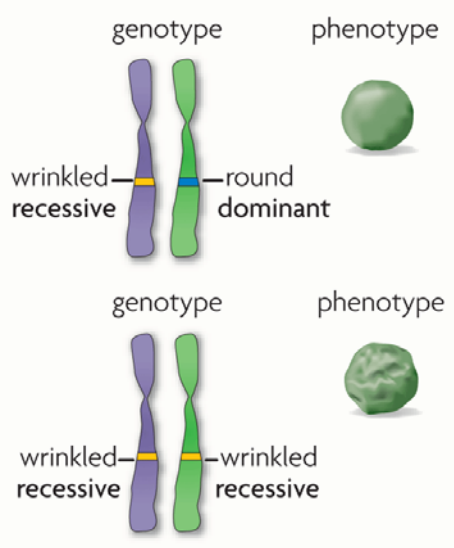
B. Genes influence the development of traits

1. **Genome**- is all the organisms _____ material

2. _____- refers to genetic makeup of a specific set of genes

3. _____- physical characteristics of organism (white or purple flowers)

C. Dominant and Recessive Alleles



1. _____ **alleles**- allele that is expressed when two different alleles or two dominant alleles are present (use capital-letter to represent)

2. _____ **alleles**- only expressed if have two copies of recessive present (use small-case letter to represent)

3. **Homozygous dominant =** _____

4. **Heterozygous =** _____

5. **Homozygous recessive =** _____

D. Alleles and Phenotypes

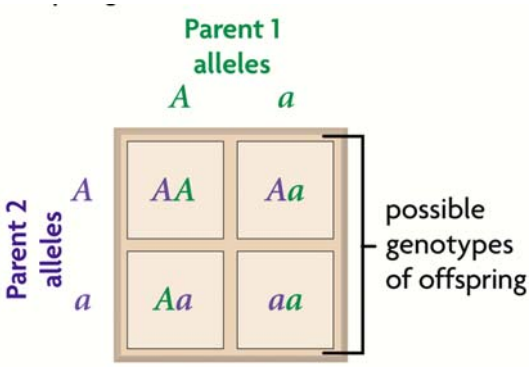
1. Both homozygous dominant and heterozygous genotypes yield a _____ phenotype.

2. Most traits occur in a _____ and <u>do not follow</u> simple dominant-recessive patterns

V. Traits and Probability (6.5)

A. **Punnett squares** illustrate genetic _____

1. Used to _____ **possible genotypes** resulting from a cross



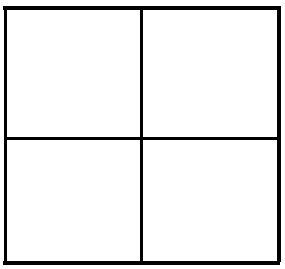
a. _____ of grid represent possible **gamete** genotypes of each parents

b. _____ show **genotypes** of **offspring**

c. Can determine _____ of genotypes in each generation

B. **Monohybrid cross involves one trait**

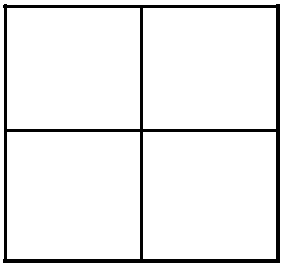
1. **Homozygous dominant X Homozygous recessive**



genotypic ratio = _____

phenotypic ratio = _____

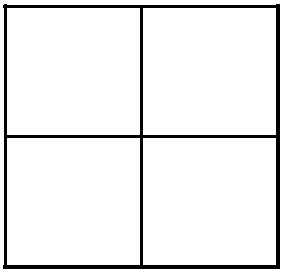
2. **Heterozygous X Heterozygous**



genotypic ratio = _____

phenotypic ratio = _____

3. **Heterozygous X Homozygous recessive**



genotypic ratio = _____

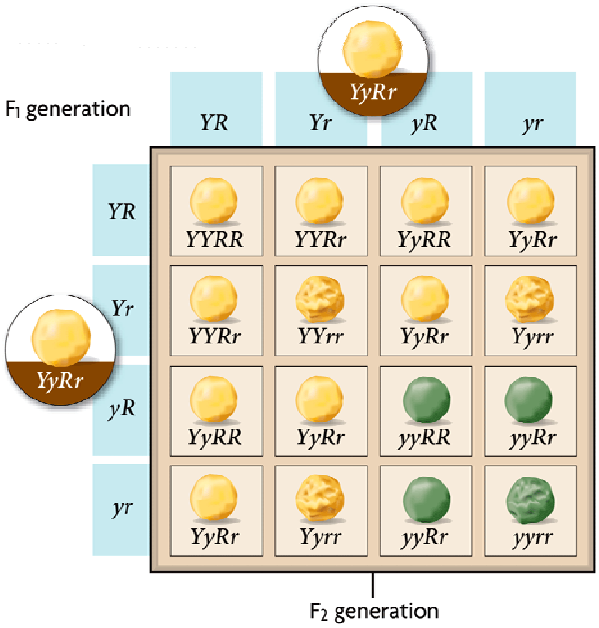
phenotypic ratio = _____

C. **Test Cross**- a cross between organism with an _____ genotype and an organism with a recessive phenotype

D. **Dihybrid** cross involves _____ <u>traits</u>

1. Mendel also conducted dihybrid crosses- wondered if both traits would always appear _____ or if they would be expressed _____ of each other

2. Mendel discovered phenotypic ratio in F_2 generation as always ___:___:___:___ regardless of combination traits he used



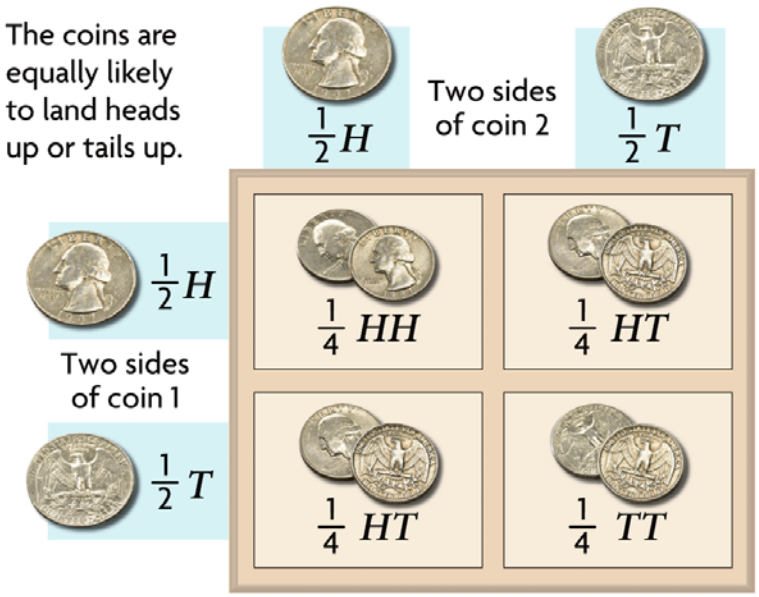
3. Mendel's dihybrid crosses led to his second law, the **law of** _____**assortment.**

4. The law of independent assortment states that **allele pairs** <u>separate independently</u> of each other **during** _____

E. Heredity patterns can be calculated with probability

1. _____ - the likelihood that a particular event will happen

2. Probability applies to _____ events such as **meiosis** and **fertilization**



VI. Meiosis and Genetic Variation (6.6)

A. **Sexual reproduction** creates _____ **gene combinations**

1. Sexual reproduction creates unique combination of genes

a. **independent assortment** of _____ in meiosis

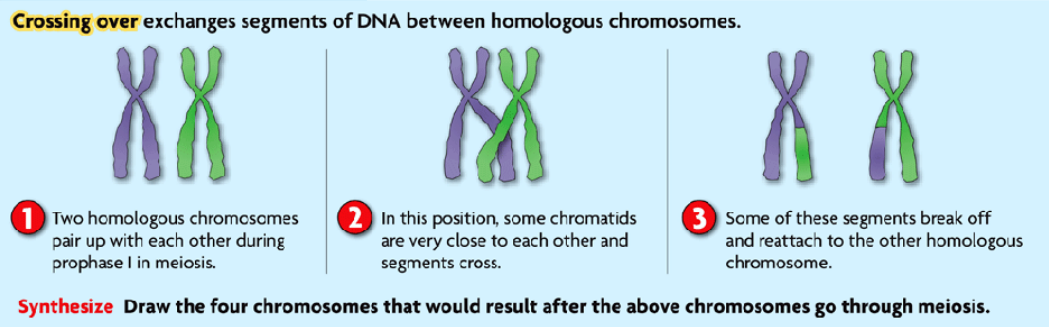
b. **random fertilization of** _____

2. 2^{23} possible sperm or egg cells produced

$2^{23} \times 2^{23}$ = about ____ _____ different combinations of chromosomes

B. Crossing over during meiosis increases genetic _____

1. **crossing over** - exchange of _____ segments between homologous chromosomes during Prophase I of Meiosis I



2. Results in **new combination of** _____

C. _____ **genes** - genes located on the same chromosome inherited together.

1. **Closer together** they are _____ chance of inheriting together

2. If **genes far apart**, _____**-over may separate them**

3. **Gene linkage** used to build **genetic** _____ of many species