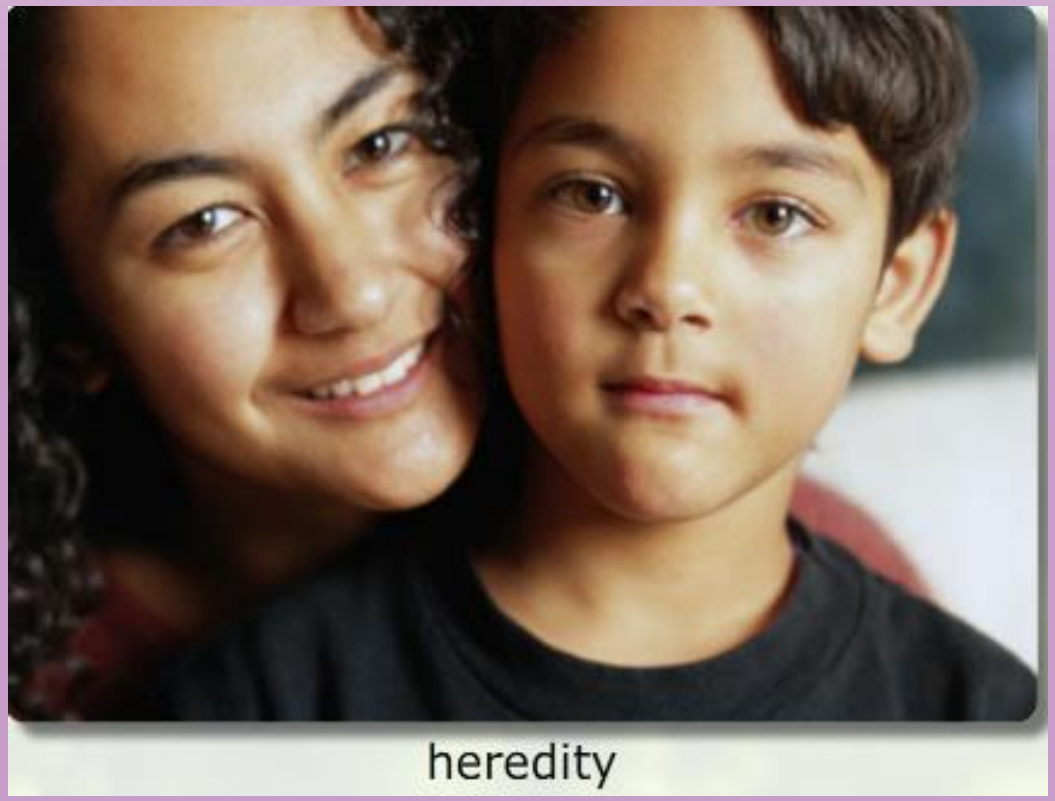
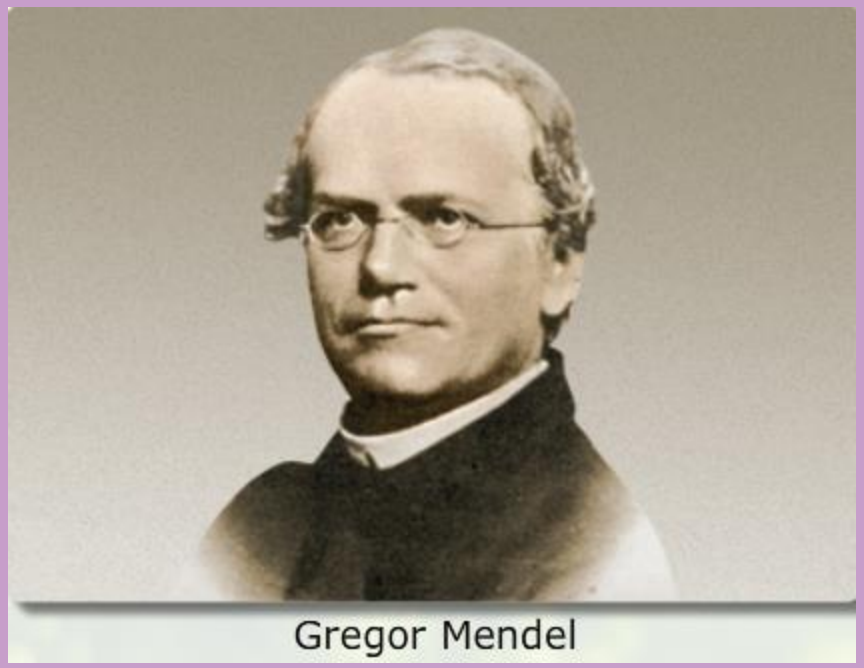
Heredity

- **Heredity** is the passing of genetic material from parents to offspring.



Mendel

- Gregor Mendel was an Austrian monk. In the 1800s, Mendel did the first major experiments in heredity.
- Known as the "Father of Genetics"



Mendel studied 7 traits of the pea plant

1. Flower color is purple or white
2. Flower position is axil or terminal
3. Stem length is long or short
4. Seed shape is round or wrinkled
5. Seed color is yellow or green
6. Pod shape is inflated or constricted
7. Pod color is yellow or green

Mendel

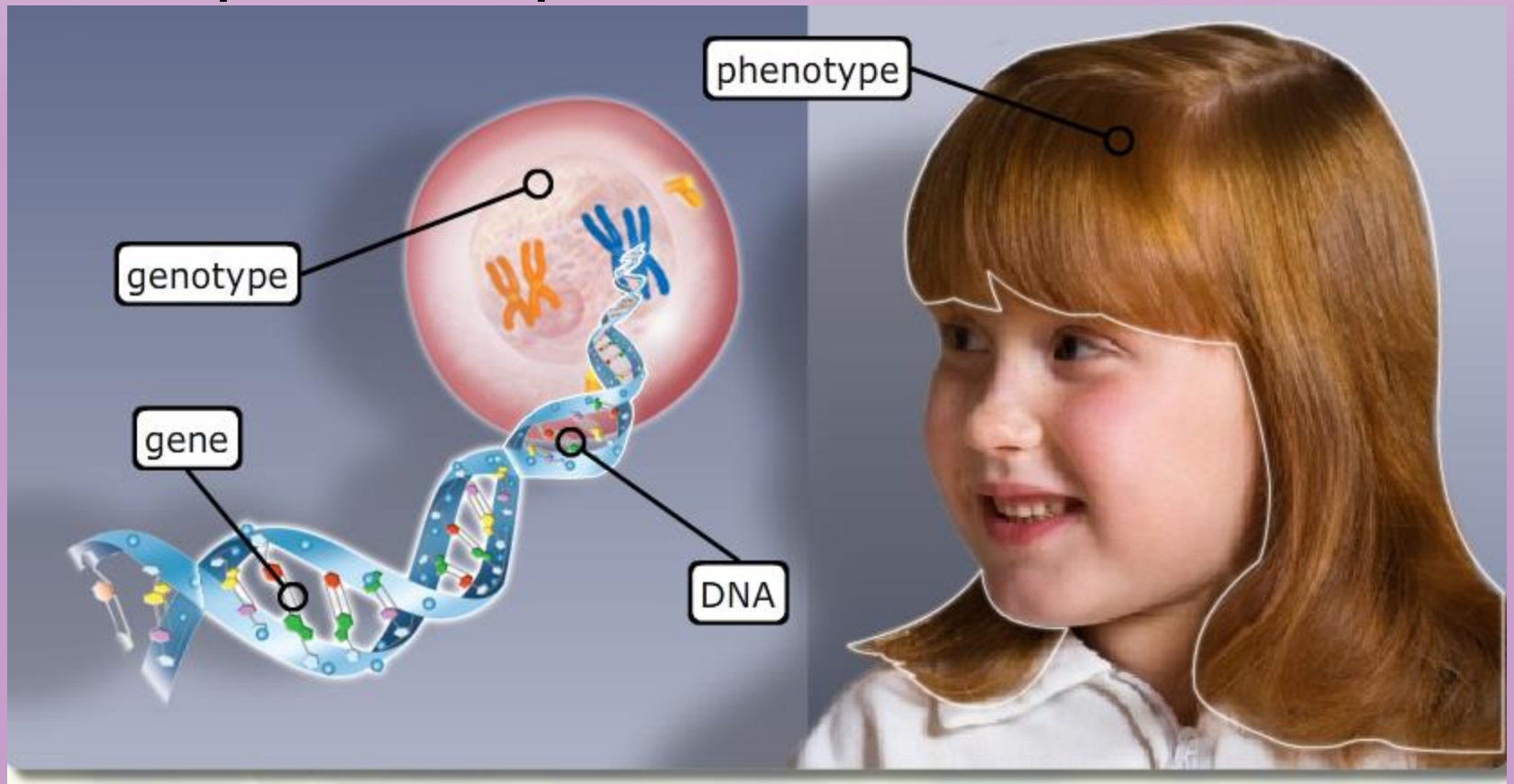
- Why Pea Plant?
  - Short reproductive period
  - Has traits that are easy to see
  - Doesn't require much care
  - Hundreds of offspring to study
- Each characteristic had two different forms. These different forms are called *traits*.

How are traits inherited?

- **Genes** are segments of DNA. They give instructions for producing a certain characteristic.

How are traits inherited?

- All organisms are produced from a blueprint, or a set of genetic instructions inherited from their parent or parents.



How are traits inherited?

- The offspring has two versions of the same gene for every characteristic—one from each parent.
- Different versions of a gene are known as alleles.
- Dominant alleles are shown with a capital letter, and recessive alleles are shown with a lowercase version of the same letter.

Dominant & Recessive Traits

- **DOMINANT** = a trait that overpowers and hides the other trait
  - Capital letters TT
- **RECESSIVE** = a trait that is weak and can be hidden (we do not see it)
  - Lower case letters tt

How are traits inherited?

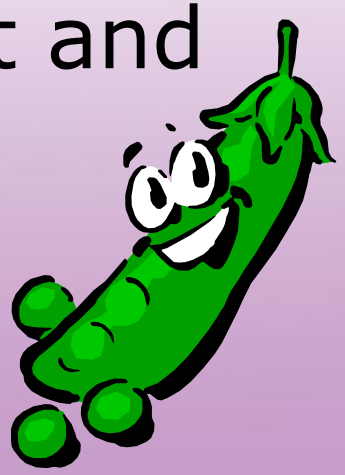
- An organism with one dominant and one recessive allele for a gene is *heterozygous* for that gene.
  - **Tt**
- An organism with two of the same alleles for a gene is *homozygous* for that gene.
  - **TT or tt**

How are traits inherited?

- The dominant allele contributes to the phenotype (physical appearance) if one or two copies are present in the genotype.
  - TT or Tt
- The recessive allele contributes to the phenotype **only** when two copies of it are present.
  - tt

HYBRID

- Hybrid = a mixture of dominant and recessive traits



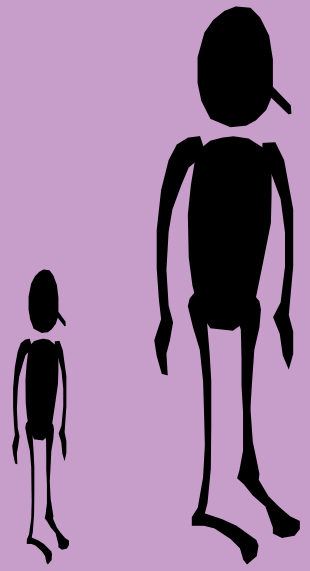
- Tt = Tall trait from one parent
  Short trait from one parent

WOULD THE HYBRID PLANT BE SHORT OR TALL? WHY?

How are traits inherited?

- Genotype - the combination of alleles that are inherited
  - Letter combinations (TT, Tt, tt)

- Phenotype - observable traits (traits that you can see)
  - Tall or Short



Complete Dominance

- Dominant allele and the other contains a recessive allele, the dominant allele determines the phenotype.
- This is called *complete dominance*.
  - The dominant allele completely masks the recessive allele

Genes

- Some characteristics are a result of several genes acting together.
- Sometimes, one gene influences more than one trait.
- For example, many genetic disorders, such as sickle-cell anemia, are linked to a single gene but affect many traits.

Acquired Traits

- Sometimes, the environment can influence an organism's phenotype.
- Some traits are acquired only from one's environment and are not inherited.
- For example, your ability to read and write is an acquired trait.

Inherited vs Acquired

Inherited Traits:

- Eye Color
- Hair Color
- Height
- Hair on Toes
- Hitchhikers Thumb
- Ear Lobes

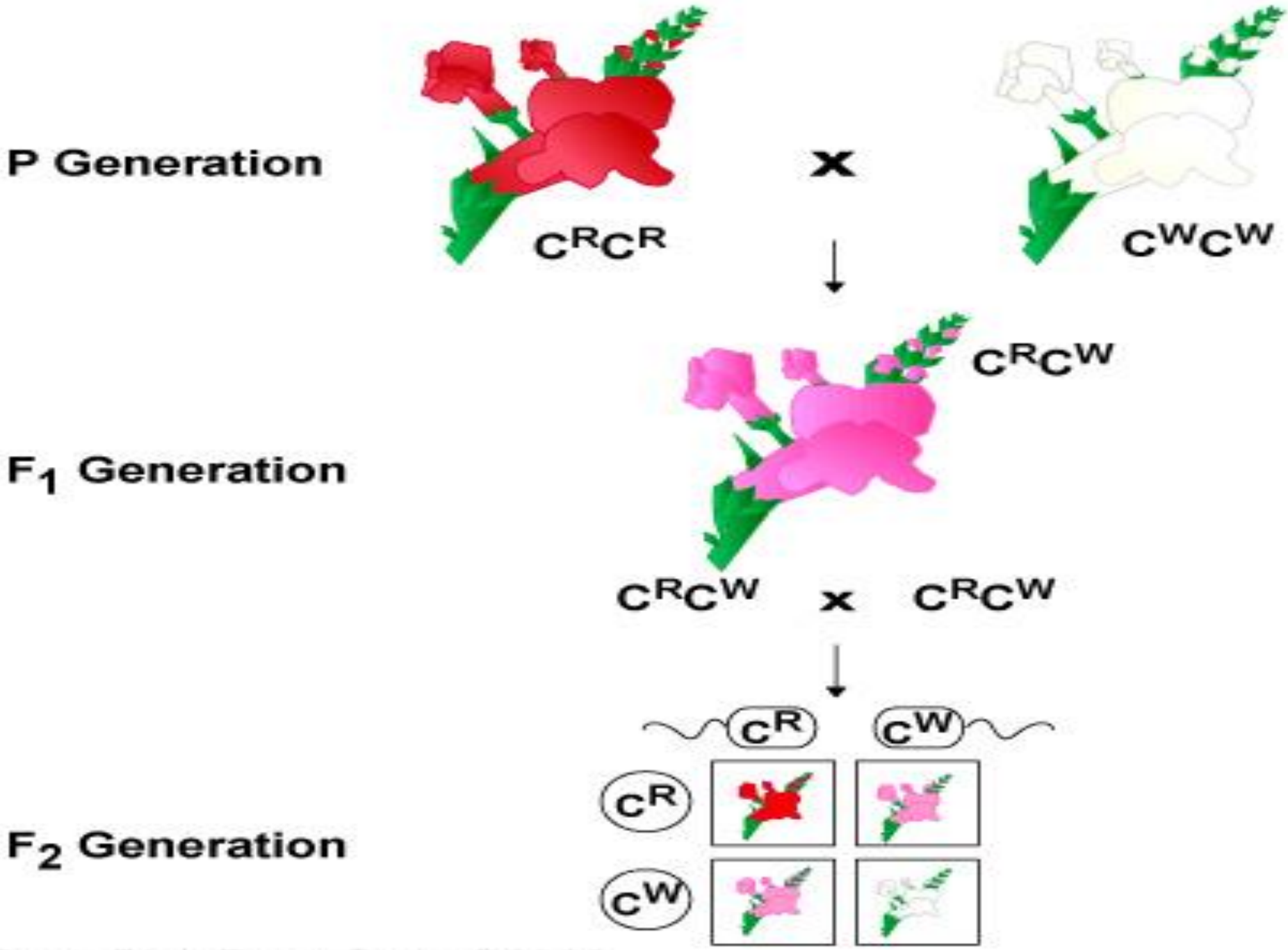
Acquired Traits:

- Reading
- Writing
- Riding a Bike
- Swimming
- Tying your Shoes
- Whistling

Travel around the room and find out which of your classmates have these inherited traits

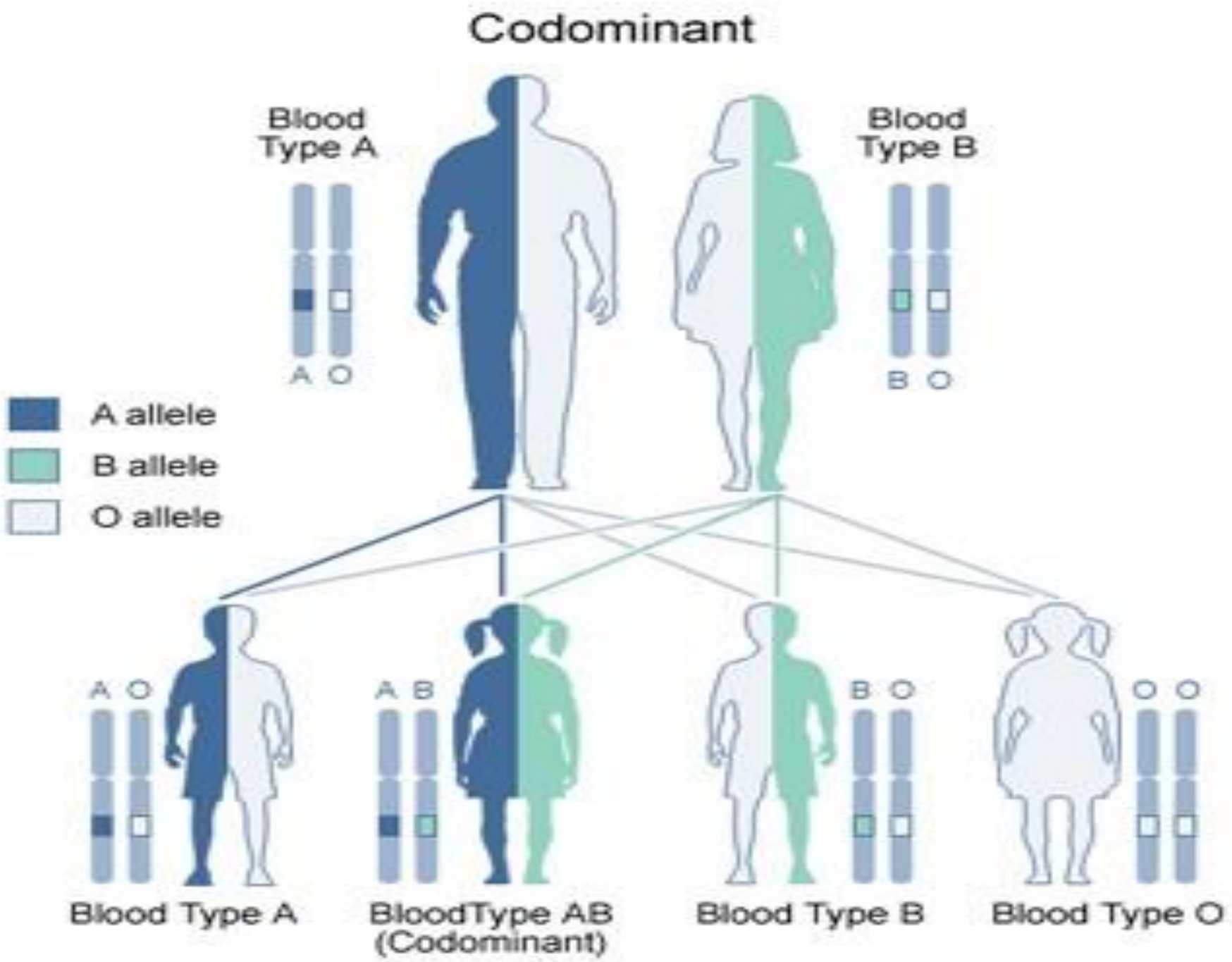
Incomplete Dominance

- In incomplete dominance, each allele in a heterozygous individual (Tt) influences the phenotype.
- This results in a phenotype that is a blend of the phenotypes.
- Example: Human Hair…
  - A person with one allele for straight hair and one allele for curly hair will have wavy hair.



Codominance

- In codominance, both traits contribute to the phenotype.
- Heterozygous individuals have both of the traits associated with their two alleles.
- Example: Human blood type
  - Three alleles play a role in determining blood type (A,B,O).
  - If you get one A allele and one B allele from your parents, you will have blood type AB


Codominant
Blood Type A
A O
Blood Type B
B O
A allele
B allele
O allele
A O
A B
B O
O O
Blood Type A
BloodType AB (Codominant)
Blood Type B
Blood Type O
U.S. National Library of Medicine

REVIEW

Which of these statements about an allele are true?

An allele is a form of a gene.

An allele makes up part of a genotype.

An allele is always affected by the environment.

An allele carries multiple genes.

If a plant with yellow seeds is crossed with a plant with green seeds, and all of the offspring have yellow seeds, what kind of inheritance pattern is this?

- incomplete dominance
- complete dominance ✓
- co-dominance
- dominance

A trait that overpowers and hides the other trait is called _____.

- Recessive
- Dominant 

Bb

- Homozygous
- Heterozygous 

If a plant with red seeds is crossed with a plant with white seeds, and all of the offspring have pink seeds, what kind of inheritance pattern is this?

- incomplete dominance
- complete dominance
- co-dominance
- dominance