Station I
Multiple alleles

Objective: **Practice solving blood type inheritance problems using Punnett squares.**

1 Problem I

Write the genotype for each person based on the description:

a. Homozygous for the “B” allele _____

b. Heterozygous for the “A” allele _____

c. Type O _____

d. Type “B” and had a type “O” parent _____

e. Type “AB” _____

2 Problem II

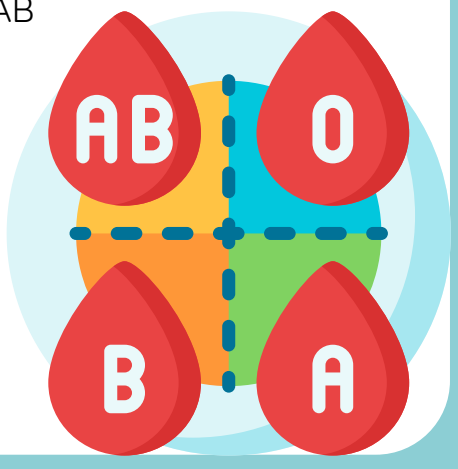
Using Punnett squares, determine the possible blood types of the offspring when:

a. Father is type B, homozygous; Mother is type A, heterozygous

_____% O
_____% A
_____% B
_____% AB

b. Father is type O, Mother is type AB

_____% O
_____% A
_____% B
_____% AB



3 Problem III

Two parents think their baby was switched at the hospital. Its 1968, so DNA fingerprinting technology does not exist yet. The mother has blood type “O,” the father has blood type “AB,” and the baby has blood type “B.”

a. Mother’s genotype: _____

b. Father’s genotype: _____

c. Baby’s genotype: _____ or _____

d. Punnett square showing all possible genotypes for children produced by this couple.

e. Was the baby switched? _____

4 Problem IV

Can two parents with blood type AB have a child with blood type O? Why or why not?

Station II
Sex-Linked Traits

Objective: **Practice solving sex-linked inheritance problems using Punnett squares.**

1 Problem I

In humans, hemophilia is a sex linked trait. Females can be normal, carriers, or have the disease. Males will either have the disease or not (but they won't ever be carriers)

X^HX^H - female, normal
X^HX^h - female, carrier
X^hX^h - female, hemophiliac

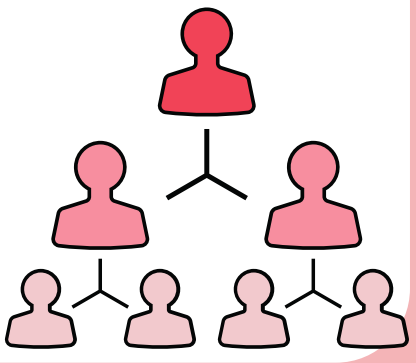
X^HY - male, normal
X^hY - male, hemophiliac

If mother is a carrier and father has a hemophilia, use a Punnett square to find the possible genotypes and phenotypes of the children.

a. What % of daughters could be carriers? _____
b. What % of sons could have hemophilia? _____

2 Problem II

A boy has hemophilia. His mother does not.
a) What is the most likely genotype of his mother? _____
b) Can his father be the source of the hemophilia gene? _____



3 Problem III

In humans, colorblindness is a sex-linked trait carried on the X chromosome. Females can be normal **(X^NX^N)**, carriers **(X^NX^c)**, or colorblind **(X^cX^c)**, depending on whether one or both of their X chromosomes carry the gene. Males, on the other hand, have only one X chromosome, so they are either colorblind **(X^cY)** or not colorblind **(X^NY)** — they cannot be carriers. This is why colorblindness is more common in males, as a single recessive allele on the X chromosome is enough to express the condition.

A woman is a carrier for colorblindness (X^NX^c) and her husband has normal vision (X^NY).

Use a Punnett square to answer:

a. What percentage of their sons could be colorblind? _____

b. What percentage of their daughters could be carriers? _____

4 Problem IV

A boy is colorblind, but neither of his parents appear to be colorblind.

a. What are the most likely genotypes of the mother and father? _____

b. Explain how the boy inherited the trait.

_____

_____

c. Could a daughter in the same family also be colorblind? Why or why not?

_____

_____

d. Use a Punnet square to answer:

Station III

Reasoning & Application

Objective: **Use reasoning and genetic knowledge to explain inheritance patterns in real-world examples.**

1 Problem I

A mother has blood type A, and the father has blood type B. Their child has blood type O.

a) Is this possible? _____

b) If yes, what are the possible genotypes of the parents? Explain.

_____

_____

_____

2 Problem II

A baby girl is born with hemophilia, a sex-linked disorder. Her mother does not have hemophilia, and her father does.

a) Is it possible for the daughter to have hemophilia? _____

b) What must the mother's genotype be for this to happen? Explain.

_____

_____

_____

3 Problem III

A boy is colorblind. His mother has normal vision, and his father is not colorblind.

a) How did the boy inherit the trait?

_____

_____

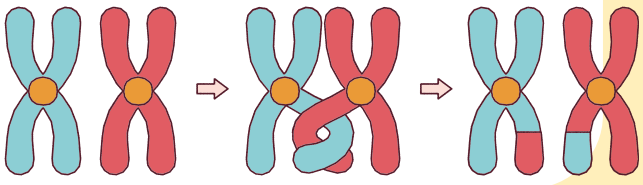
b) What is the most likely genotype of the mother? _____

c) Can the father be the source of the gene? Explain

_____

_____

_____



4 Problem IV

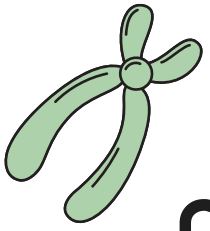
Parent 1: Blood type AB

Parent 2: Blood type O

a) What are the possible blood types of their children? Use a Punnet square.

_____% O
_____% A
_____% B
_____% AB

b) Show or explain why this is (or is not) possible.



Station IV
Create and Solve

Objective: **Apply your understanding of sex-linked inheritance and multiple alleles by creating your own genetic problem and challenging another group to solve it.**

1 Create a Genetic Problem

Write your own problem that includes one of the following:

- A blood type inheritance scenario using A, B, AB, or O
- A sex-linked trait scenario (colorblindness or hemophilia)

Your problem must include:

- Clear information about parent genotypes or phenotypes
- A specific question to answer (e.g., “What are the possible genotypes of the children?” or “Can a daughter be affected?”)

2 Write the Answer Key

Solve your own problem using a Punnett square or give a clear explanation.

3 Exchange and Solve

Swap your problem with another group.

- Read and solve their problem
- Compare your solution with theirs when finished.