Name_____Period:_____Date_____

Sex-Linked Traits Worksheet

Background Information:

Sex-linked traits are those whose genes are found on the X chromosome but not on the Y chromosome. In humans the X chromosomes are much larger than the Y chromosome and contains thousands of more genes than the Y chromosome. For each of the genes that are exclusively on the X chromosomes, females, who are XX, would obviously have two alleles. Males, who are XY, would have only one allele. Thus females with one recessive allele and one dominant allele, for a gene that is unique to the X chromosome, will always display the dominant phenotype. However, a male with a recessive allele for a gene unique to the X chromosome will always exhibit that recessive trait because there is no other corresponding allele on the Y chromosome.

In humans, each of two different sex-linked genes has a defective recessive allele that causes a disease. The diseases are hemophilia and colorblindness. In hemophilia, the defective allele prevents the synthesis of a factor needed for blood clotting. In colorblindness, the defective allele prevents a person from seeing certain colors.

Use the information below to answer the following questions.

X^H- X chromosome with normal dominant allele (no hemophilia)

X^h - X chromosome with recessive hemophilia allele

Y - Y chromosome (does not contain comparable gene)

X^B - X chromosome with normal dominant allele (not colorblind)

X^b - X chromosome with recessive colorblind allele

Y - Y chromosome (does not contain comparable gene)

1. Write the genotypes for the following phenotypes of red-green color
   blindness.

   a. normal male _____

   b. normal female carrying no colorblind alleles (Homozygous) _____

   c. colorblind male _____

   d. normal female carrying the colorblind allele (Heterozygous) _____

   e. colorblind female _____

2. $X^B X^B$ x $X^b Y$

    a. What proportion/percent of the male children
       are colorblind? _____

    b. What proportion/percent of the female children
       are colorblind? _____

3. $X^B X^b$ x $X^B Y$

    a. What proportion of the male children are
       colorblind? _____

    b. What proportion of the female children are
       colorblind? _____

4. What is the probability that a colorblind woman who marries a man with normal
   vision will have a colorblind child? _____

_____ X _____

5. A normal-sighted woman (whose father was colorblind)
   marries a colorblind man. _____ X _____

    a. What is the probability that they will have a **son**
              who is colorblind? _____

    b. What is the probability that they will have a
              colorblind **daughter**? _____

For the following Sex-Linked Punnett Squares:

H= normal blood clotting
H = hemophilia

6. X^HX^h x X^HY

    a. What is the probability that any of their offspring
       will have hemophilia? _____

7. A woman who is a carrier for hemophilia marries a hemophiliac man.

    a. What proportion of the male children are
       hemophiliacs? _____

    b. What proportion of the female children are
       hemophiliacs? _____

8. A phenotypically normal man marries a homozygous normal woman.

_____ X _____

    a. What is the probability that any of their children
       will be hemophiliacs? _____

9. A phenotypically normal woman has phenotypically normal parents. However, she has a hemophiliac brother.

    (Mom is carrier)   (Dad)   Brother

    _____   _____   _____

a. What are her chances of being a carrier for hemophilia? _____

ANSWER THE FOLLOWING QUESTIONS USING YOUR KNOWLEDGE OF SEX-LINKED TRAITS, THE BACKGROUND INFORMATION AND YOUR NOTES.

10. What is a sex-linked trait?

11. Why must males inherit colorblindness or hemophilia from their mothers?

12. Why is colorblindness or hemophilia more common in males than in females?