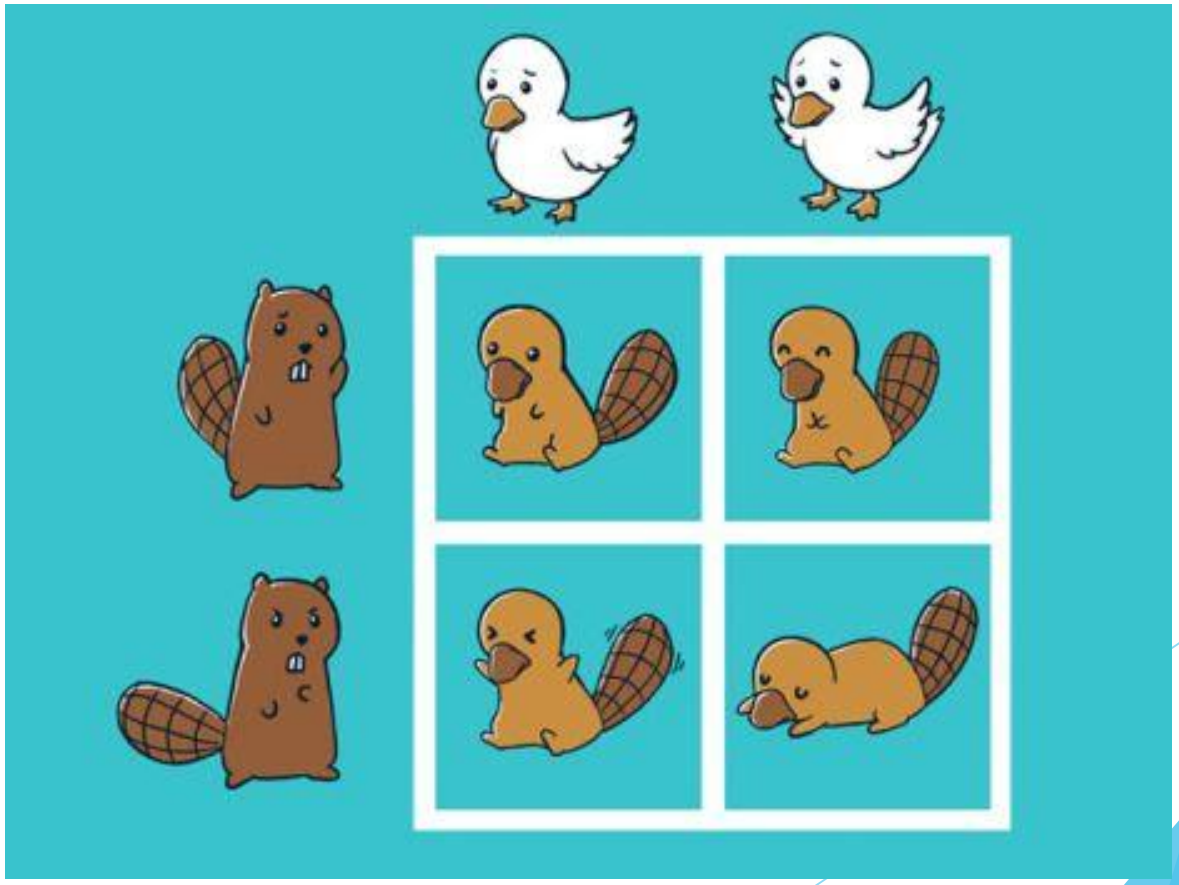
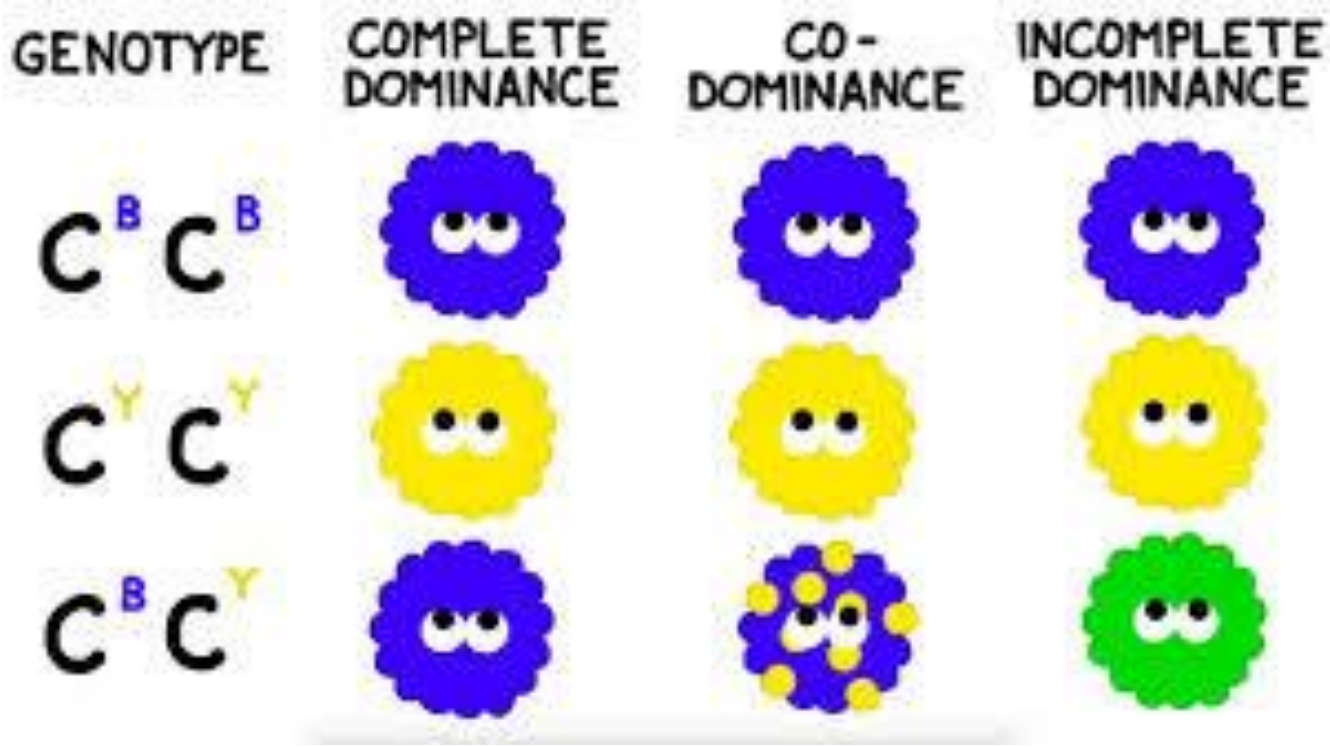
What happens if Both Alleles are expressed?



Amoeba Sisters Video

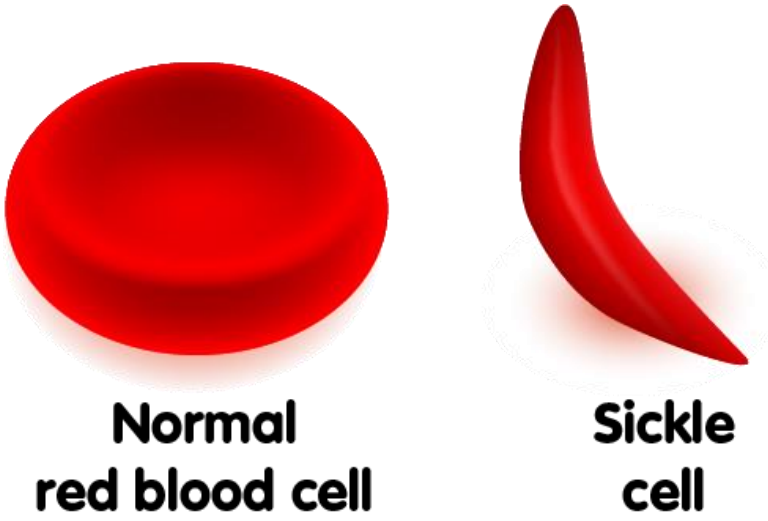


Both alleles are expressed in codominance.

- **Codominance:** the condition in which both alleles for a trait are equally expressed in a heterozygote; both alleles are dominant
- Codominant alleles are represented by capital letters with a superscript for each allele
  - Example: $H^R H^W$

Sickle Cell Anemia—Another Example of Codominance

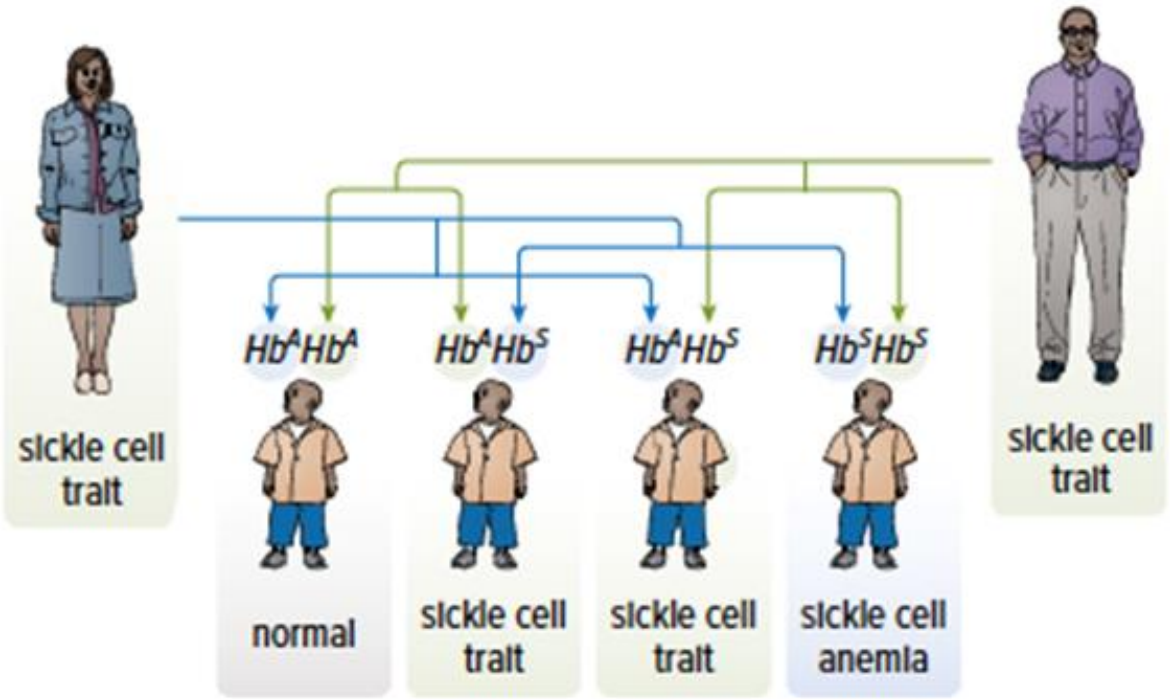
- Sickle cell anemia is a genetic disorder where the red blood cell is C-shaped (sickle shape) and therefore cannot transport oxygen effectively.
- Caused by a specific form of the gene that directs the synthesis of hemoglobin
  - Hemoglobin is a protein in red blood cells that carries oxygen in the blood



Sickle Cell Anemia

- The allele for normal hemoglobin is represented by Hb^A
- The allele for sickle cell hemoglobin is represented by Hb^S
- Individuals that are homozygous (Hb^SHb^S) have sickle cell anemia
- Those who are heterozygous have some normal and some sickle cells.
  - These people have the “sickle cell trait”

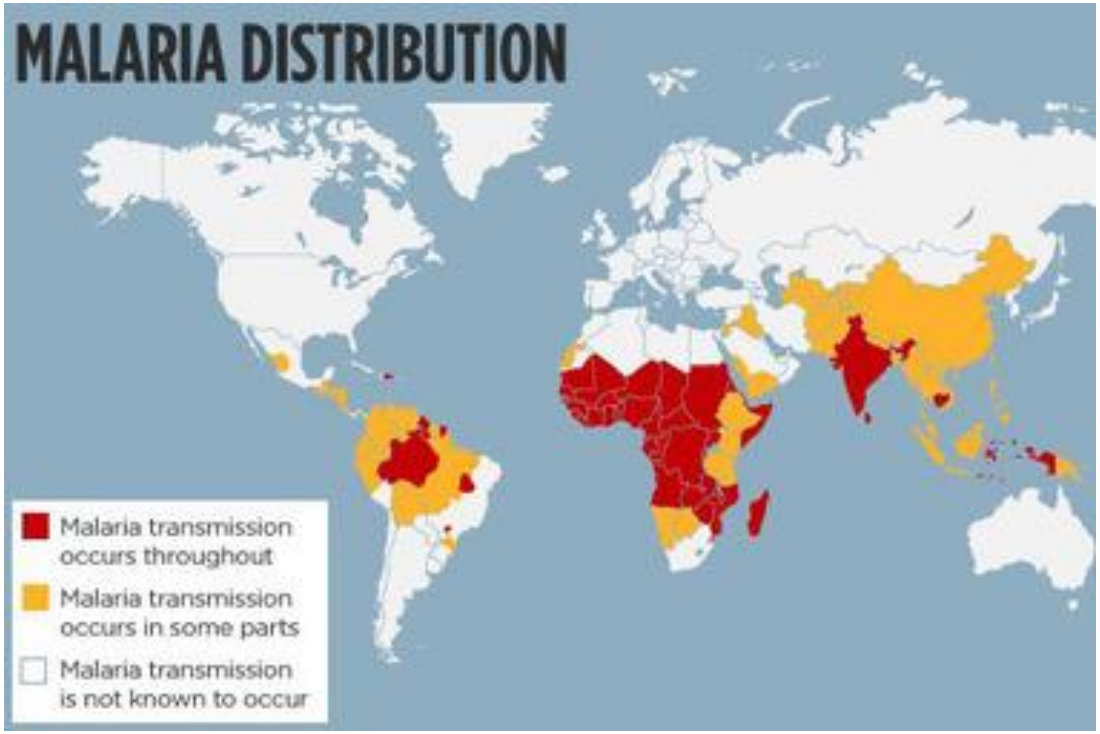
Figure 1.18: When a man and a woman are both heterozygous for the sickle cell gene, there is a one in four chance that they will have a child with sickle cell anemia.



	Hb^A	Hb^S
Hb^A	Hb^AHb^A	Hb^AHb^S
Hb^S	Hb^AHb^S	Hb^SHb^S

Malaria & Sickle Cell

- People who are heterozygotes with the sickle cell trait are resistant to the life-threatening disease malaria.



Discussion Questions

1. What is codominance? Give an example

2. Hypothesize why the frequency of the sickle cell allele is much higher in Africa than in other areas of the world.

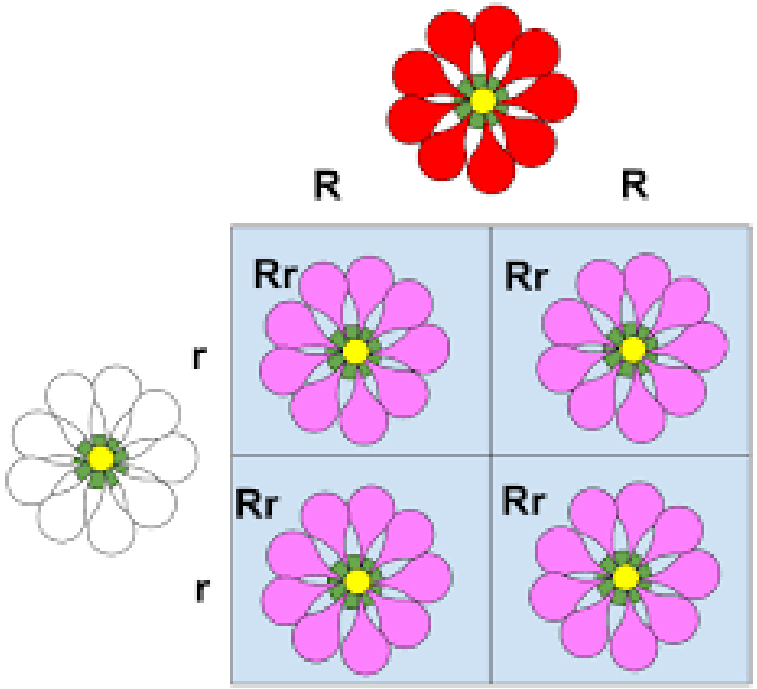
Blood Groups

- Codominance

Blood type	Genotype	
A	I^A, I^O I^A, I^A	AO AA
B	I^B, I^O I^B, I^B	BO BB
AB	I^A, I^B	AB
O	$I^O\ I^O$	OO

In incomplete dominance, alleles are neither dominant nor recessive

- **Incomplete dominance:** a condition in which neither allele for a gene completely conceals the presence of the other; it results in intermediate expression of a trait
- Example: Four o'clock flowers can be red, pink, or white.



Incomplete Dominance

- Use capital letters with superscripts to represent incomplete dominance.

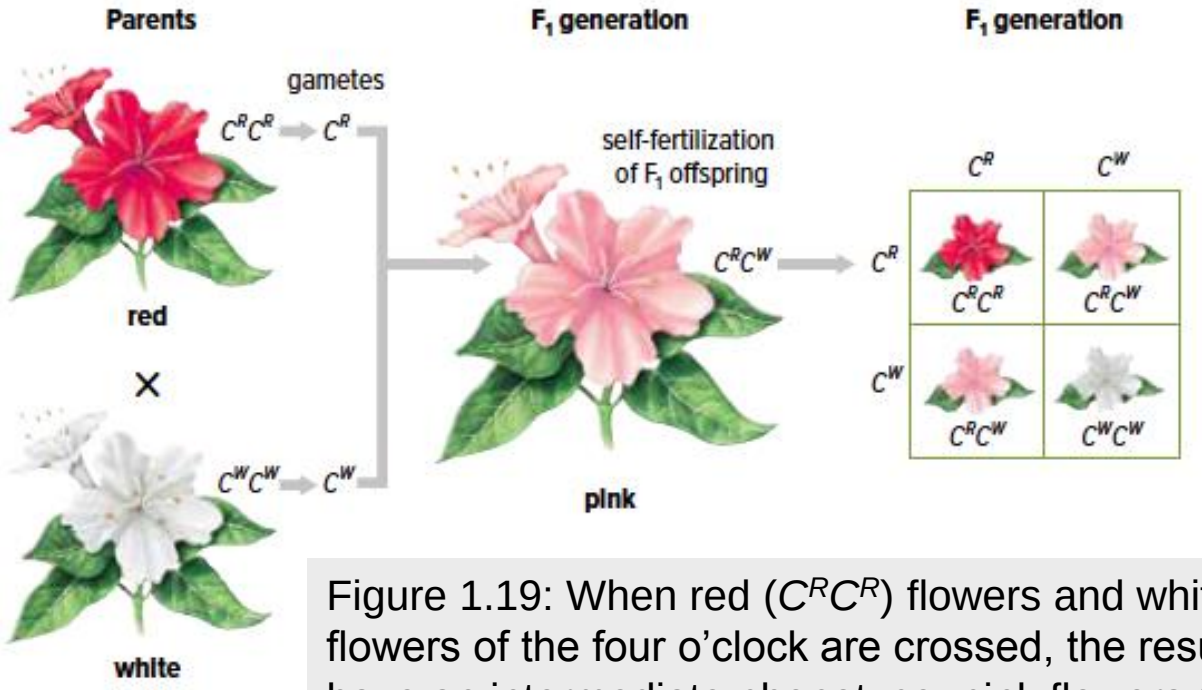


Figure 1.19: When red (C^RC^R) flowers and white (C^WC^W) flowers of the four o'clock are crossed, the resulting offspring have an intermediate phenotype, pink flowers (C^RC^W). In the F_2 generation, all three phenotypes are observed.

Discussion Questions

1. What is the difference between incomplete dominance and codominance?
2. A plant that produces white flowers is crossed with a plant that produces purple flowers. Describe the phenotype of the offspring if the inheritance pattern for flower colour is

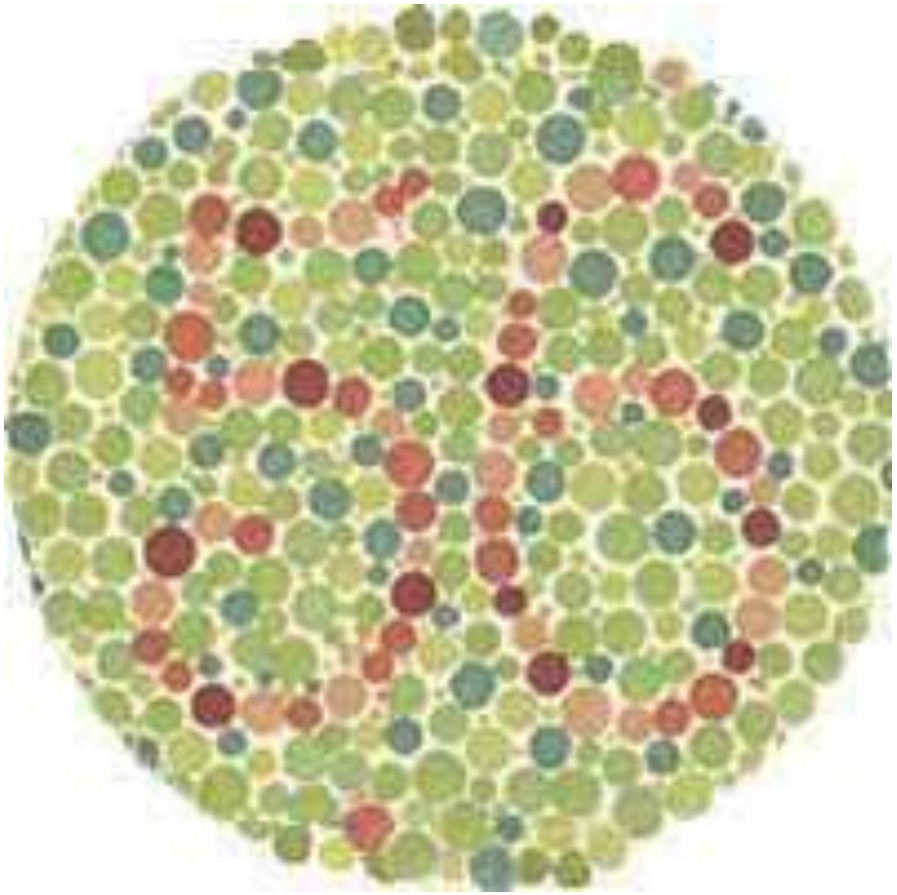
   a) incomplete dominance

   b) codominance

Some inherited traits are due to alleles on the sex chromosomes

- **Sex-linked trait:** a trait controlled by genes on sex chromosomes
- **X-linked trait:** a trait controlled by genes on the X chromosome
- Males are affected by recessive X-linked traits more often because they have only one X chromosome.

What number do you see?



Red-Green Colour Vision Deficiency

- Red-green colour vision deficiency is a recessive X-linked trait.
- *Carrier* is a female that has one recessive allele on one of her X chromosomes.

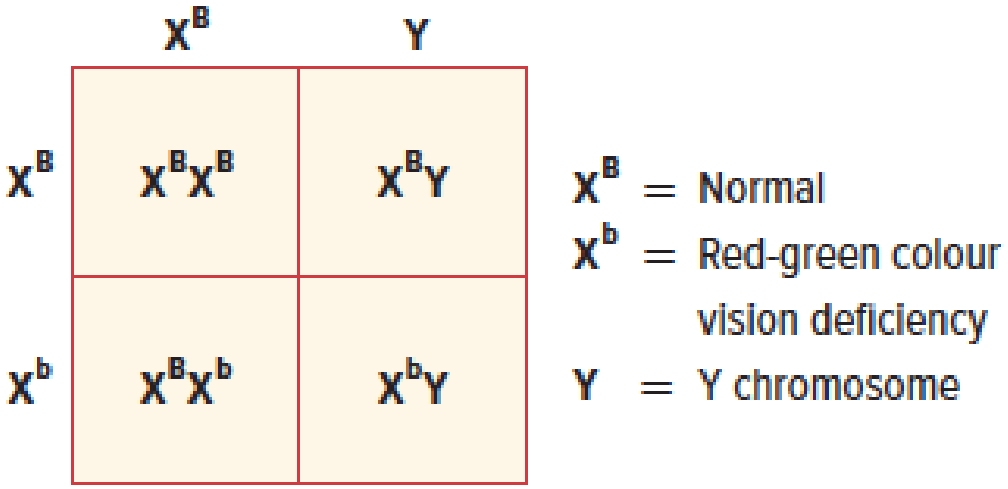


Figure 1.20: The Punnett square shows how the sex-linked trait is inherited.

Discussion Questions

1. What are sex-linked traits?

2. Use vocabulary terms to describe the genotype of a male who is red-green colour vision deficient.