Genetics Problems Review

1. Sickle cell disease is an autosomal recessive disorder. People with 2 of the recessive alleles have sickle cell disease. If they have 1 recessive allele, they are considered a carrier, which has actually proven beneficial against malaria. This is known as sickle cell trait. Using S for the normal allele and s for the sickle cell allele, cross a man who has sickle cell disease with a woman who is normal but whose father had sickle cell disease. Complete the following.

\[ \text{♂} \quad \quad \text{♀} \quad \quad \]

What is the chance they could have a child with sickle cell disease? 

What is the chance they could have a child with sickle cell trait (carrier)?

2. Hemophilia is an X-linked recessive trait. Let N stand for normal blood clotting and let n stand for hemophilia. Cross a male who has hemophilia with a female who is a carrier for hemophilia. Complete the following.

\[ \text{♂} \quad \quad \text{♀} \quad \quad \]

What is the chance they could have a son with hemophilia? 

What is the chance they could have a daughter with hemophilia? 

What is the chance they could have a child WITHOUT hemophilia?

3. Two babies were born in a hospital at the same time. Their ID bracelets got mixed up. The babies had blood types A and O. The parents had blood types A x O and A x AB. Which baby belonged to which set of parents? Draw 2 Punnett squares to support your answer.
4. Suppose that black hair (B) is dominant over blonde hair (b) and brown eyes (E) are dominant over blue eyes (e). Cross a male who is heterozygous for black hair and heterozygous for brown eyes with a female who is homozygous for black hair and has blue eyes. Complete the following.

\[ \text{♂} \underline{\qquad} \times \text{♀} \underline{\qquad} \]

What is the chance they could have a child with black hair and brown eyes? \[ \underline{\qquad} \]

What is the chance they could have a child with black hair and blue eyes? \[ \underline{\qquad} \]

What is the chance they could have a child with blonde hair and blue eyes? \[ \underline{\qquad} \]

5. Albinism is an autosomal recessive condition that affects males and females and can skip generations due to carriers. Homozygous recessive individuals lack an enzyme needed to produce melanin, which colors the eyes, skin, and hair. Draw a pedigree to depict the following family: One couple has a son and a daughter with normal skin pigmentation. Another couple has one son and two daughters with normal skin pigmentation. The daughter from the first couple has three children with the son of the second couple. Their son and one daughter have albinism; their other daughter has normal skin pigmentation. Also, show which individuals MUST be carriers (heterozygous) by shading half of their square/circle.