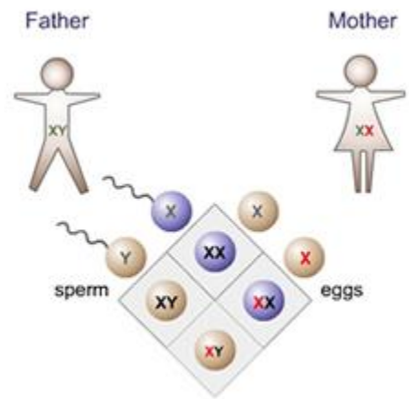
Name_____Date_____Period_____ Bio K/H

Day 4: Non- Mendelian Genetics: SEX- LINKED TRAITS

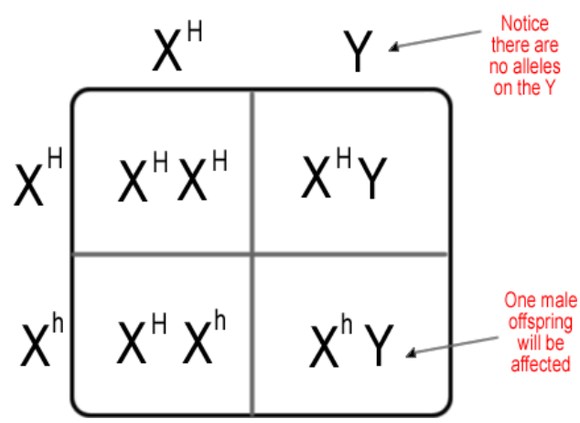
A. Determining Sex

1. Humans have a _____ number of _____ chromosomes or _____
2. 22 of the pairs are autosomes, they are the _____ for males and females
3. The 23rd pair of chromosomes _____ in males and females
   - These are the sex chromosomes and are indicated by _____ and _____
   - _____ determine the baby's sex.



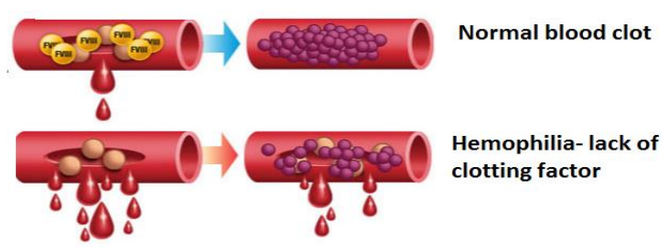
B. Inheriting Sex linked traits

1. Genes located on the _____ _____ are called sex- linked traits
2. Because the Y chromosome is small it carries _____, including the male determinant sex gene.
3. Males who receive a _____ on the X chromosomes will express the_____ _____ because he cannot inherit on the Y chromosome.
   - There is _____ dominant allele to _____ the recessive gene
4. _____ have a higher percent chance of expressing the recessive trait



C. Examples in Humans

1. Hemophilia



- Causes a problem with _____
- Caused by a _____ allele on the _____ chromosomes
- Males: 1/10,000
  - Need _____ recessive allele from carrier mom
- Females: 1/10,000,000
  - Need _____ recessive alleles; one from mom and one from dad
- Sex- Linked Traits

2. _____ Color Blindness
   - People who have red-green color blindness cannot differentiate between the two colors.
   - Caused by a _____ allele on the X chromosomes

USE THIS CHART TO HELP YOU ANSWER THE PRACTICE PROBLEMS THAT FOLLOW!!

Colorblindness- C= normal c'= colorblindness		Hemophilia- H=normal h=hemophilia	
PHENOTYPE	**GENOTYPE**	**PHENOTYPE**	**GENOTYPE**
Female normal	X X	Female normal	X X
Female normal, Carrier		Female normal , Carrier	
Female, color-blind		Female, hemophiliac	
Male normal	X Y	Male normal	X Y
Male, color-blind		Male hemophiliac	

*Males either have colorblindness or they don't. They only have **one X chromosome** that was received from the mother.
** **More males** have hemophilia and color blindness because males need **one gene** for hemophilia or color-blindness to occur.

PRACTICE PROBLEMS: SHOW ALL 5 STEPS!

A. A normal woman marries a normal man producing two colorblind sons, two normal sons and three normal daughters. Show your work.

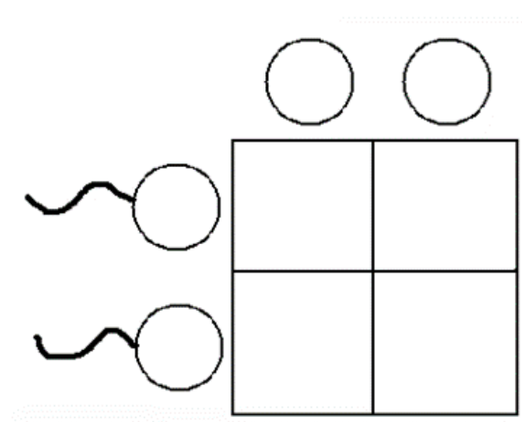
1. Key:

2. Parents:

3. Geno Ratio:

4. Phenotype Ratio:

3. Punnett Square



B. A female carrier of hemophilia marries a normal male. What are the genotypes and phenotypes of the possible offspring? Show your work.

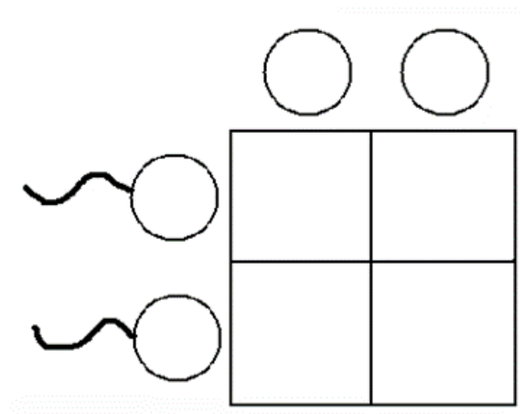
1. Key:

2. Parents:

3. Geno Ratio:

4. Phenotype Ratio:

3. Punnett Square



C. Normal man X Hemophiliac woman

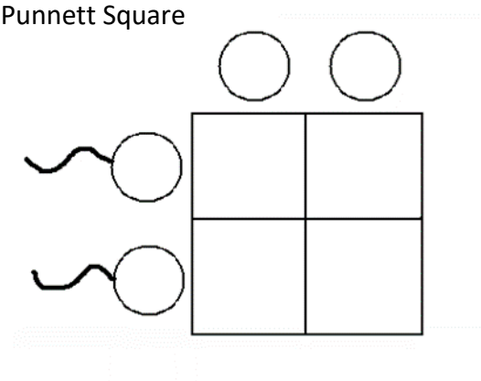
1. Key:

2. Parents:

3. Geno Ratio:

4. Pheno Ratio:

3. Punnett Square



D. Hemophiliac man X Heterozygous normal woman

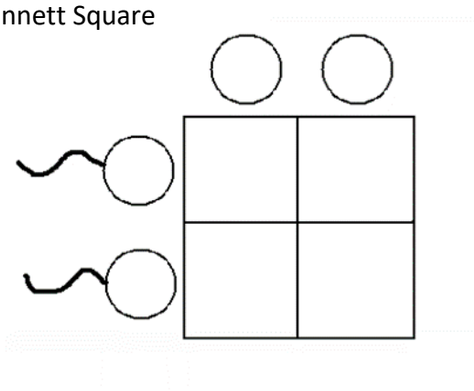
1. Key:

2. Parents:

3. Geno Ratio:

4. Pheno Ratio:

3. Punnett Square



E. Hemophiliac man X Homozygous normal woman

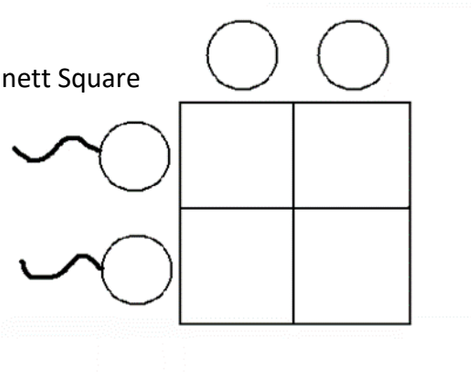
1. Key:

2. Parents:

3. Geno Ratio:

4. Pheno Ratio:

3. Punnett Square

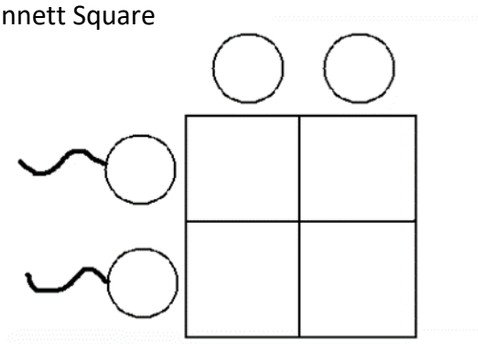


F. If a normal woman marries a normal man and two of their three sons are hemophiliacs, what is her genotype? Is this possible? Show this problem.

1. Key:

2. Parents:

3. Geno Ratio:

4. Pheno Ratio:

3. Punnett Square