

Mendel's Laws of Heredity

Why we look the way we look..



What is GENETICS?

- **Genetics:** the study of heredity
- **Heredity:** The passing on of characteristics (traits) from parents to offspring



Trait – A particular **characteristic** that can vary from one individual to another. **Ex: hair color**



Smooth-coated, Long-haired and Wire-haired Dachshunds

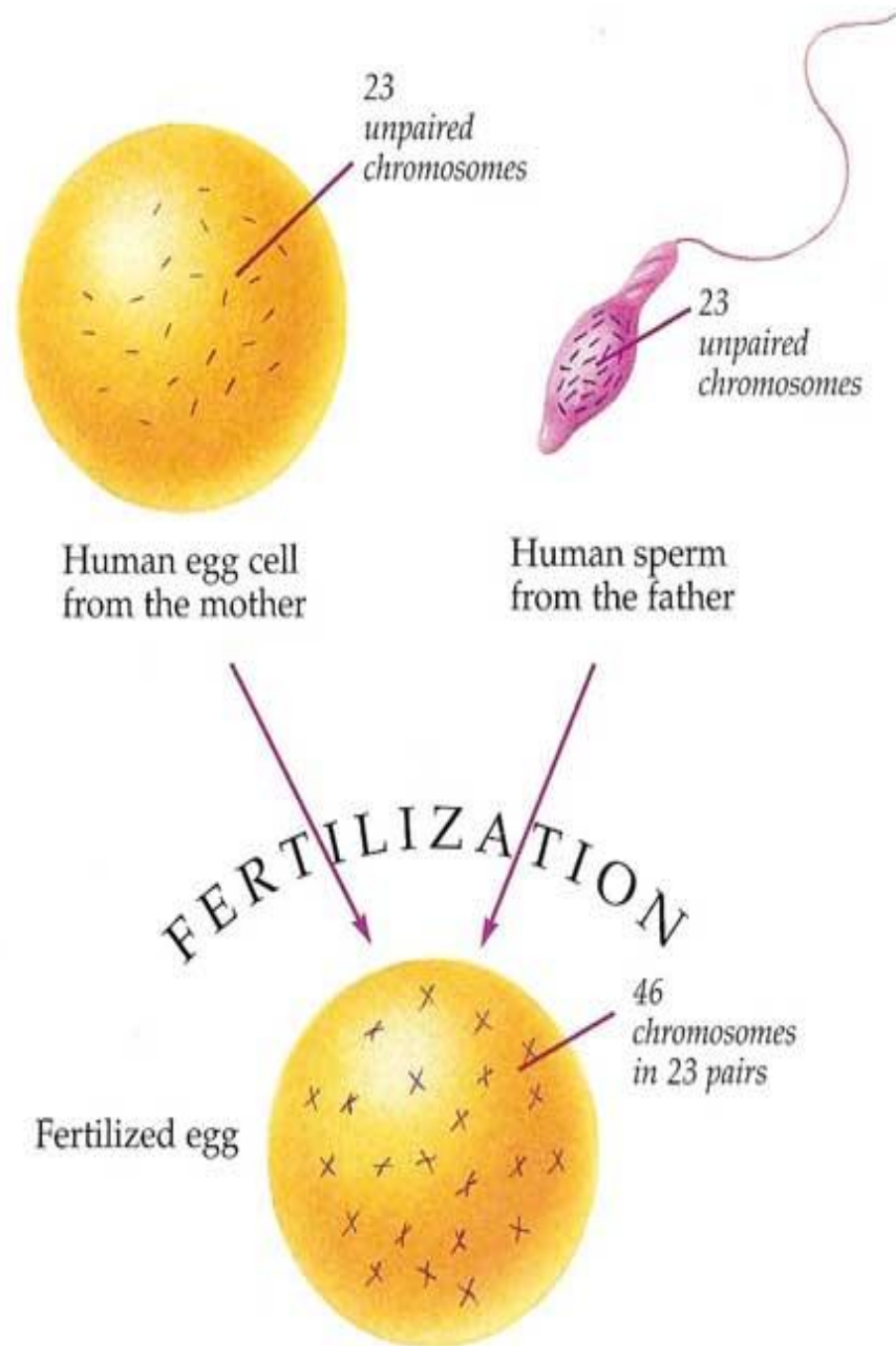
Examples of Dachshund Traits

- Type of fur coat: smooth, long, wire
- Color of fur coat: red, tan, black, silver

Fertilization

Remember!

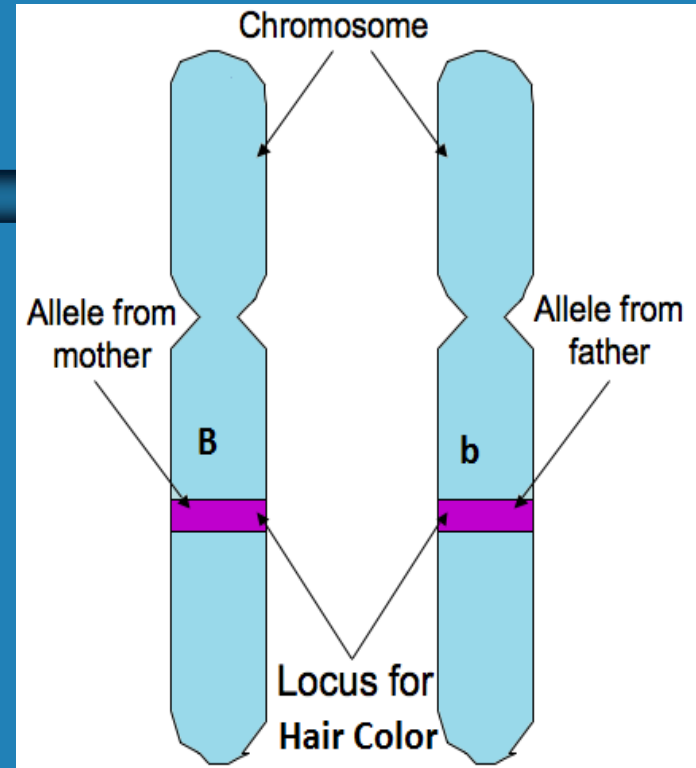
- **Fertilization:** Joining of male and female gametes (reproductive cells) during sexual reproduction



GENES

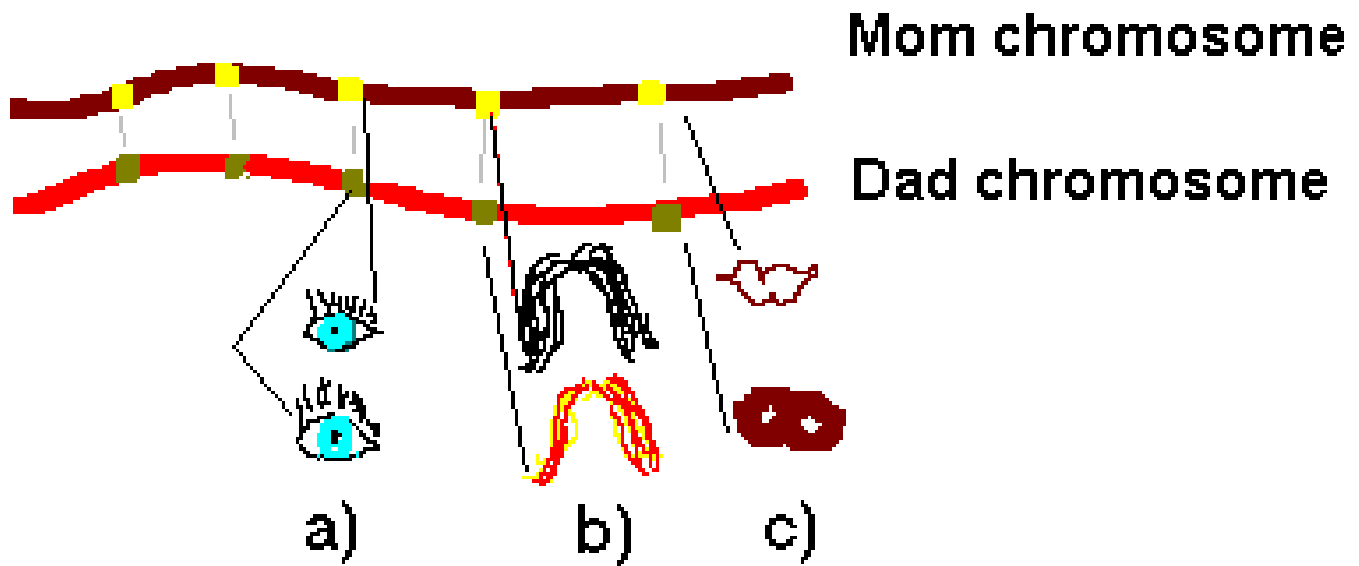
□ Genes - Section of a chromosome that determine the trait we will inherit Ex: Sally has the gene for brown hair

*One gene comes from mom, one gene comes from dad



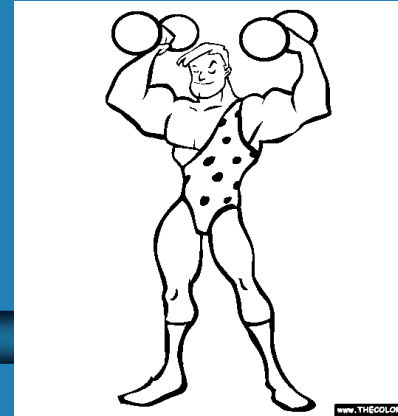
Alleles- Different forms of one gene

Ex: Brown, red, or blond hair are all different forms the hair color gene



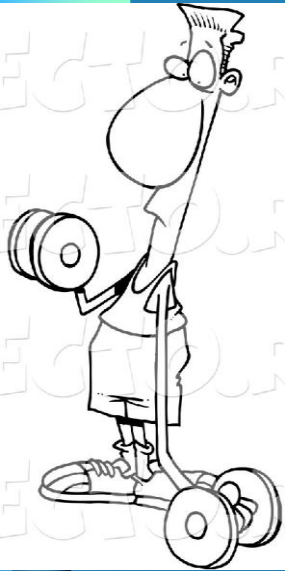
Genes, alleles and the result I

Rule of Dominance



□ Dominant gene: Always expressed if present for a trait

- Represented by a capital letter; B is for brown eyes



□ Recessive gene: Only expressed if two alleles are present for that trait

- Represented by a lowercase letter; b is for blue eyes

PRACTICE!

1. TT _____ Dominant

2. tt _____ Recessive

3. Tt _____ Dominant

4. SS _____ Dominant

5. ss _____ Recessive

6. Ss _____ Dominant

Homozygous vs. Heterozygous

- Homozygous: Organisms have 2 identical (SAME) alleles for a trait
 - BB is homozygous dominant for brown eyes
 - bb is homozygous recessive for blue eyes
- Heterozygous: Organisms have 2 different alleles for a trait
 - Bb is heterozygous dominant for brown eyes



PRACTICE!

1. **AA** Homozygous

2. **Aa** Heterozygous

3. **Mm** Heterozygous

4. **gg** Homozygous

5. **GG** Homozygous

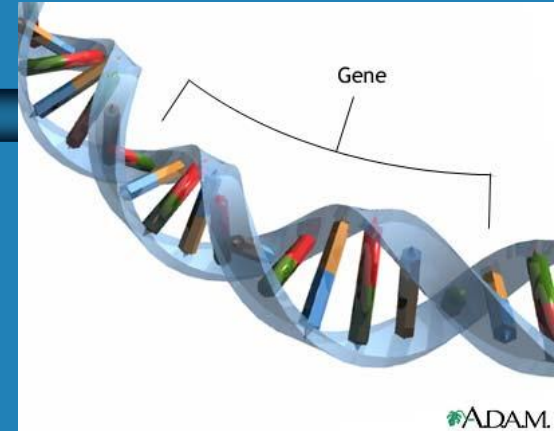
6. **Gg** Heterozygous

Phenotypes and genotypes

- Genotype: genetic makeup (DNA) or combination of 2 alleles (1 from mom & 1 from dad)

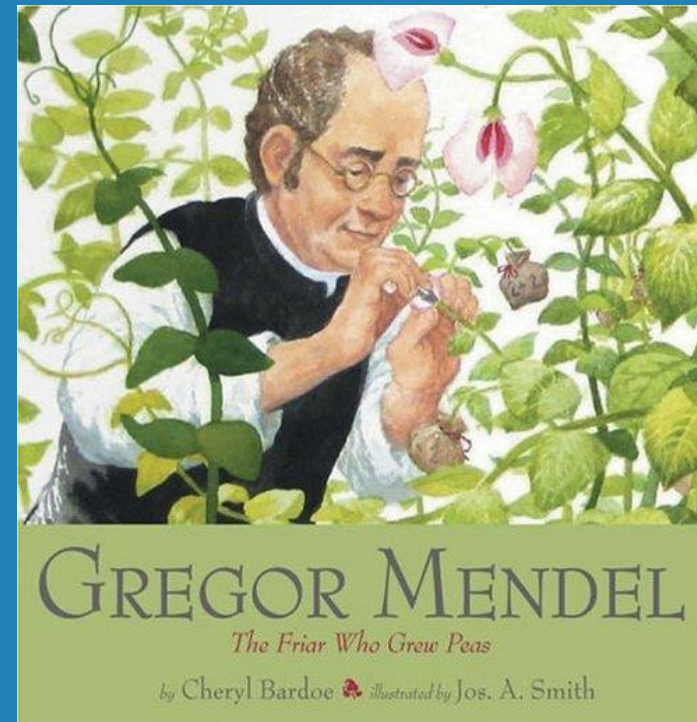
EX. BB, Bb, bb

- Phenotype: physical characteristics of the trait
 - Brown hair (what you see)



Who is Gregor Mendel?

- ❑ Austrian monk
- ❑ The Father of Genetics
- ❑ Crossbred common pea plants to study the inheritance of traits through each generation.



III. Mendel's Experiment

A. Pea cross-pollination experiments

PARENT GENERATION (P₁)

Tall purebred x short recessive

(TT X tt)



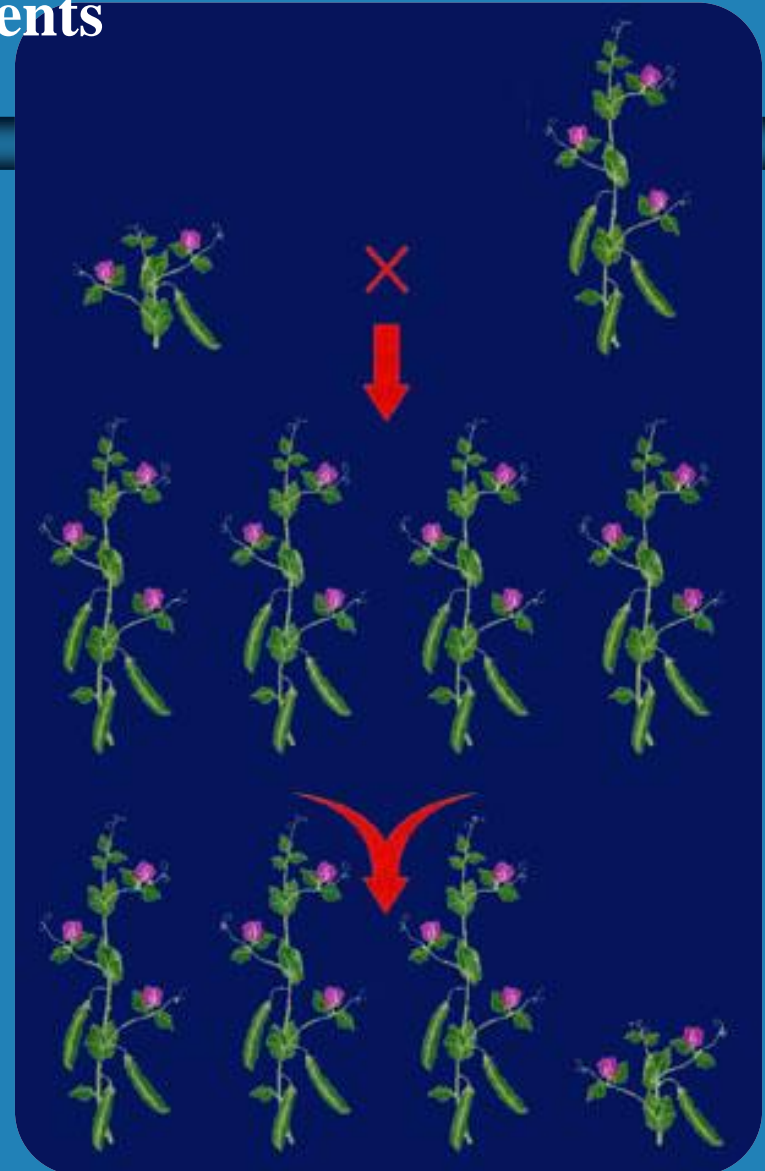
FILIAL GENERATION (F₁)

All tall hybrids (heterozygous)



FILIAL GENERATION (F₂)

75% tall, 25% short



IV. Mendel's Conclusions

A. Biological Inheritance is passed from one generation to the next.

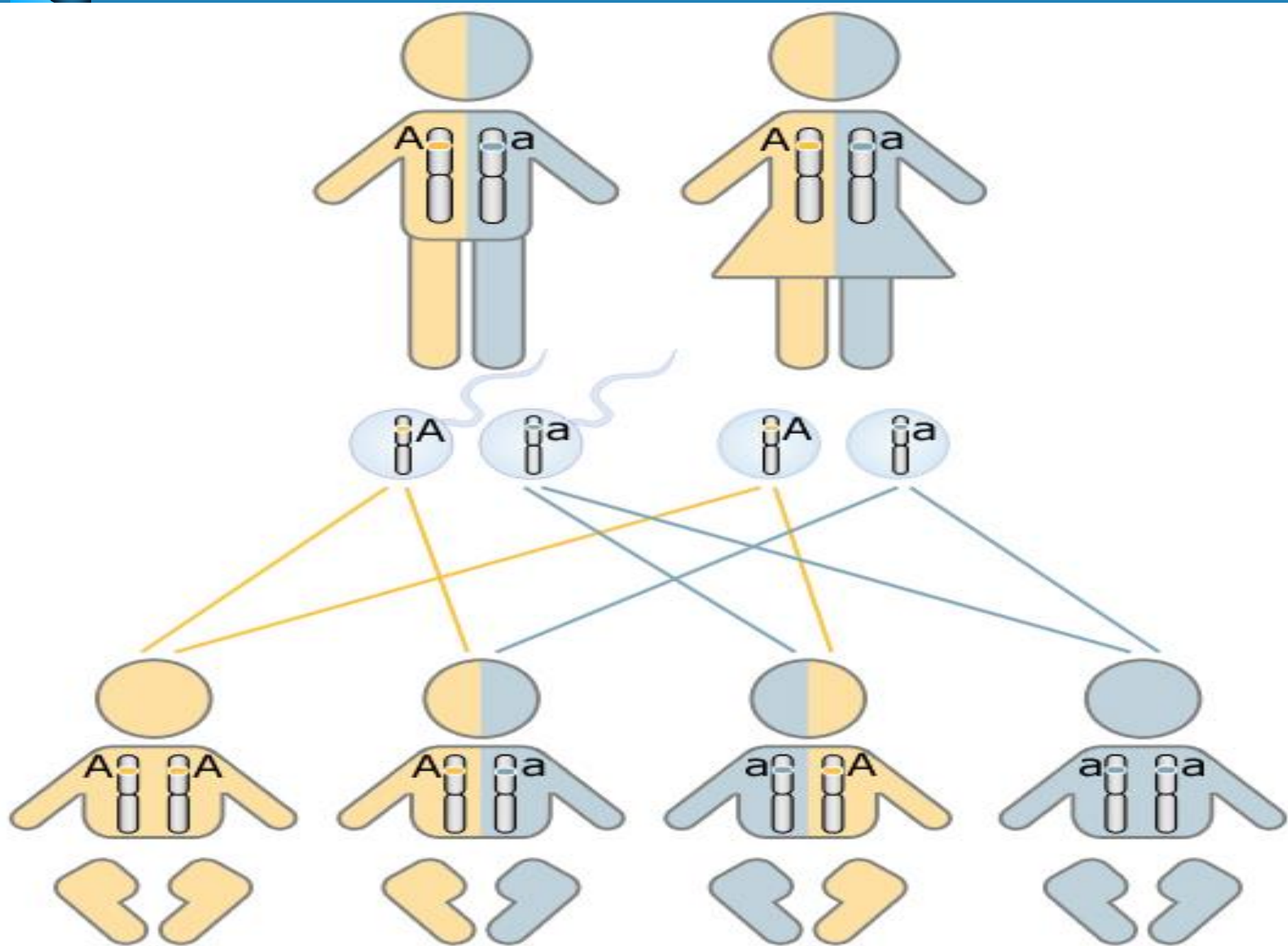
- Ex: your traits were determined by your parents genes that were passed onto you.

B. Law of Segregation





- During Meiosis, the pairs of genes separate so that each gamete receives only one gene for each trait

C. Law or Principle of Dominance

- Some alleles are dominant and some are recessive.
- Recessive traits will only show up if dominant is NOT present



V. Punnett Squares

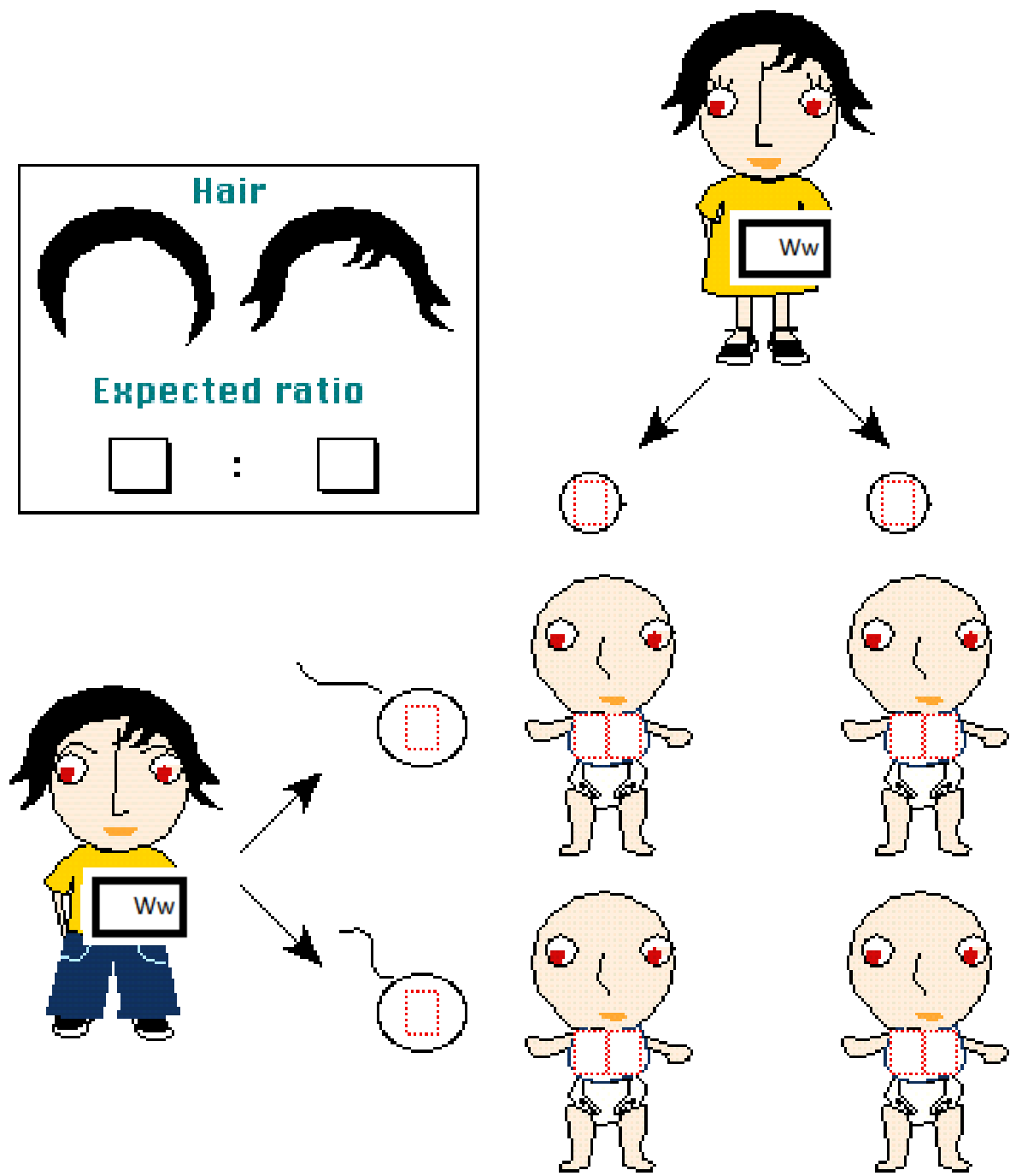
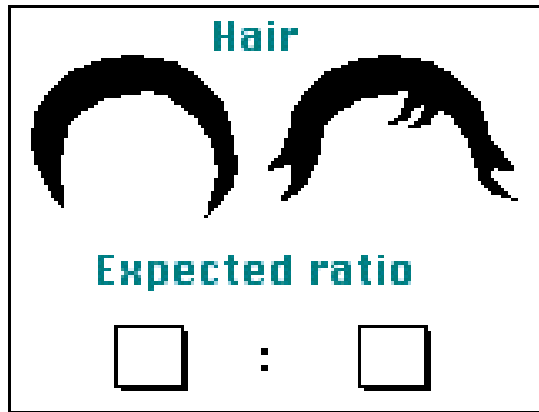
		pollen ♂	
		B	b
pistil ♀	B	 BB	 Bb
	b	 Bb	 bb

- A Punnett Square is a diagram used to predict the outcome of a particular cross or breeding experiment
- Used to determine the PROBABILITY of EACH offspring's genotypes and phenotypes
- This does NOT determine how many offspring will be produced or exactly what the offspring's genotype and phenotype will be...just the chances!



V. Punnett Squares

- A. There are five steps (you must always show your work)
1. Key- List the trait, Both alleles, and which phenotype corresponds with each allele
 2. Parents- List the genotypes of each parent
 3. Draw the punnett square
 4. Determine the genotype ratio
 5. Determine the phenotype ratio



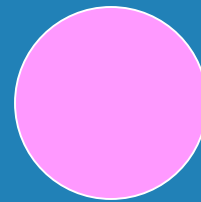
W = wavy hair
 w = straight hair

	W	w
W	WW	Ww
w	Ww	ww

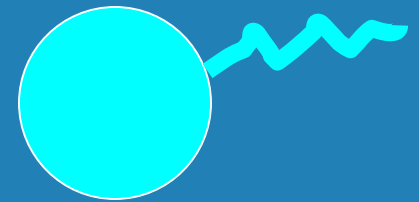
WW, Ww, Ww = wavy
 ww = straight
 Genotype Ratio 1:2:1
 Phenotype Ratio 3:1

Practice Monohybrid Punnett!

- Cross a female heterozygous dominant brown eyes with a male homozygous recessive blue eyes



X



Possible Phenotypes:

Possible Genotypes:

Ratio:

Percent:

Practice Monohybrid Punnett!

- Cross a female heterozygous dominant brown eyes with a male homozygous recessive blue eyes

B

b

Bb

X

bb

b

b

Bb	bb
Bb	bb

Possible Phenotypes: Brown & Blue

Possible Genotypes: Bb, bb

Ratio: 1:1 Percent: 50% Brown

50% blue