Name _____   Date _____

Warm-Up: Human Hereditary Traits

For each of the problem below, show your solution step by step.

A. One gene with two alleles controls the expression of red blood cell shape in humans. There
    are three different phenotypes: 1. Normal blood cells only resulting in no anemia (**SS**), 2. A
    few sickled cells resulting in a carrier state with mild anemia (**Ss**), and 3. A
    usually fatal condition with mostly sickled cells and severe anemia (**ss**).

    Three couples go to get genetic counseling before marriage. In the first
    couple, both people are homozygous for the normal allele. In the second,
    the man is heterozygous, while the woman is homozygous for the normal
    allele. In the third couple, both parents are heterozygous. Show the expected
    genotypic and phenotypic ratios for the children of each couple. What is the
    probability that each couple will have a child with fatal sickle cell anemia?
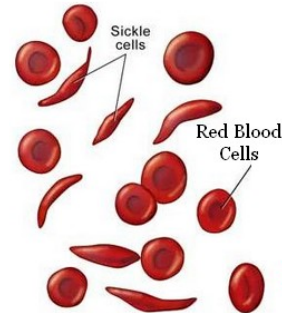
COUPLE 1: _____ X _____

Genotypic ratio: _____

Phenotypic ratio: _____

COUPLE 2: _____ X _____

Genotypic ratio: _____

Phenotypic ratio: _____

COUPLE 3: _____ X _____

Genotypic ratio: _____

Phenotypic ratio: _____

B. Hemophilia is a rare hereditary human disease of the blood. The blood of individuals with this condition does not clot properly. Without the capacity for blood clotting, even a small cut can be lethal. In a marriage of two non-hemophiliac parents, a bleeder son is born. What are the probabilities of these parents giving birth to sons being bleeders, and to daughters being bleeders?

* Use (**H**) for the normal "non-hemophiliac" allele and (**h**) for the hemophilia allele.

Parents: Male = $\mathbf{X^H Y}$ Female = _____

Son Bleeder = $\mathbf{X^h Y}$

Daughter Bleeder = $\mathbf{X^h X^h}$

Genotypic ratio: _____

Phenotypic ratio: _____