S7L3. Students will recognize how biological traits are passed on to successive generations.

Explain the role of genes and chromosomes in the process of inheriting a specific trait.

2/22/16 Agenda: Heredity and Genetics Intro

Learning Target: I know that heredity passes inherited traits to offspring , because …

Success Criteria: I can describe the factors that control the inheritance of traits in organisms.

Warm Up:

1.List at least 3 different characteristics that you possess. This may include skills or physical features.

2.For each characteristic listed, describe where it came from.

Traits

- **Dog breeders *select* certain traits to produce dogs for different purposes.**

What traits do you think are each of these dogs might have been was breed for?

Heredity

- **Ancient dog breeders thought that the traits inherited by a dog were a blend of those from the mother and father.**

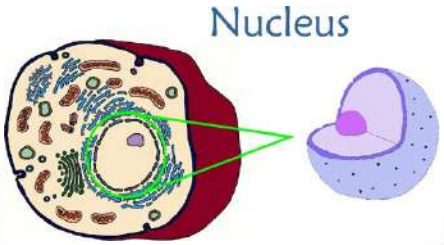
- **An organism's heredity is the set of traits it receives from its parents.**

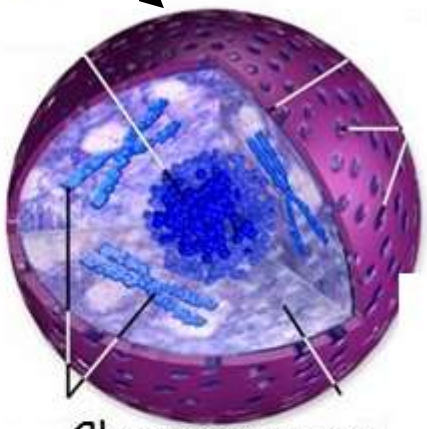
- **Today, we know that heredity is not so simple.**

Reminder:

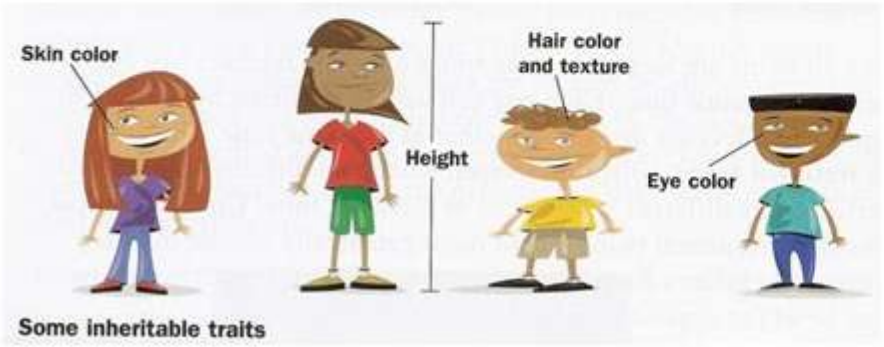
Cells

- nucleus
  - chromosomes
    - DNA
      - genes
        - traits

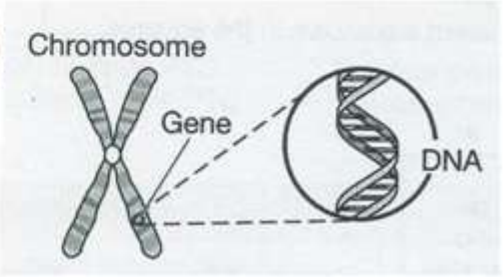




Chromosomes



Some inheritable traits



Genetic Material

Brainpop Genetics ~stop @ 1:19 minutes

https://www.brainpop.com/health/geneticsgrowthanddevelopment/genetics/

Watch and listen to answer the following:

1. What is heredity?

2. What is the relationship between DNA and chromosomes?

3. Why are your chromosomes arranged in pairs?

4. How does DNA vary in individuals?

Genetic Material

1. **What is heredity?**

A. A kind of genetic disorder
B. The way that DNA divides
C. A trait you inherit from your parents
D. The passing down of traits from parents to children

2. **What is the relationship between DNA and chromosomes?**

A. Chromosomes are made out of DNA
B. DNA is made out of chromosomes
C. DNA and chromosomes are the same thing
D. DNA forces chromosomes to mutate

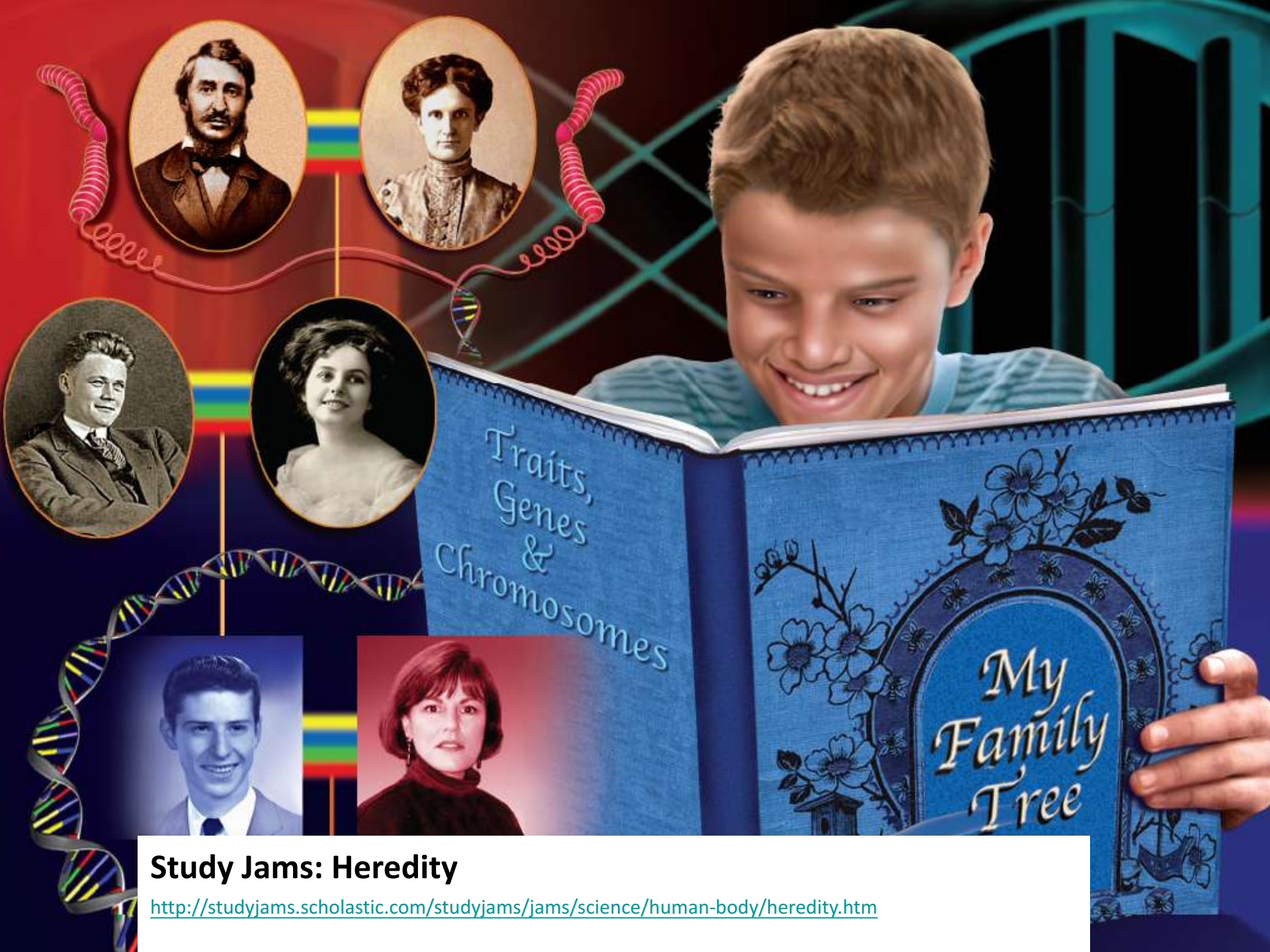
Genetic Material

3. Why are your chromosomes arranged in pairs?

A. Scientists aren't sure
B. Because you get one from your mother, and one from your father
C. Because pairs are able to divide more easily
D. Because DNA has a double helix structure

4. Which of the following statements is true?

A. Your set of DNA is the same as your siblings'
B. Your set of DNA is the same as your mother's
C. Your set of DNA is the same as your father's
D. Your set of DNA is unique to you



Study Jams: Heredity

http://studyjams.scholastic.com/studyjams/jams/science/human-body/heredity.htm

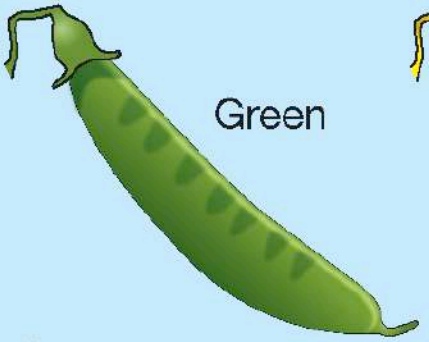
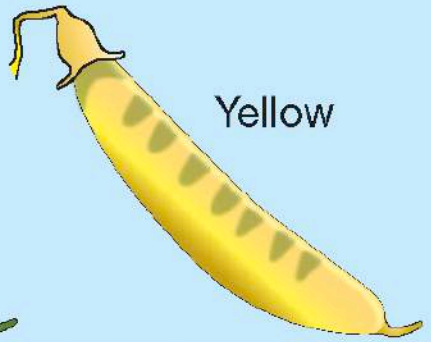
5. Genetics

- **Genetics is the study of heredity.**
- **A monk (priest) named Gregor Mendel was one of the first to experiment with heredity.**
- **He is often called the "Father of Genetics."**

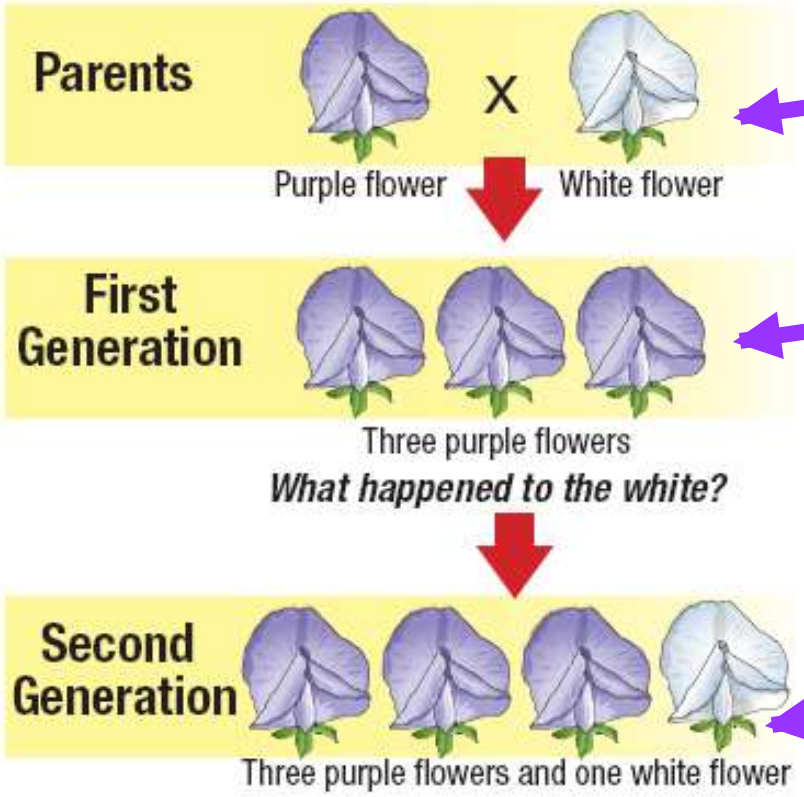
6. *The Priest and the Pea*

- Mendel carefully studied pea plants in the monastery garden.
- He noticed peas had **2 forms** of a trait.
  - Flower color was purple or white
  - Seed shape was smooth or wrinkled
  - Seed color was green or yellow
  - Pod color was green or yellow

Four Traits in Pea Plants

TRAIT	FORM 1	FORM 2
Flower color	 Purple	 White
Seed shape	 Smooth	 Wrinkled
Seed color	 Yellow	 Green
Pod color	 Green	 Yellow

7. The Priest and the Pea

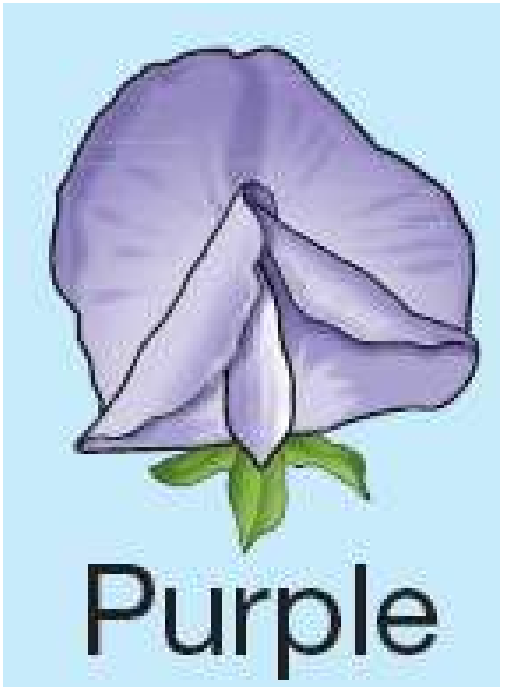


- Mendel noticed that a trait from the parent pea plant did **not** always show up in the offspring or F_1 (1st generation or filial).
- Mendel wanted to find out why traits disappeared and then appeared again.

8. True Breeding Plants

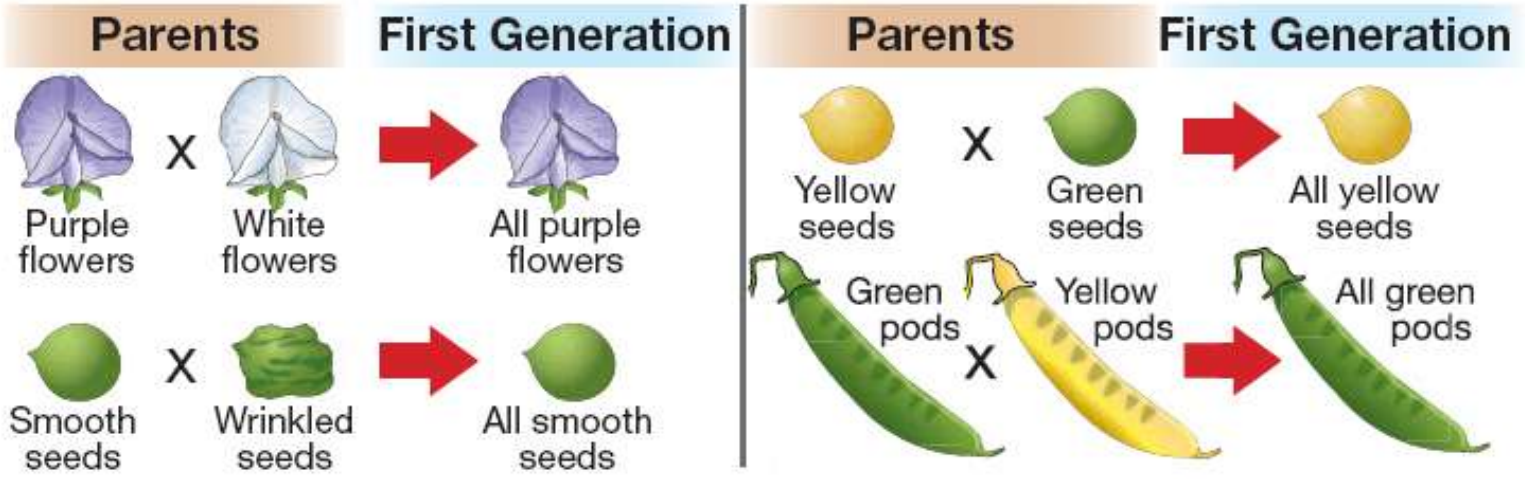
- For his experiments, Mendel was careful to start out with **purebred** parent plants.

- A purebred plant with purple flowers will only produce plants with purple flowers.



9. First Generation

- When Mendel crossed purebred, purple-flowered plants with purebred, white-flowered plants, the first generation **produced all** purple-flowered plants!
- Mendel got similar results for the other traits.

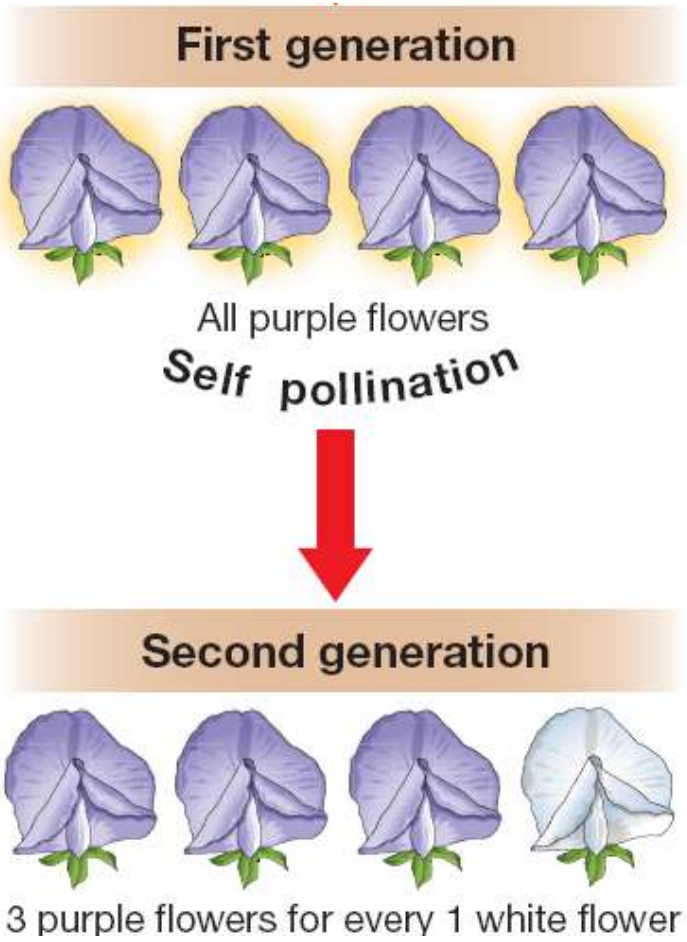


X = crossed with

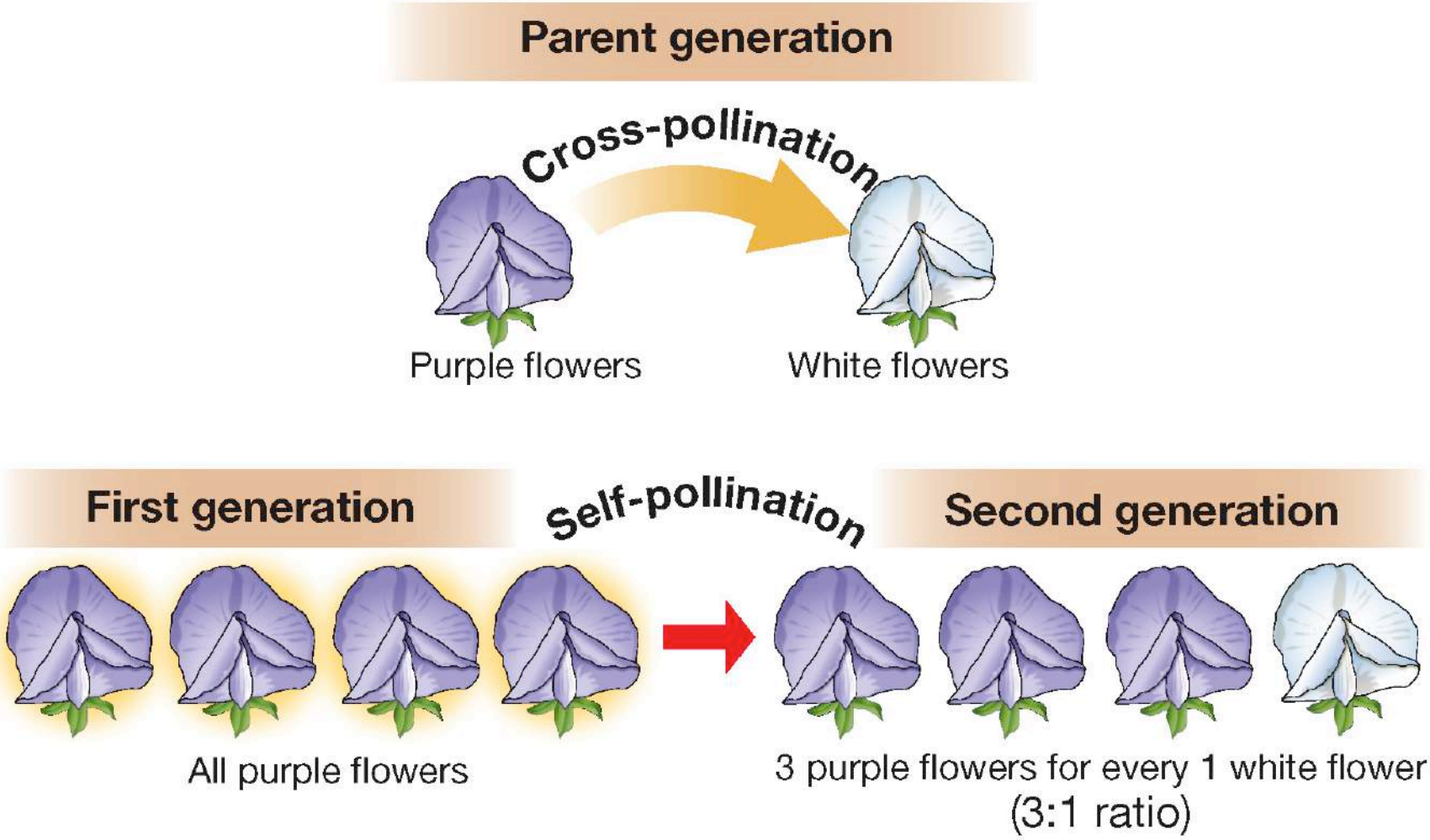
10. Second Generation

- When the purple-flowered plants of the offspring self-pollinated, white flowers reappeared in the second generation.

- Mendel was careful.
- How could this happen**?**



Pea Flower Crosses



11. Mendel's Conclusions

- From his results, Mendel proved that all traits do **not blend** in a 50/50 ratio.
- Pea plants exhibited one trait over another in a ratio of about 3 to 1.
- Mendel concluded that pea traits like flower color were determined by separate units.
- Today, we call those units genes.

12. Dominant and Recessive Alleles

- We call the different forms of the same trait alleles.

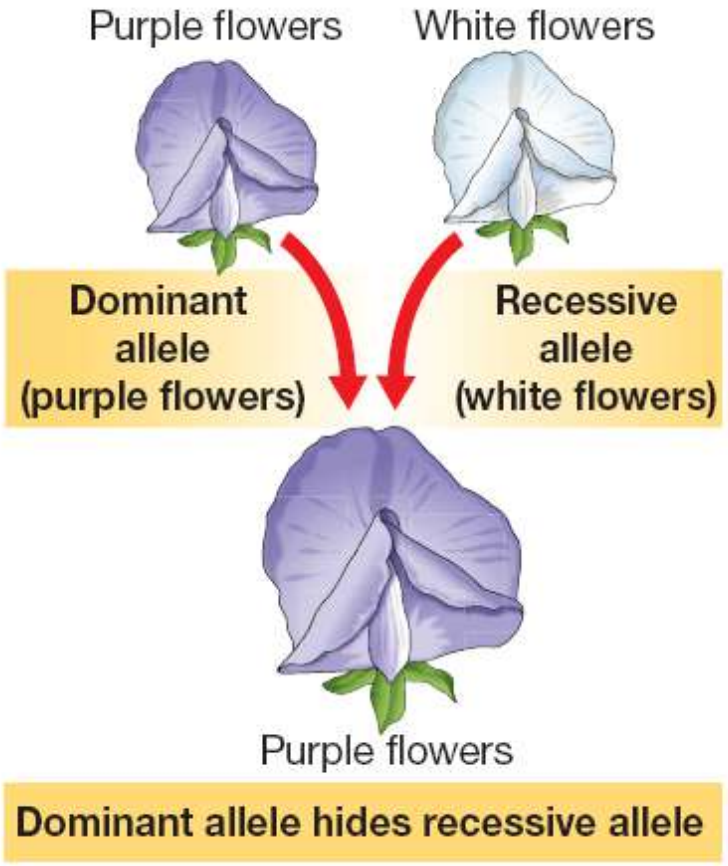
- Mendel showed us that the dominant allele (purple flower) appears in peas more often and seems to “hide” the other form (white flower).

- A recessive allele is the form of a gene that gets hidden if the dominant allele is present.

Dominant and Recessive Alleles

- If **both** alleles for flower color get passed to the offspring, then the dominant allele that causes purple flowers hides the recessive allele.

- No white flowers show up in the next generation.



S7L3. Students will recognize how biological traits are passed on to successive generations.

Explain the role of genes and chromosomes in the process of inheriting a specific trait.

2/23/16 Agenda: Genetics and Probability

Learning Target: I know how biological traits are passed on to successive generations, because …

Success Criteria: I can use a Punnett square to predict

the probable genotypes of the offspring.

Warm Up: See next slide.

Traits	Seed Shape	Seed Color	Seed Coat Color	Pod Shape	Pod Color	Flower Position	Stem Height
Controlled by Dominant Allele	 Round	 Yellow	 Gray	 Smooth	 Green	 Side	 Tall
Controlled by Recessive Allele	 Wrinkled	 Green	 White	 Pinched	 Yellow	 End	 Short

Use the chart above to answer the following review questions:

1.According to the table, if a purebred tall pea plant is crossed with a purebred short pea plant, what will the phenotype (physical appearance) of the offspring be?

2.How can this be predicted? How do you know?

3.What alleles would result in a yellow pod? What alleles must the offspring have?

Mendel & Punnett Squares on Brainpop

Watch the following clip and answer the following questions:

1. What is a Punnett Square used for in genetics?

2. How are dominant alleles represented?

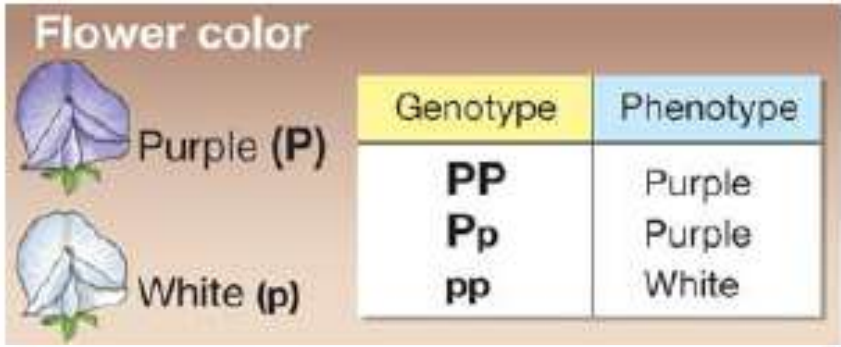
3. How are recessive alleles represented?

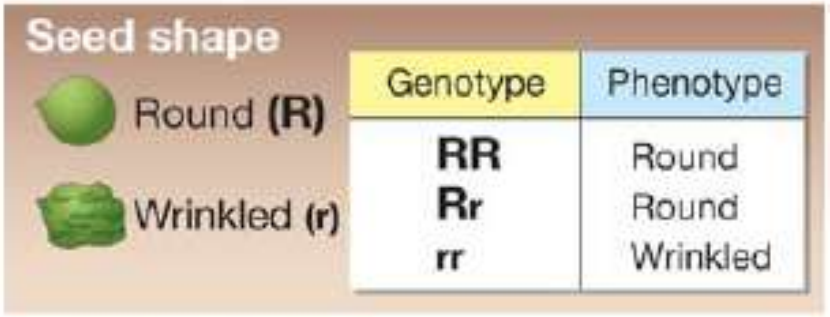
Day 2: Note start video clip @ 51 sec.s

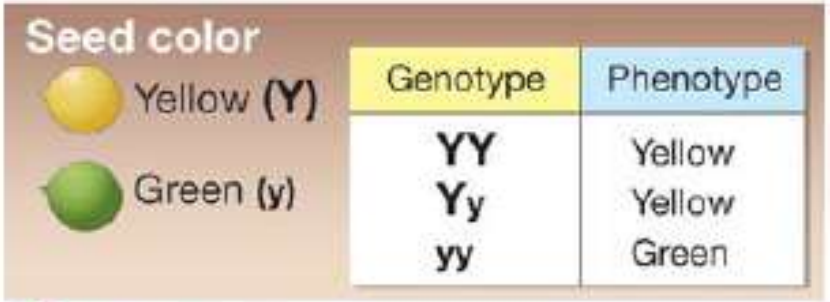
- https://www.brainpop.com/health/geneticsgrowthanddevelopment/heredity/

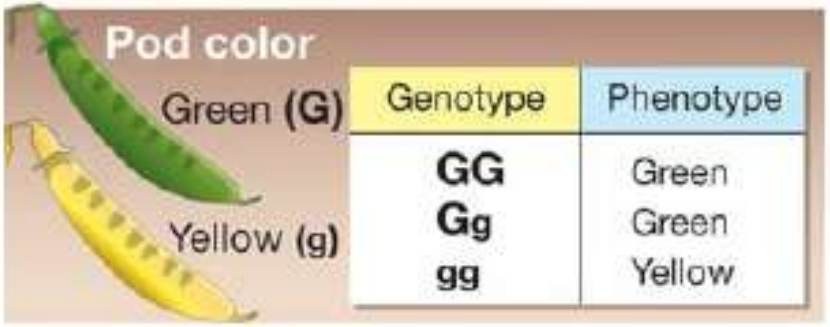
13. Genotype

- Mendel used **letters** to show how the different forms of a gene were passed to the next generation.
- Mendel discovered that a pea plant with purple flowers could have a **genotype** of either *PP* or *Pp*.
- A pea plant with white flowers could **only** have a genotype of *pp*.
- An organism's **genotype** shows the alleles of a gene it contains.
- Think, "***G***eno = ***G***enes."





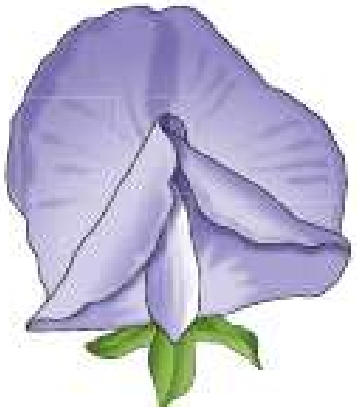




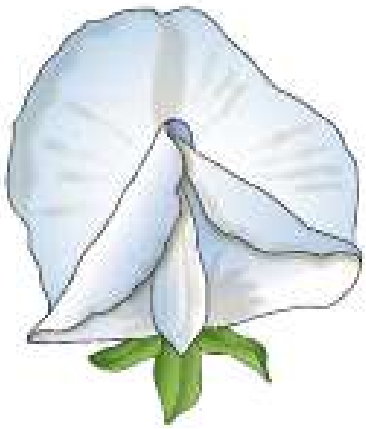
14. Phenotype

- An organism's phenotype is the form of a trait that is visible.
- Think, " ***Ph***eno = ***Ph***ysical."
- For flower color, a pea plant can show a phenotype of purple or white flowers.

purple phenotype



white phenotype



Flower Genotype/Phenotype

Parent generation

Genotype: **PP**

Phenotype: **purple**

X

Genotype: **pp**

Phenotype: **white**

First generation

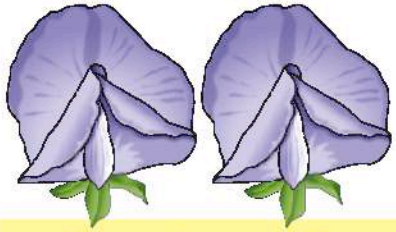
Genotype: **Pp**

Phenotype: **purple**

Second generation

Genotype: **PP**

Phenotype: **purple**



Genotype: **Pp**

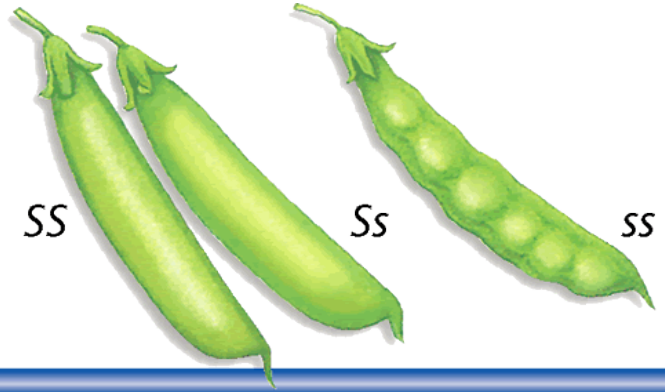
Phenotype: **purple**

Genotype: **pp**

Phenotype: **white**

15. Phenotypes and Genotypes

- An organism's phenotype is its **physical** appearance, or visible traits, and an organism's genotype is its **genetic** makeup, or allele combinations.



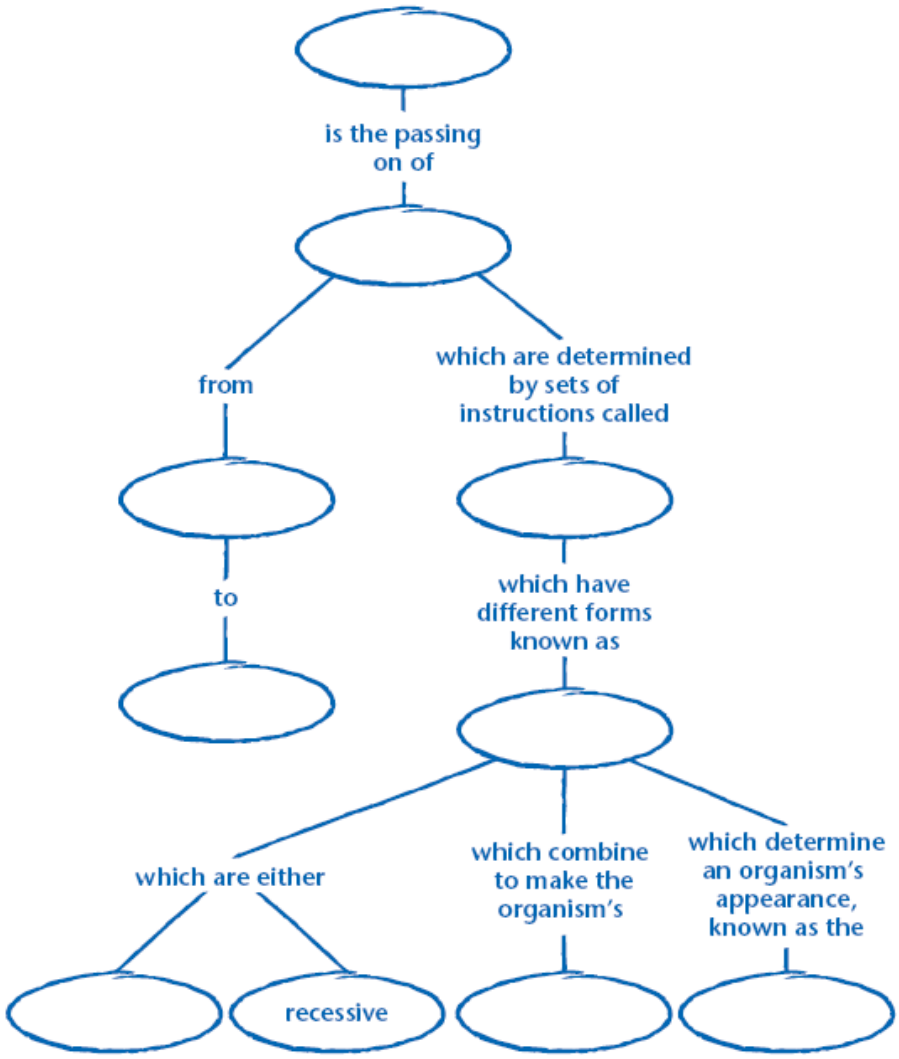
Phenotypes and Genotypes

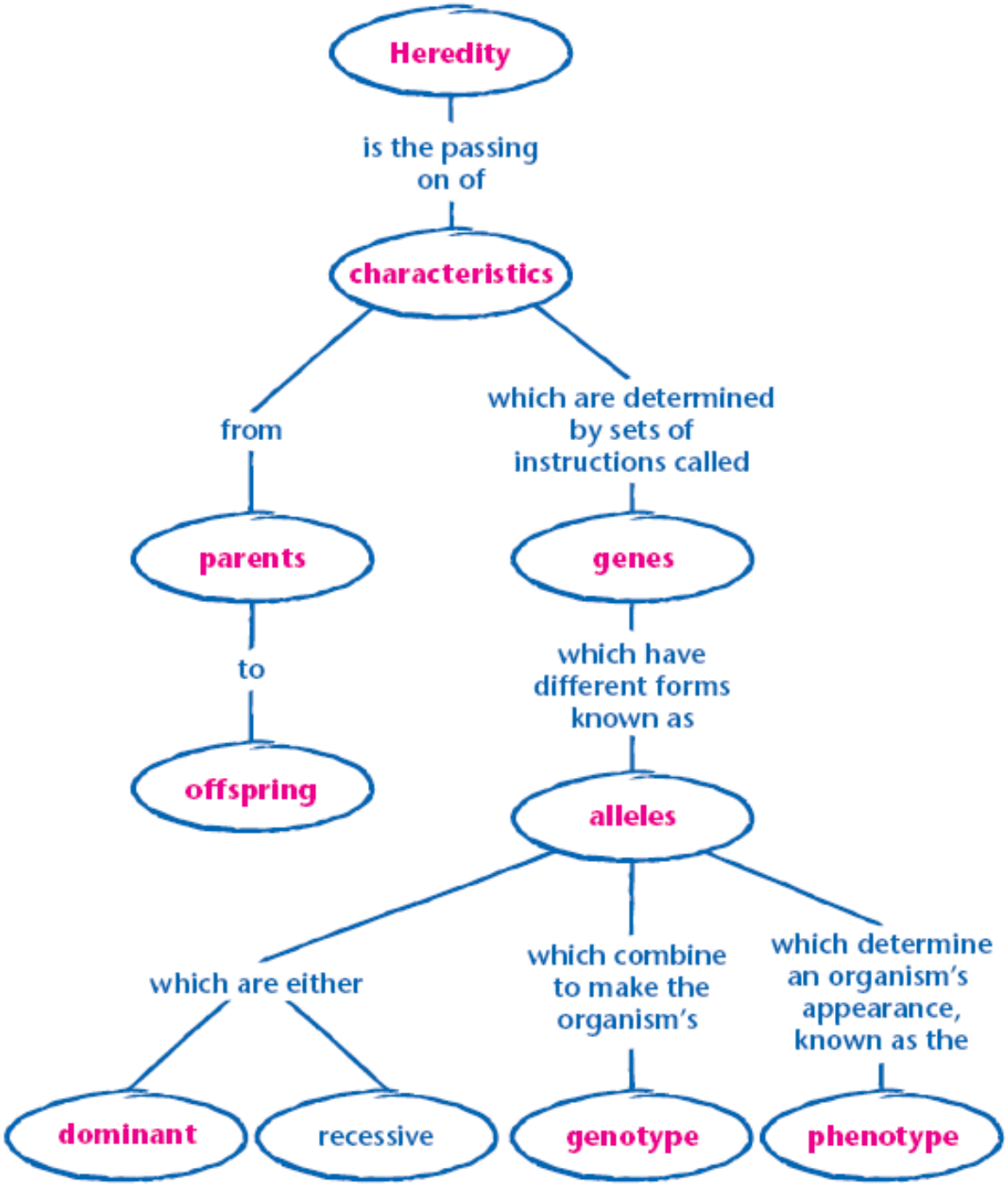
Phenotype	Genotype
Smooth pods	*SS*
Smooth pods	*Ss*
Pinched pods	*ss*

Describe the factors that control the inheritance of traits in organisms by completing the graphic organizer.

Use the following terms to complete the concept map below:

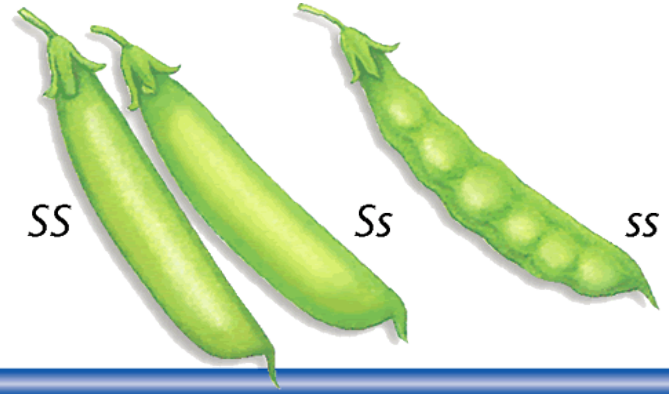
alleles, parents, heredity, phenotype, genes, offspring, genotype, characteristics, dominant




Heredity
is the passing on of
characteristics
from
which are determined by sets of instructions called
parents
genes
to
which have different forms known as
offspring
alleles
which are either
which combine to make the organism's
which determine an organism's appearance, known as the
dominant
recessive
genotype
phenotype

16. Phenotypes and Genotypes

- An organism's phenotype is its **physical** appearance, or visible traits, and an organism's genotype is its **genetic** makeup, or allele combinations.



Phenotypes and Genotypes

Phenotype	Genotype
Smooth pods	SS
Smooth pods	Ss
Pinched pods	ss

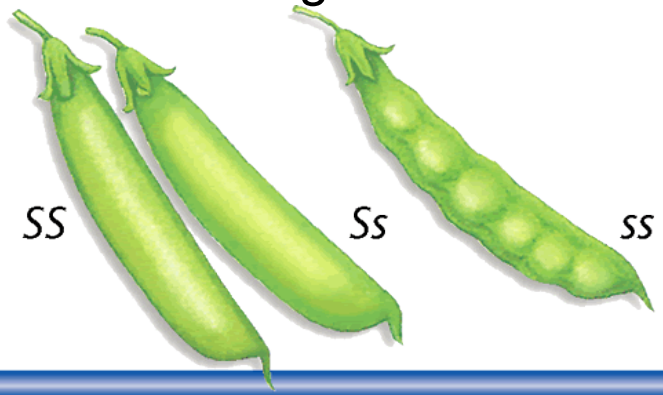
An organism that has two identical alleles for a trait is said to be **homozygous**.

An organism that has two different alleles for a trait is **heterozygous** for that trait.

17. Phenotypes and Genotypes

- What phenotype/s are possible when you have an organism with **homozygous** alleles?

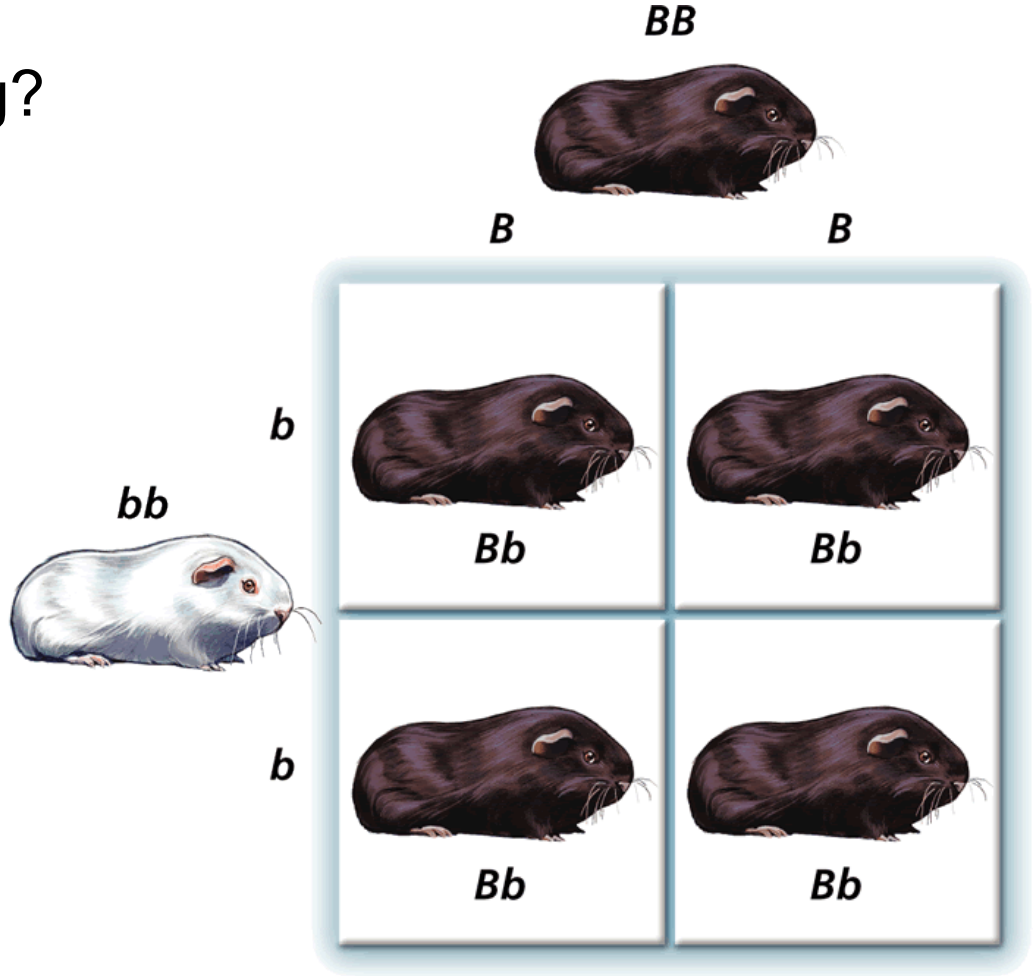
- What phenotype/s are possible when you have an organism with **heterozygous** alleles?



Phenotypes and Genotypes

Phenotype	Genotype
Smooth pods	*SS*
Smooth pods	*Ss*
Pinched pods	*ss*

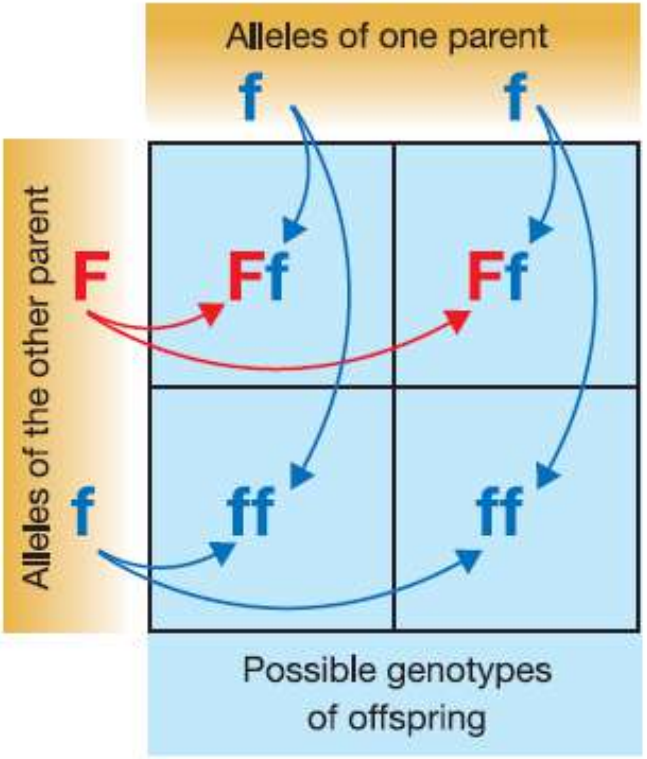
- What are the genotypes of these guinea pig parents?
- What are the phenotypes of these guinea pig parents?
- Are the parents heterozygous or homozygous?
- What about the offspring?



18. Predicting Genotypes and Phenotypes

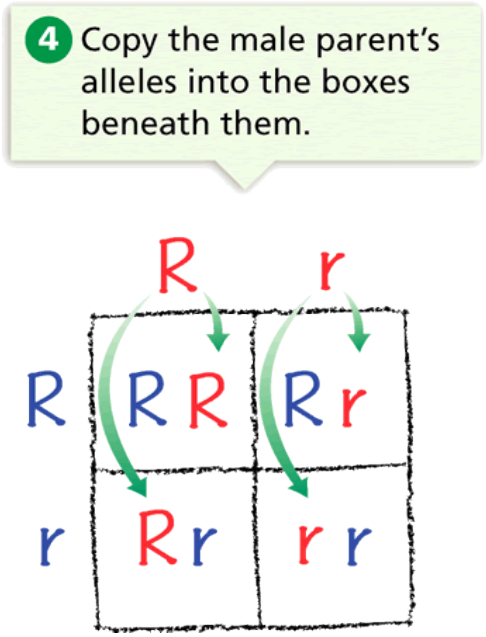
- You can predict the possible genotypes and phenotypes of offspring if you know the genotypes of the parents.

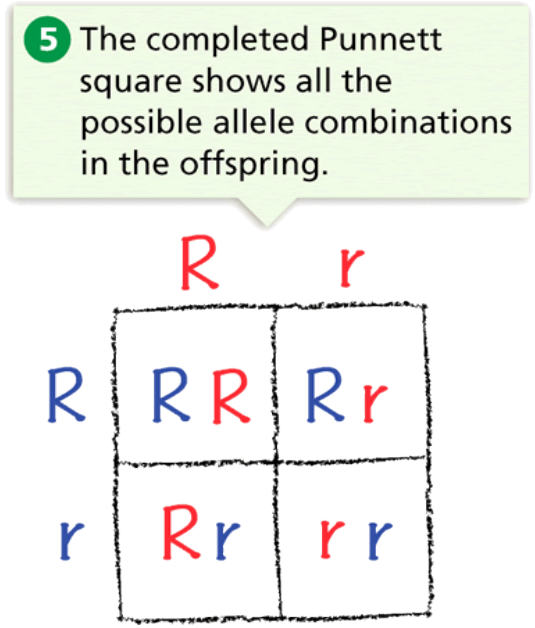
- A Punnett square shows all of the possible combinations of alleles from the parents.



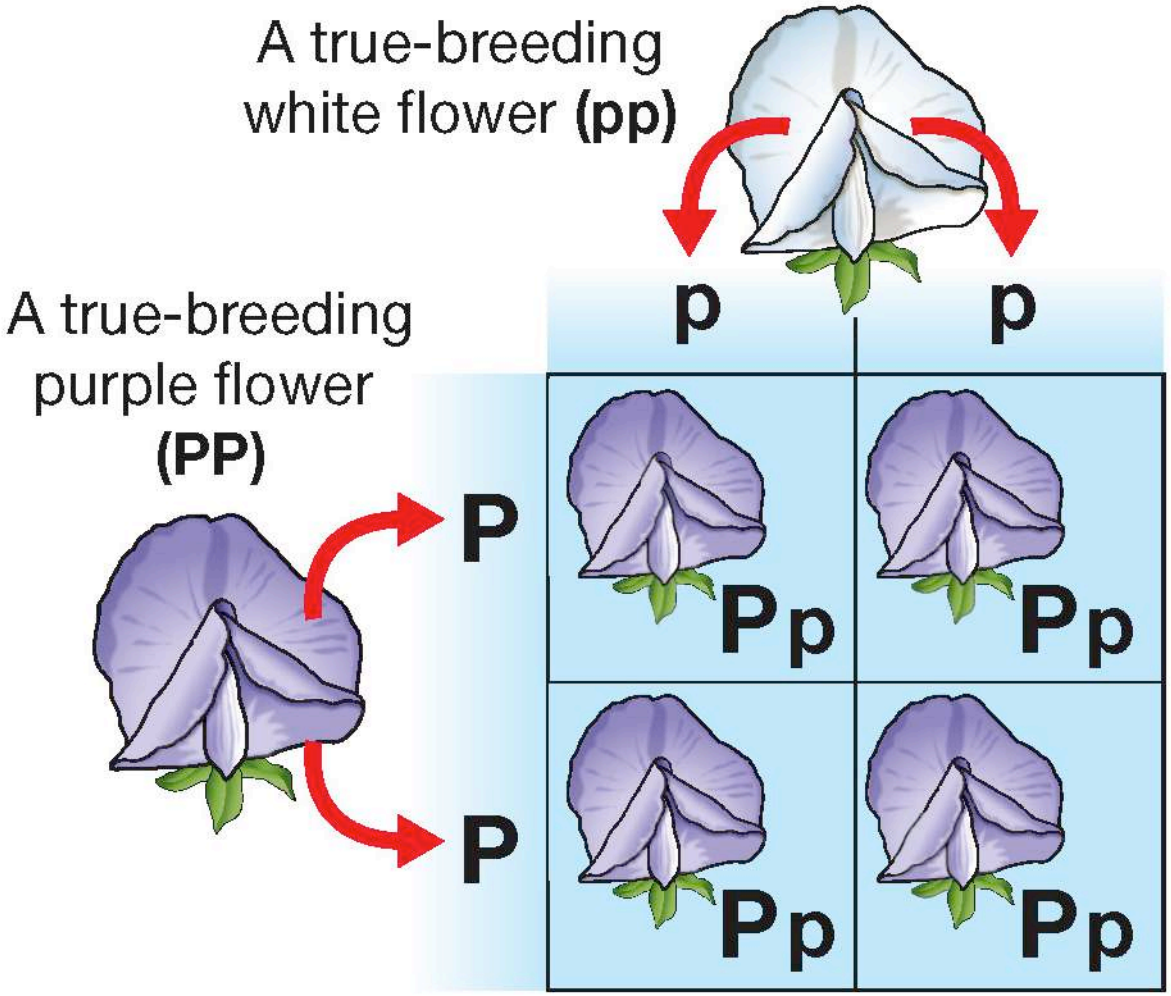
19. A Punnett Square

- The diagrams show how to make a Punnett square. In this cross, both parents are heterozygous for the trait of seed shape. *R* represents the dominant round allele, and *r* represents the recessive wrinkled allele.





First Generation Punnett



Punnett Square Practice

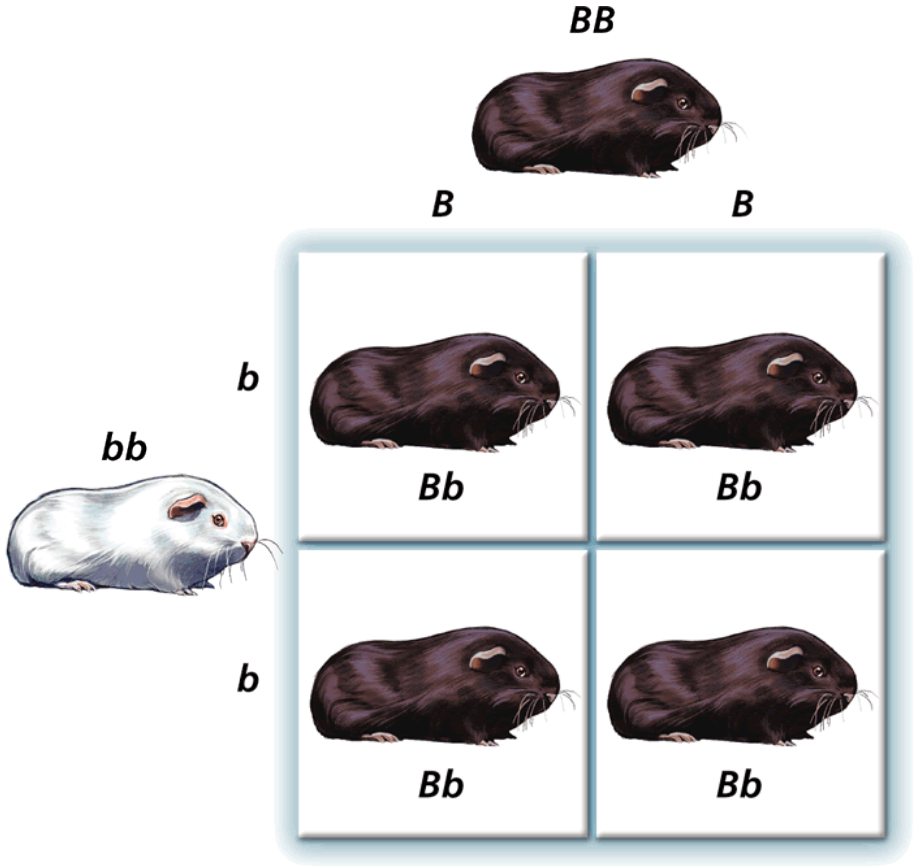
- Now practice predicting offspring in different crosses using a Punnett Square.

Closing:

- How does a Punnett Square help to predict the probable genotypes of the offspring?

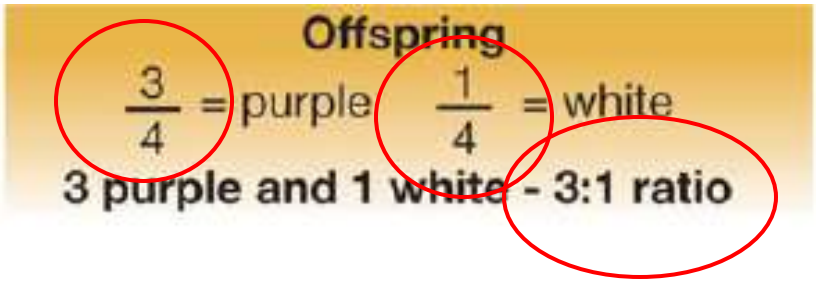
Probability and Genetics

- In a genetic cross, the allele that each parent will pass on to its offspring is based on probability.



Punnett squares and probability

- Probability **is the mathematical chance that an event will occur.**
- **Probability can be expressed as a fraction, a ratio, or a percentage.**

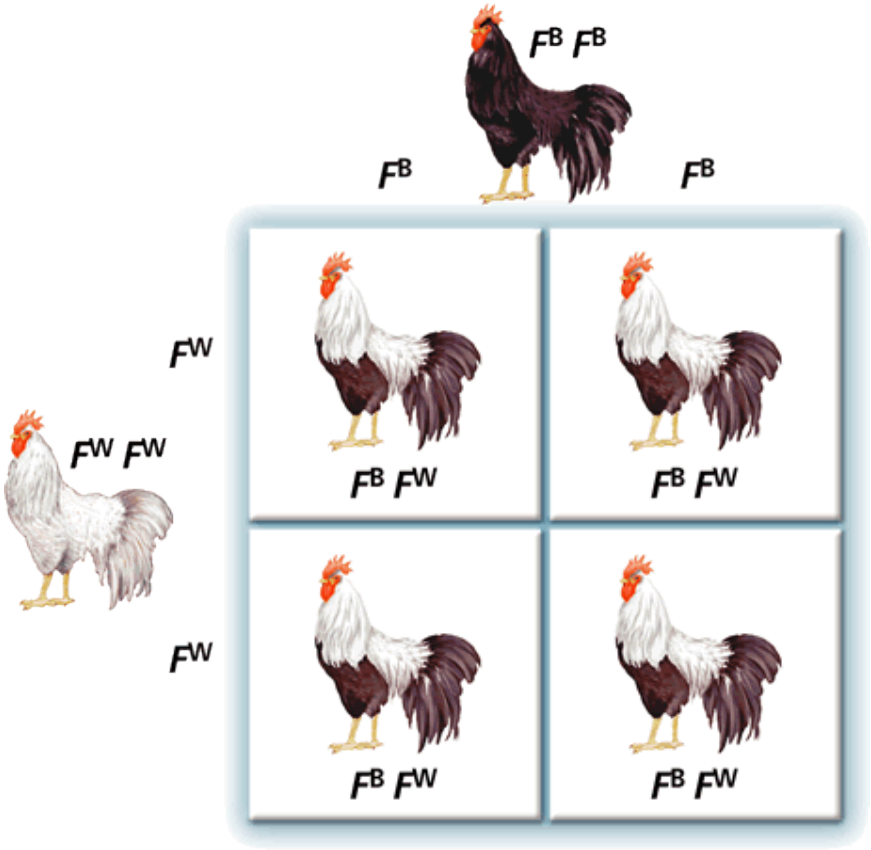


$$\frac{3}{4} \times 100 = 75\%$$

$$\frac{1}{4} \times 100 = 25\%$$

Codominance

- In codominance, the alleles are neither dominant nor recessive. As a result, both alleles are expressed in the offspring.



Reviewing Vocabulary

Key Terms

heredity

trait

genetics

fertilization

purebred

gene

alleles

dominant allele

recessive allele

hybrid

Definitions

a. the passing of traits from parents to offspring

b. an organism with two different alleles for a trait

c. factors that control traits

d. physical characteristics of organisms

e. an allele whose trait always shows up in the organism

f. the different forms of a gene

g. the scientific study of heredity

h. an allele whose trait is masked in the presence of a dominant allele

Building Vocabulary

- Use all the information you have learned to write a definition of each Key Term in your own words.

Key Terms:	Examples:
F1	**Probability** is a number that describes how likely it is that an event will occur.
Punnett square	A **Punnett square** is a chart that shows all the possible combinations of alleles that can result from a genetic cross.
phenotype	An organism's **phenotype** is its physical appearance, or visible traits.
genotype	An organism's **genotype** is its genetic makeup, or allele combinations.

Building Vocabulary

Use all the information you have learned to write a definition of each Key Term in your own words.

Key Terms:	Examples:
probability	**Probability** is a number that describes how likely it is that an event will occur.
heterozygous	An organisms that has two different alleles for a trait is **heterozygous** for that trait.
codominance	In **codominance**, the alleles are neither dominant nor recessive.

Building Vocabulary

Use all the information you have learned to write a definition of each Key Term in your own words.

Key Terms:	Examples:
homozygous	An organisms that has two identical alleles for a trait is said to be **homozygous**.
heterozygous	An organisms that has two different alleles for a trait is **heterozygous** for that trait.
codominance	In **codominance**, the alleles are neither dominant nor recessive.