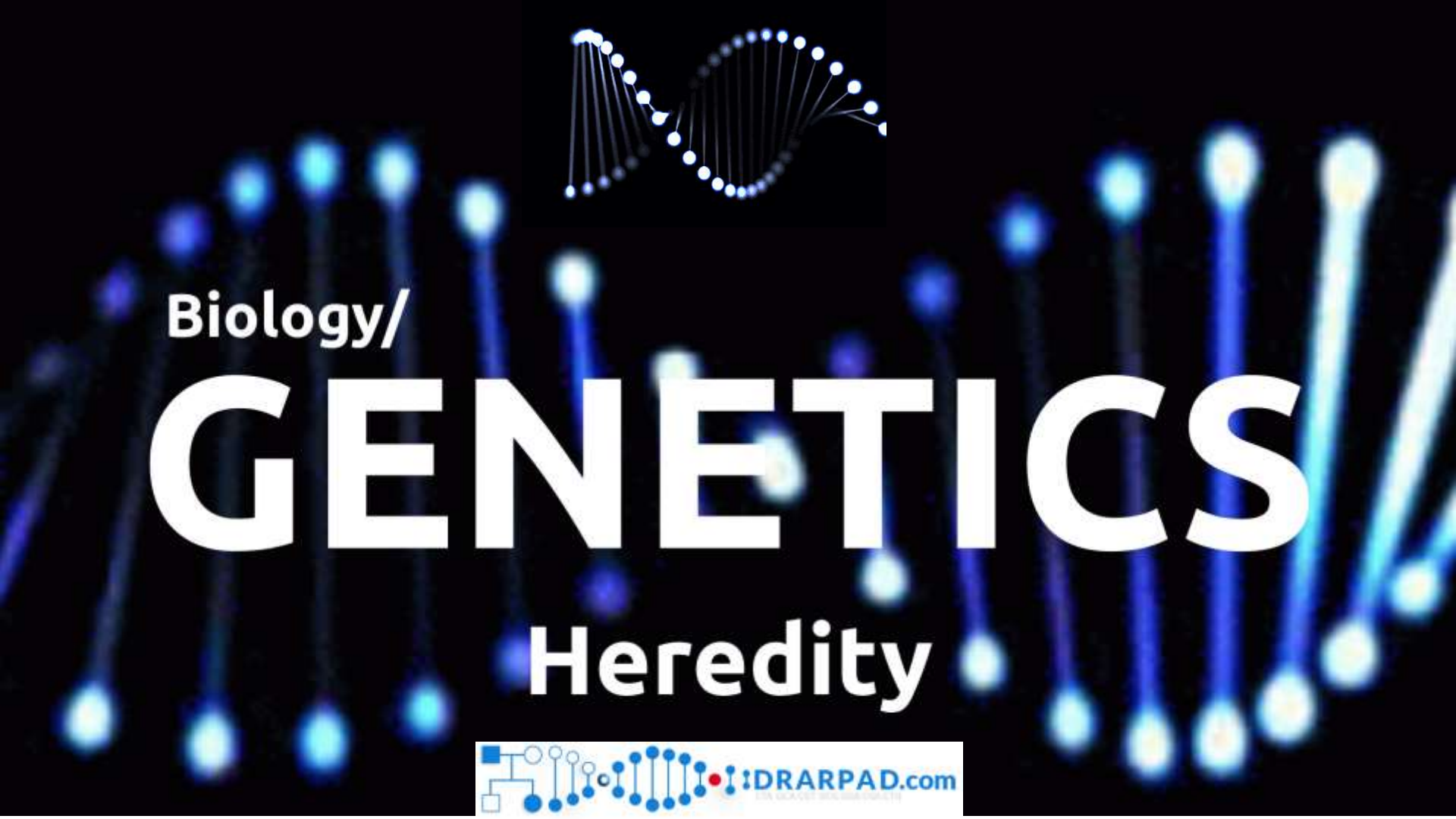

Biology/
GENETICS
Heredity
DRARPAD.com

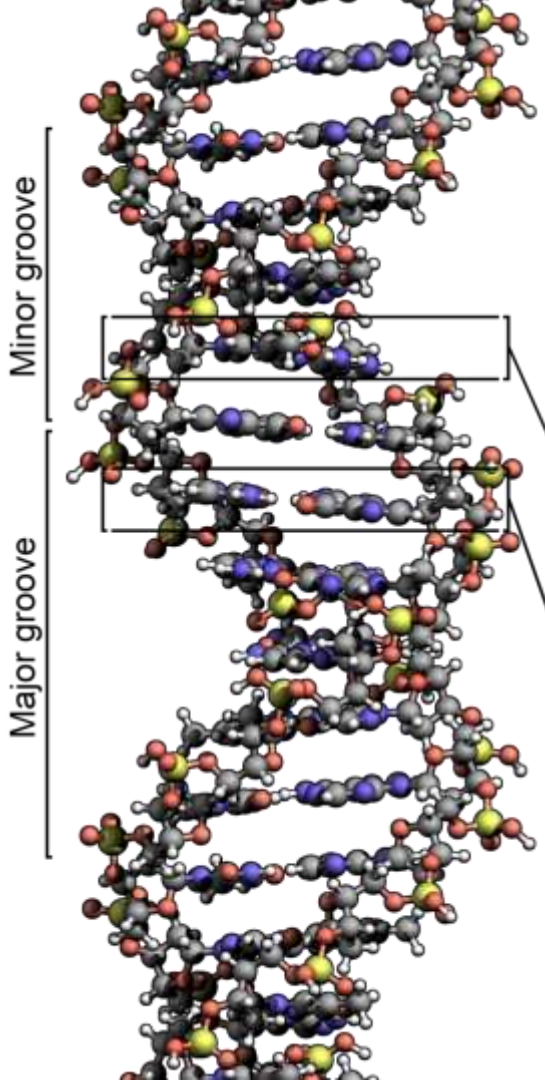
REVIEW

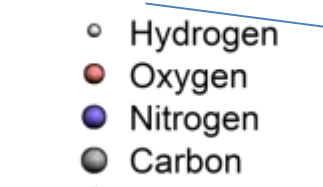
1. STRUCTURE OF THE DNA MOLECULE

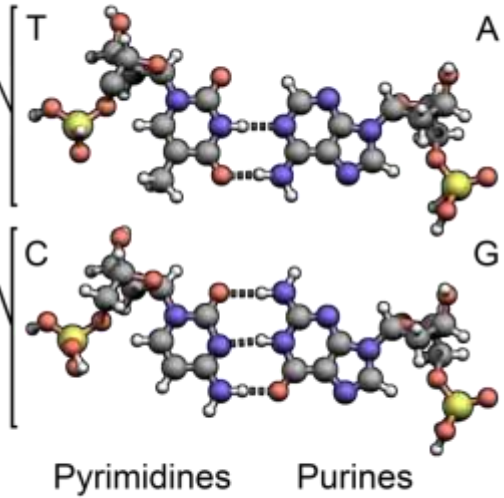
2. FUNCTIONS OF THE DNA MOLECULE

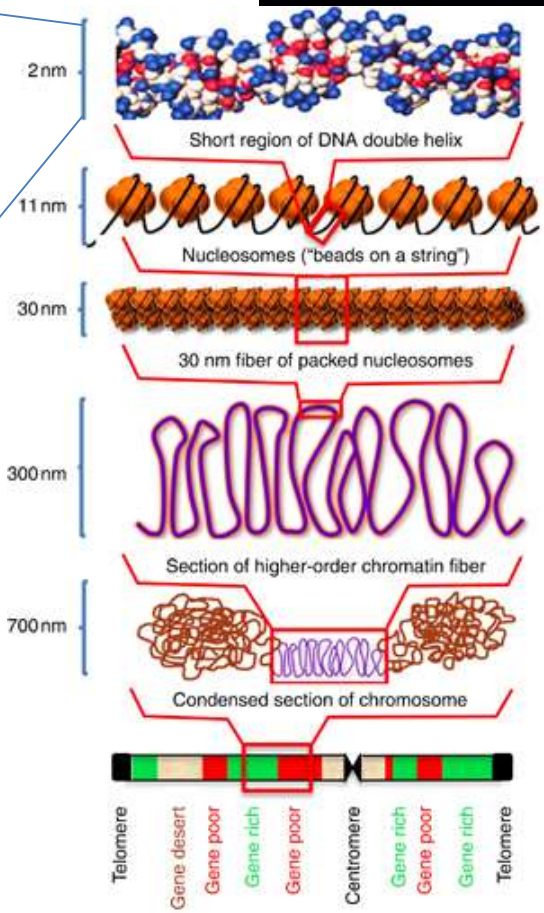
3. PHYSIOLOGICAL CELL CYCLE

LEVELS OF CHROMATIN ORGANIZATION



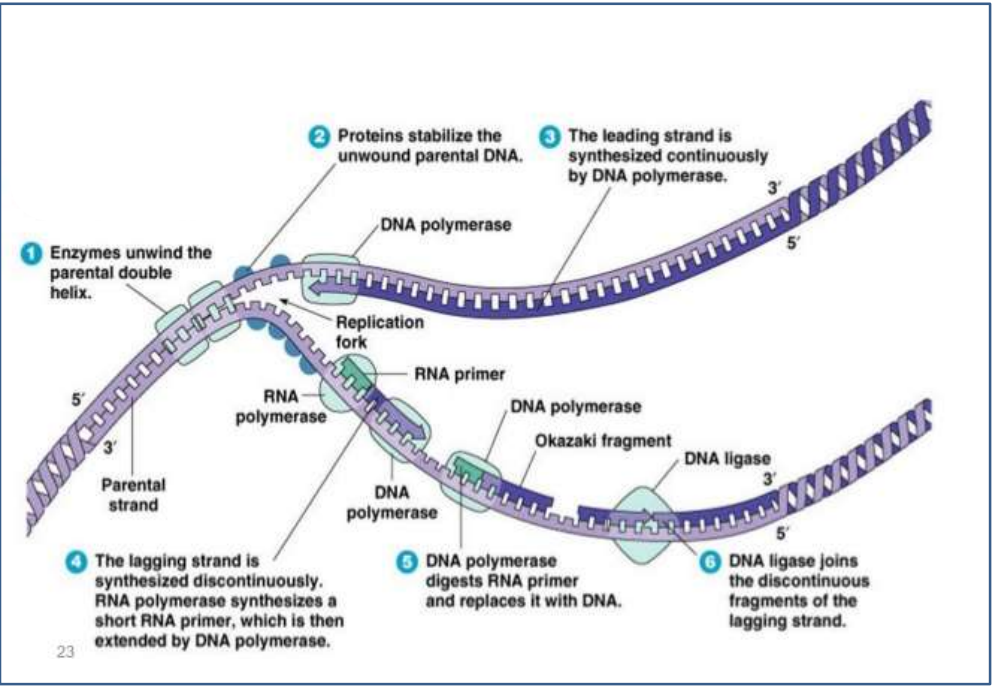




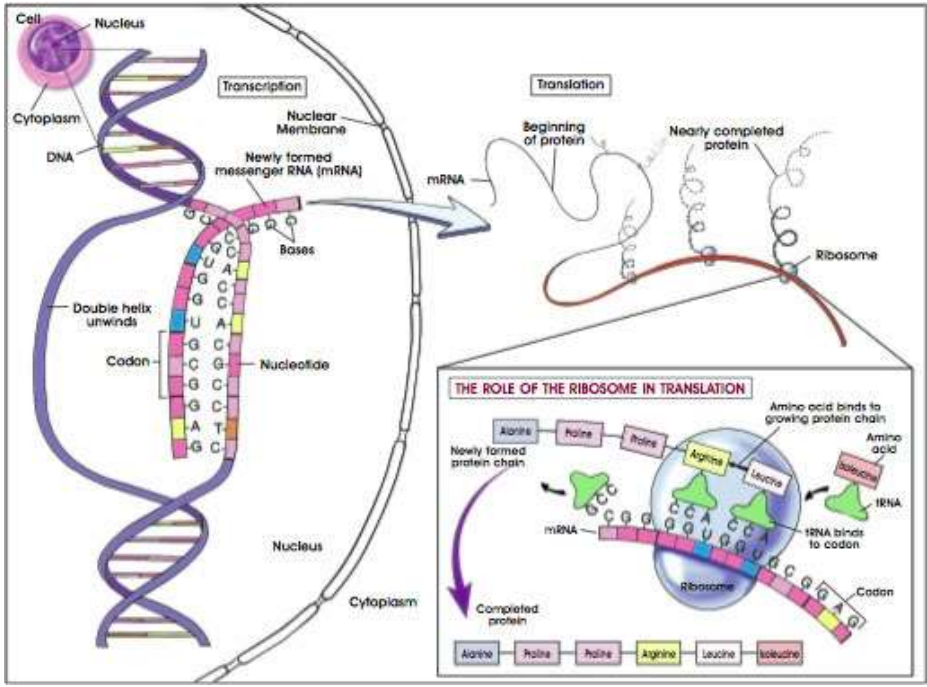


FUNCTIONS OF THE DNA MOLECULE

DNA REPLICATION



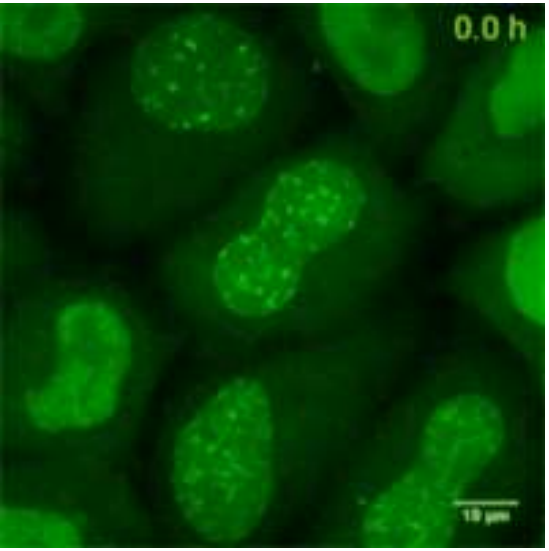
GENE EXPRESSION

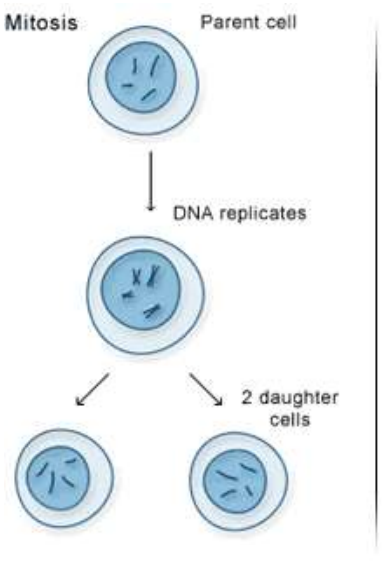


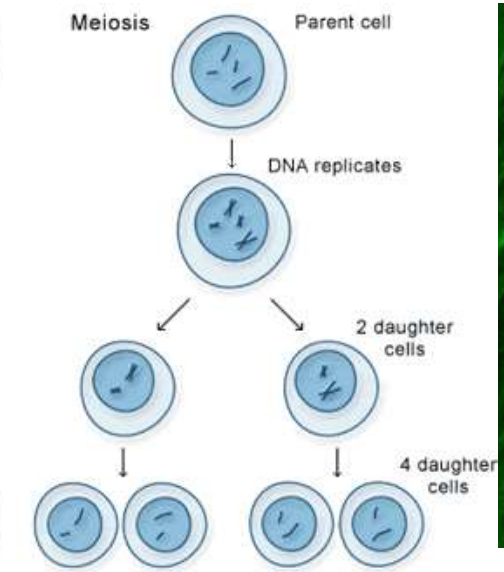
GENE DEFINITION

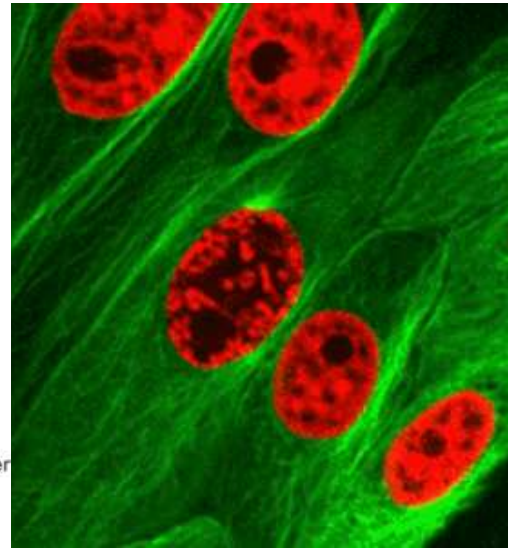
= UNIT OF HEREDITY, A SPECIFIC DNA SEQUENCE, WHICH CODES FOR A MOLECULE THAT HAS A FUNCTION

CELL DIVISION









OVERVIEW OF TODAY'S CLASS

LEARNING OBJECTIVE

MENDEL'S WORK AND THE PRINCIPLES OF HEREDITY

BASIC TERMS

Phenotype – physical appearance of an organism

Genotype – genetic makeup of an organism

Locus – segment of DNA has the information for controlling some aspect of the structure or function of the organism

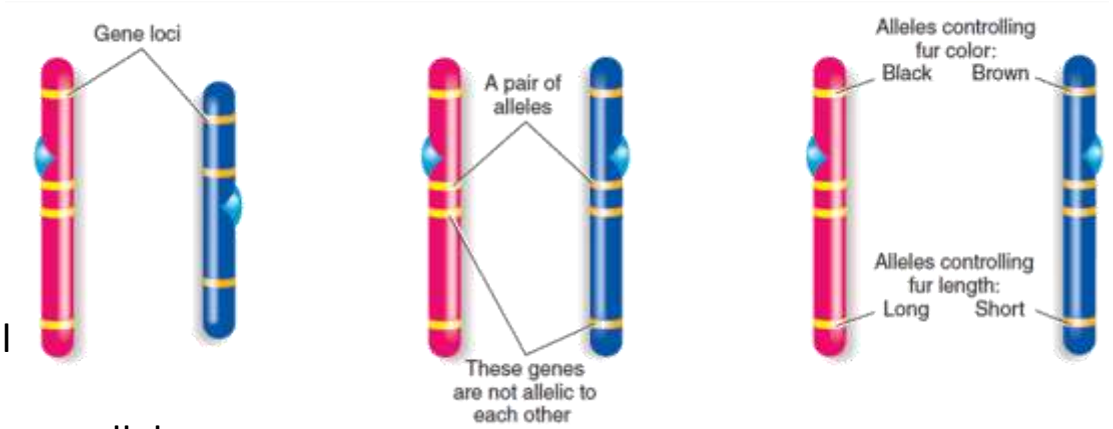
Allele – alternative form of a gene

Dominant allele – capital letter

Recessive allele – lowercase letter

Homozygous – the two alleles are identical

Heterozygous – two different locus in the same alleles



P – parental generation

F – filial generation

GREGOR MENDEL

	Flower color	Flower position	Seed color	Seed shape	Pod shape	Pod color	Stem length
P	Purple × White	Axial × Terminal	Yellow × Green	Round × Wrinkled	Inflated × Constricted	Green × Yellow	Tall × Dwarf
F_1	Purple	Axial	Yellow	Round	Inflated	Green	Tall

7 CHARACTERS

2.

SEED COLOR

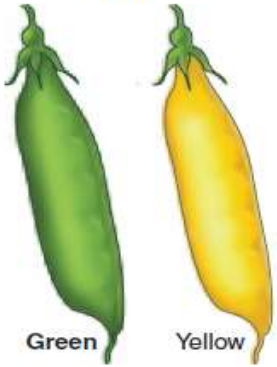
SEED SHAPE

1.

5.

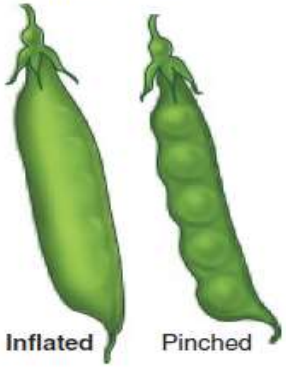
FLOWER COLOR

POD COLOR



4.

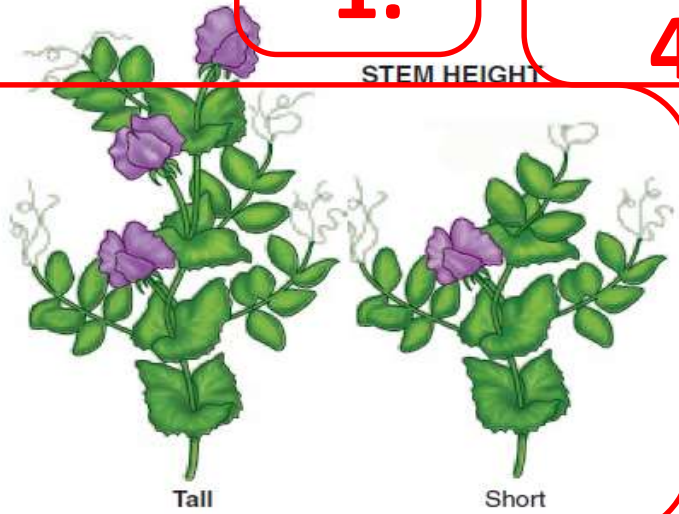
POD SHAPE



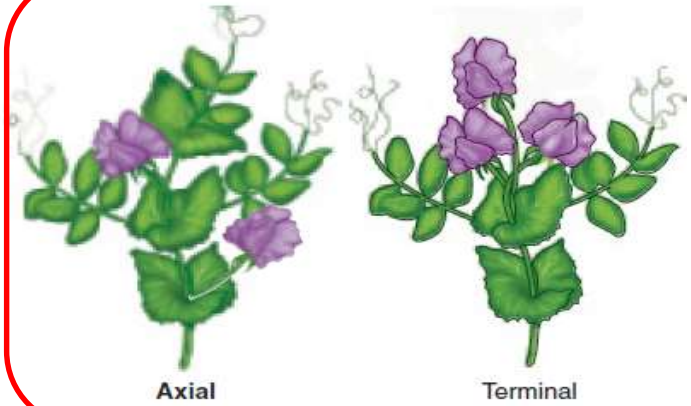
3.

6.

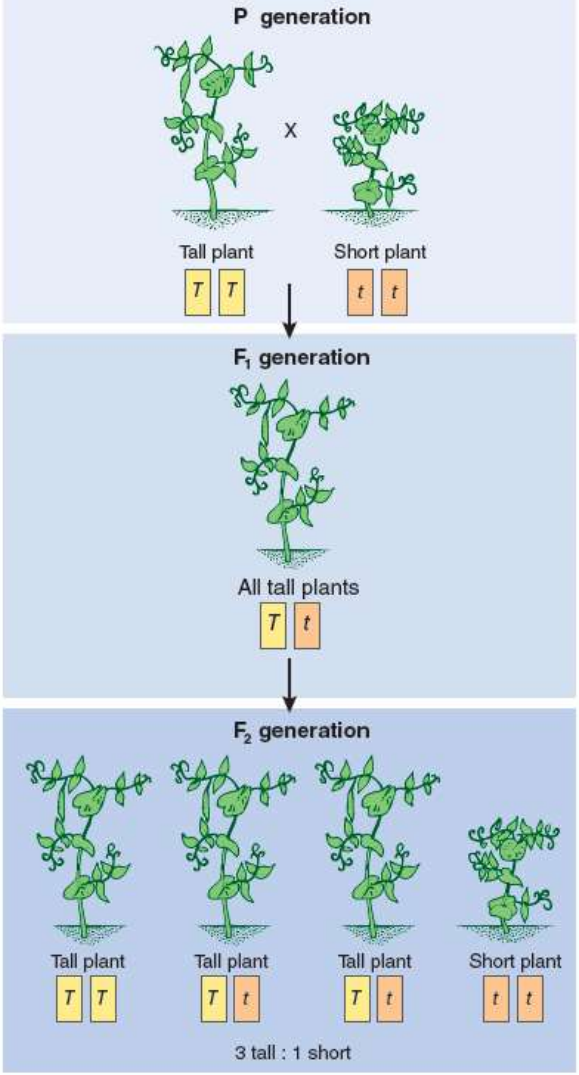
STEM HEIGHT

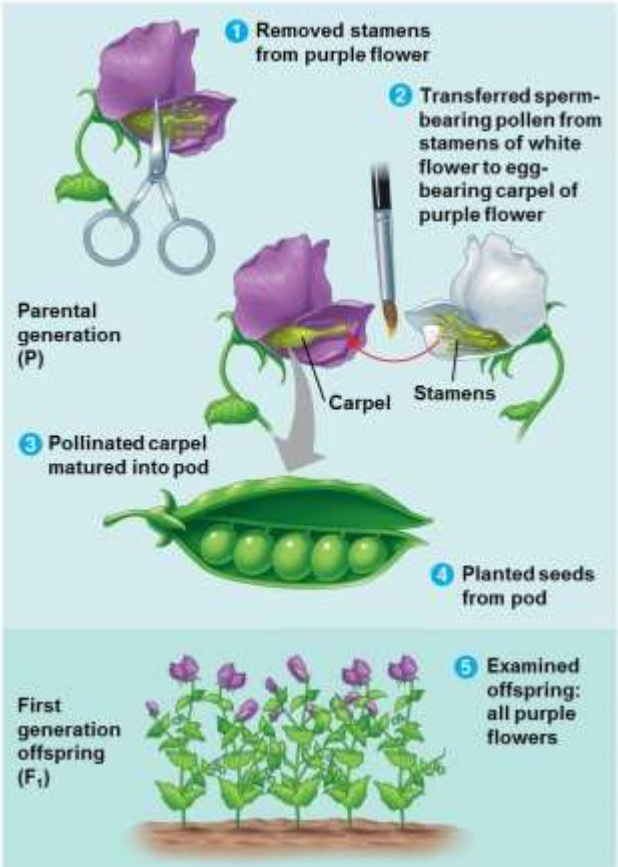


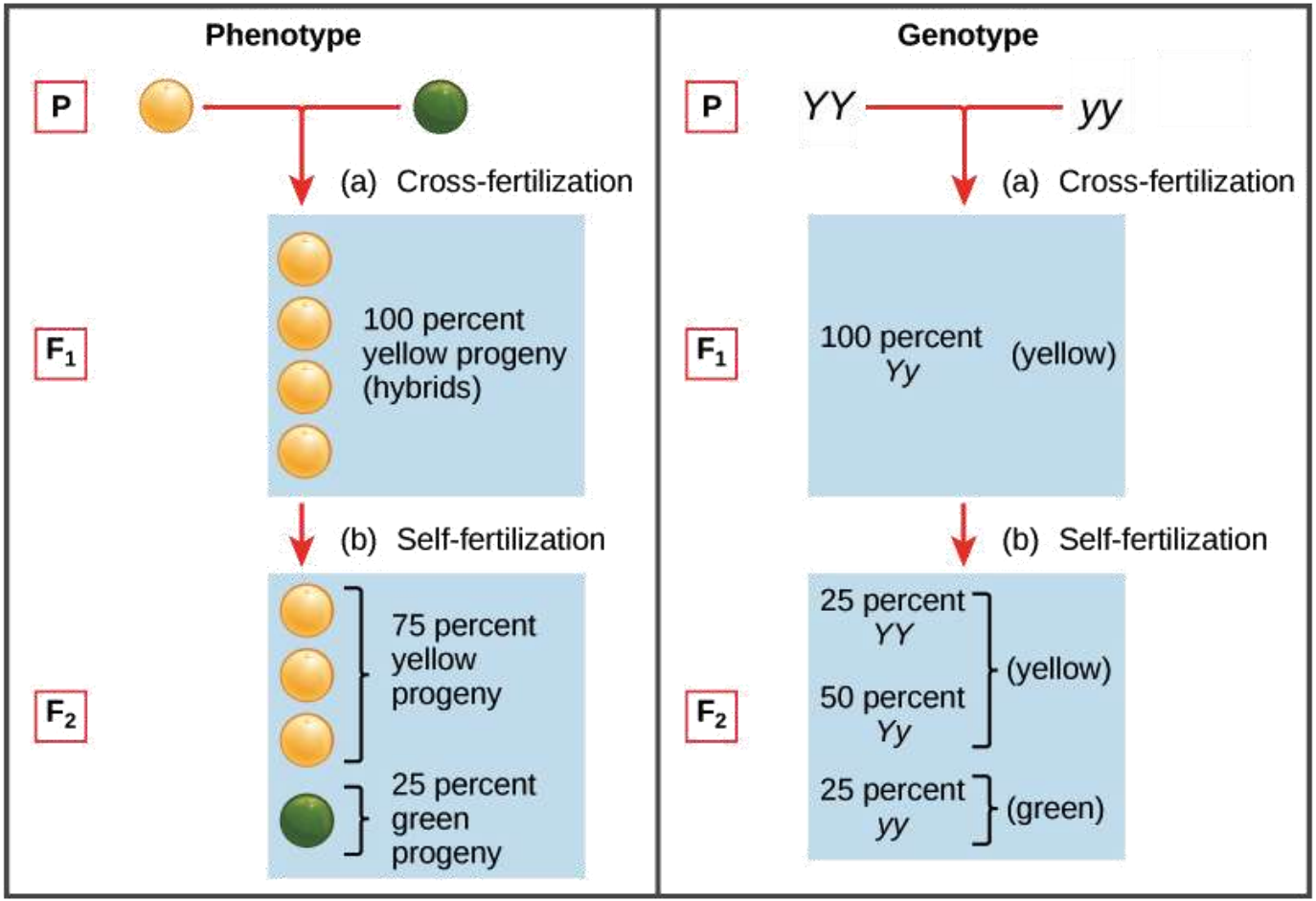
FLOWER POSITION



7.


P generation
X
Tall plant
Short plant
T T
t t
F1 generation
All tall plants
T t
F2 generation
Tall plant
Tall plant
Tall plant
Short plant
T T
T t
T t
t t
3 tall : 1 short


1 Removed stamens from purple flower
2 Transferred sperm-bearing pollen from stamens of white flower to egg-bearing carpel of purple flower
Parental generation (P)
Carpel
Stamens
3 Pollinated carpel matured into pod
4 Planted seeds from pod
First generation offspring (F1)
5 Examined offspring: all purple flowers


Phenotype
P
(a) Cross-fertilization
F1
100 percent yellow progeny (hybrids)
(b) Self-fertilization
F2
75 percent yellow progeny
25 percent green progeny
Genotype
P
YY
yy
(a) Cross-fertilization
F1
100 percent Yy (yellow)
(b) Self-fertilization
F2
25 percent YY
50 percent Yy
(yellow)
25 percent yy
(green)

Mendel's Laws of Inheritance

Gregor Mendel

Genetic inheritance boils down to three simple concepts put forth by Gregor Mendel

a humble monk and part-time scientist who founded the entire discipline of genetics

Segregation

In diploid organisms, chromosome pairs (and their alleles) are separated into individual gametes (eggs or sperm) to transmit genetic information to offspring

Dominance

A dominant allele completely masks the effects of a recessive allele

A dominant allele produces the same phenotype in heterozygotes and in homozygotes

Independent Assortment

Alleles on different chromosomes are distributed randomly to individual gametes

I. LAW OF DOMINANCE

recessive alleles will always be masked by dominant alleles. Therefore, a cross between a homozygous dominant and a homozygous recessive will always express the dominant phenotype

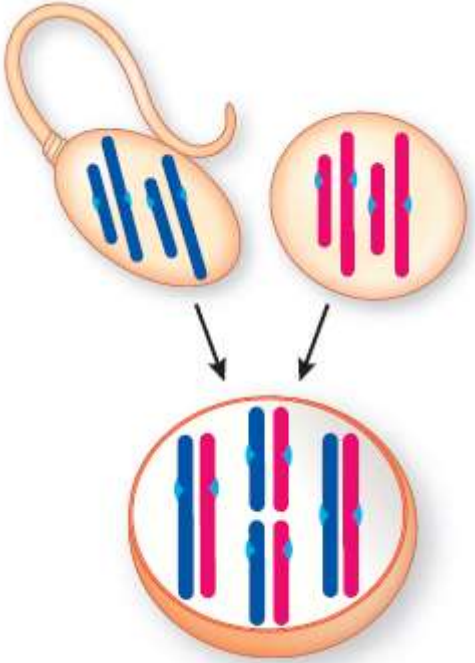
F1
Green

F1
Green

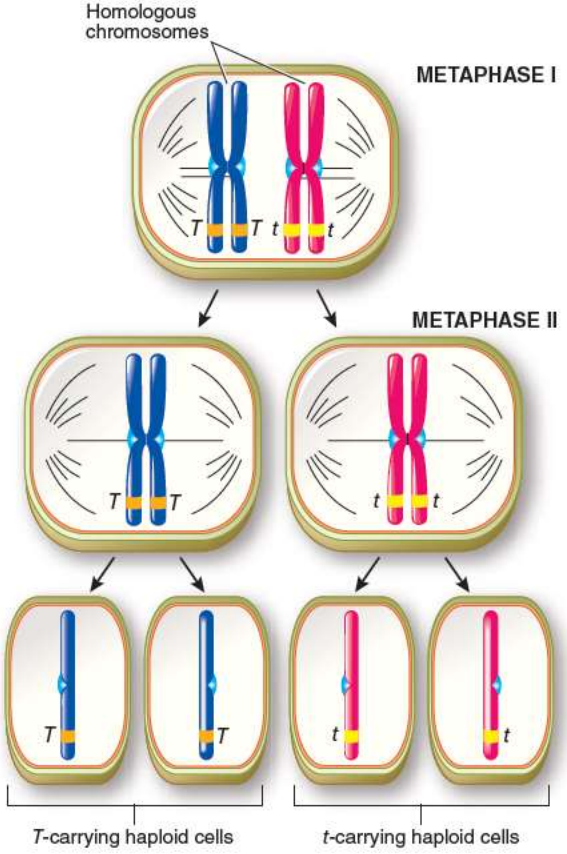
	G	g
G	GG	Gg
g	Gg	gg

II. PRINCIPLE OF SEGGREGATION

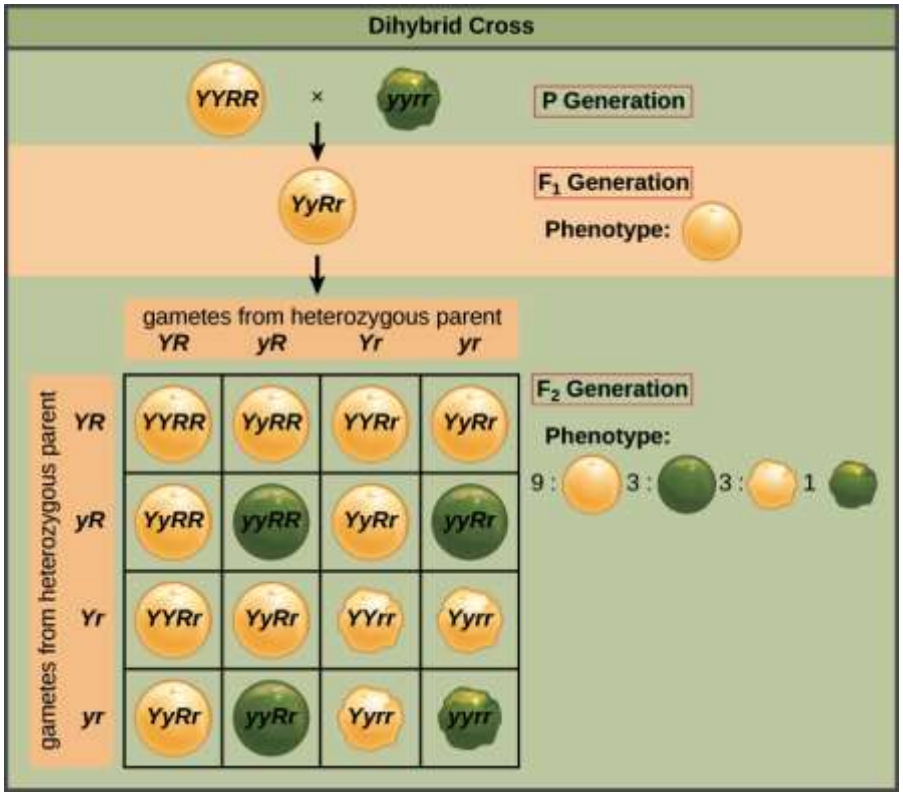
During meiosis the alleles for each locus separate, or segregate, from each other. When haploid gametes are formed, each contains only one allele for each locus.



Segregation of alleles is a direct result of homologous chromosomes separating during meiosis



III. PRINCIPLE OF INDEPENDENT ASSORTMENT

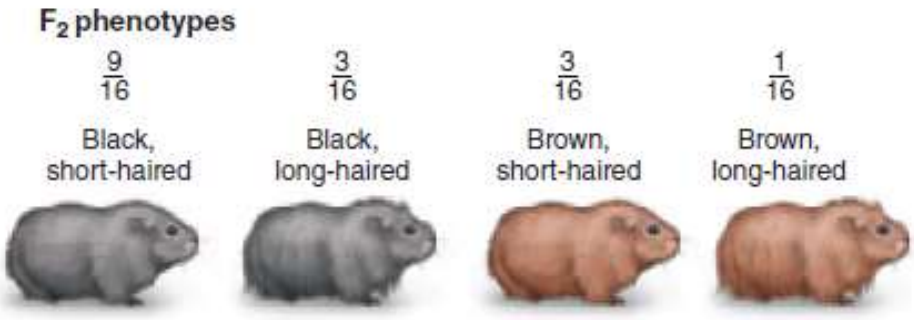


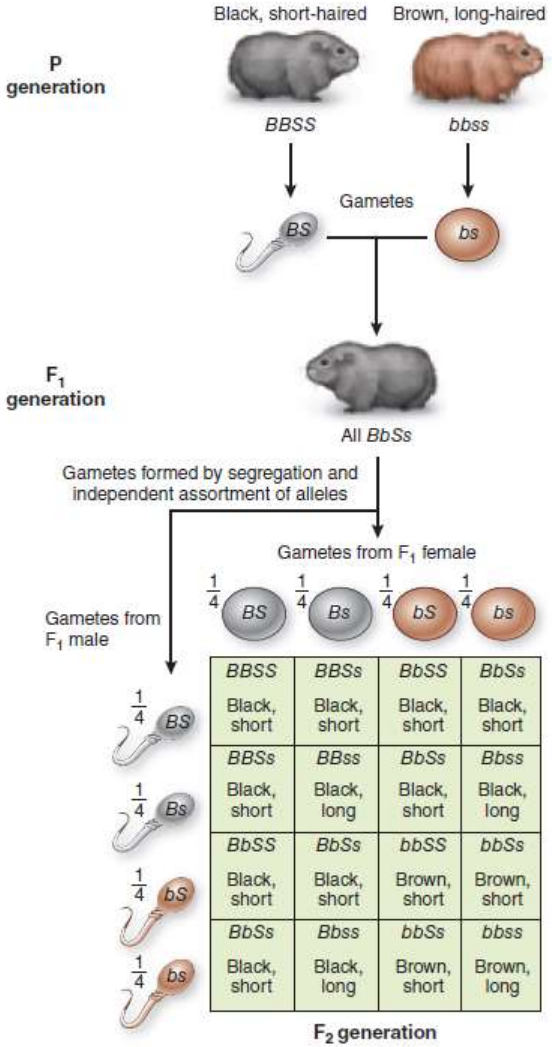
alleles of different loci are distributed randomly into gametes.
The result can be **genetic recombination,** the production of new allele combinations that were not present in the **parental (P) generation**

The two parents contribute equally to their offspring's genetic constitution

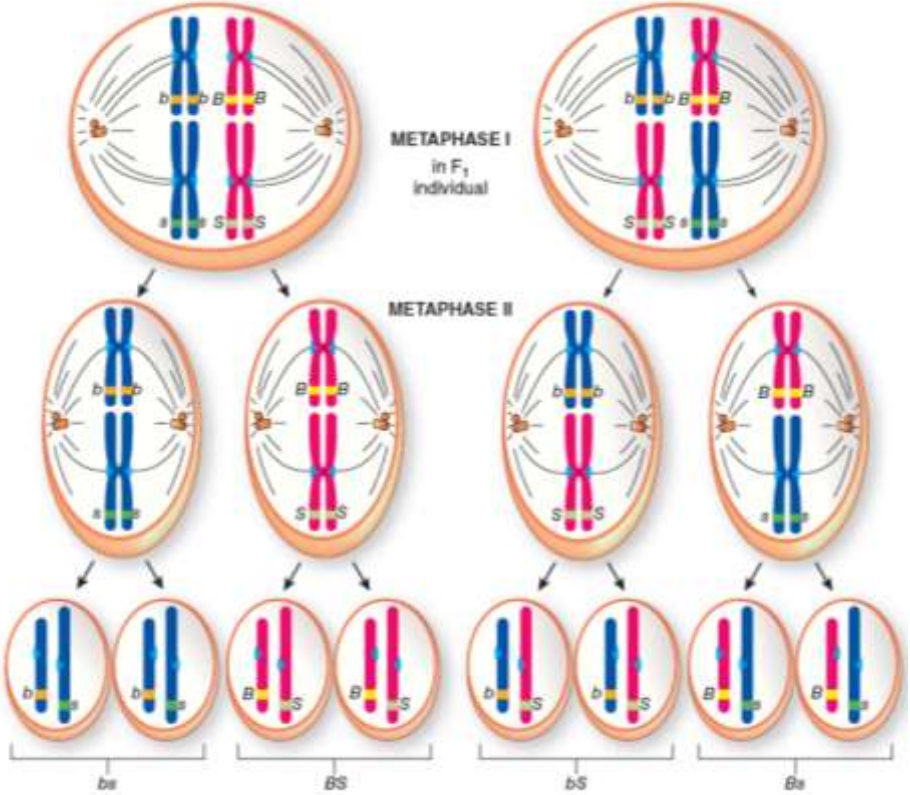
Dominance is the property of an allele relative to other alleles
→ is produced by the mechanism of gene expression

Alleles on nonhomologous chromosomes are randomly distributed into gametes: the principle of independent assortment





III. PRINCIPLE OF INDEPENDENT ASSORTMENT



The Scientific Language of Genetics

- **Alleles** — Alternative forms of a gene
- **Autosomal chromosome** — A nonsex chromosome
- **Chromosome** — A linear or circular strand composed of DNA that contains genes
- **Diploid** — An organism with two copies of each chromosome
- **DNA** — Deoxyribonucleic acid; the molecule that carries genetic information
- **Dominant** — A phenotype or allele that completely masks the presence of the other, recessive allele in the heterozygote
- **Gene** — The fundamental unit of heredity; a specific section of DNA within a chromosome
- **Genotype** — The genetic makeup of an individual; the allele(s) possessed at a given locus
- **Heterozygote** — An individual with two different alleles of a given gene or locus
- **Homozygote** — An individual with two identical alleles of a given gene or locus
- **Locus** — A specific location on a chromosome
- **Phenotype** — The physical characteristics of an individual
- **Recessive** — A phenotype or allele exhibited only when homozygous

KEYWORDS

PHENOTYPE
GENOTYPE
P GENERATION
F1, F2, F3 GENERATION
DOMINANT TRAIT
RECESSIVE TRAIT
HETEROZYGOTE
HOMOZYGOTE
GENE
ALLEL
LOCUS
MONOHYBRID, DIHYBRID, TEST CROSS

Two guinea pigs are crossed. The genotype of the mother is AAbb. In the F2 generation 3 of 16 guinea pigs have brown eyes and long legs and 9 guinea pigs have the same phenotype.

P GENERATION

Genotype	**AAbb**	
Phenotype		

F1 GENERATION

Genotype	**Aabb**	**AaBb**
Phenotype		

F2 GENERATION

Genotype						
Phenotype						

SOLUTION: 1. crossing two heterozygous dominants (F1 cross: AaBb x AaBb)

	AB	**Ab**	**aB**	**ab**
AB	AABB	AABb	AaBB	AaBb
Ab	AABb	AAbb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	aaBb
ab	AaBb	Aabb	aaBb	aabb

2. identify for which phenotype is 3 types out of 16: they will be the brown eyes and long legs

3. Establish the genotype

Other eyes: aa Short legs: Bb, BB

Brown eyes: Aa, AA Long legs: bb

4. Determine the genotype of the father (P generation): aaBB

The underlined guinea pigs (9 out of 16 have the same phenotype: other eye colour, and long legs)

Two guinea pigs are crossed. The genotype of the mother is AAbb. In the F2 generation 3 of 16 guinea pigs have brown eyes and long legs.

Other eyes: aa
Brown eyes: Aa, AA

Short legs: Bb, BB
Long legs: bb

P GENERATION

Genotype	**AAbb**	**aaBB**
Phenotype	brown eyes with long legs	other eyes with short legs

F1 GENERATION

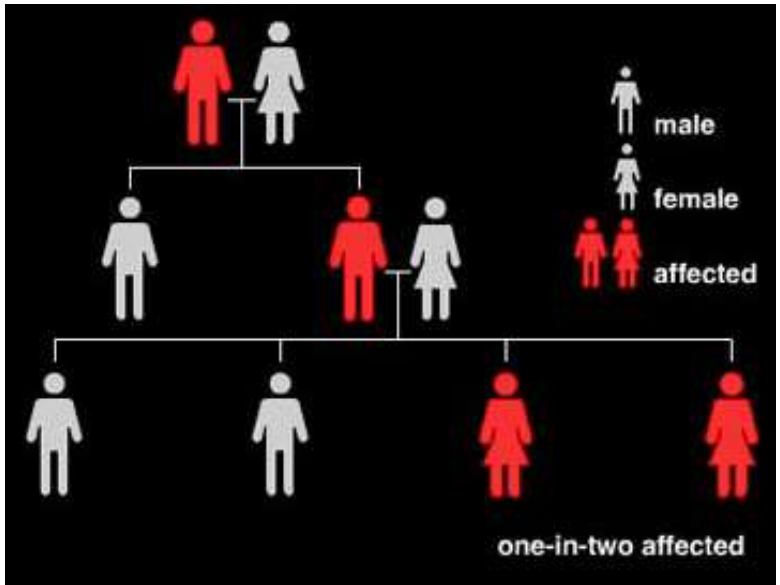
Genotype	**AaBb**	**AaBb**
Phenotype	brown eyes colour with short legs	brown eyes colour with short legs

F2 GENERATION

Genotype	**aabb (1)**	**aaBB, aaBb (3)**	**AABB, AABb, AaBB, AaBb (9)**	**Aabb, Aabb (3)**
Phenotype	other eyes, long legs	other eyes, short legs	brown eyes, short legs	brown eyes and long legs

NEXT TIME

PREDICTING MENDELIAN INHERITANCE



THANK YOU FOR YOUR ATTENTION!