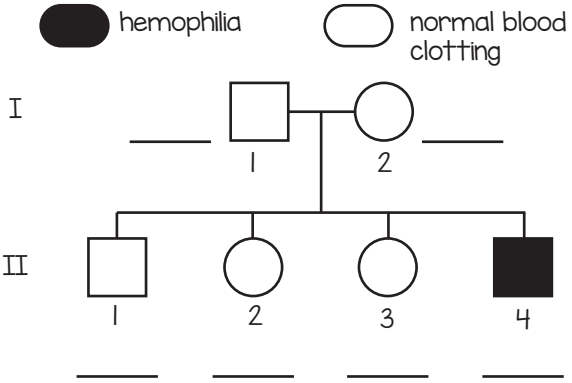
Name: Class: Date:

Pedigree Genetics Problems: X-linked Recessive

Read each scenario, label each individual in each family with their genotype, and answer the questions. If you are not sure whether an individual, write the allele you do know and a blank "_" next to the allele you know.
For example, if you are not sure if an individual is $X^A X^a$ or Aa, you would write X^A_ .

Allele Notation Key:
X^H = normal blood clotting X^h = hemophilia

One man and woman with normal blood clotting have 4 children and they discover that their youngest son has hemophilia, a serious blood clotting disorder.



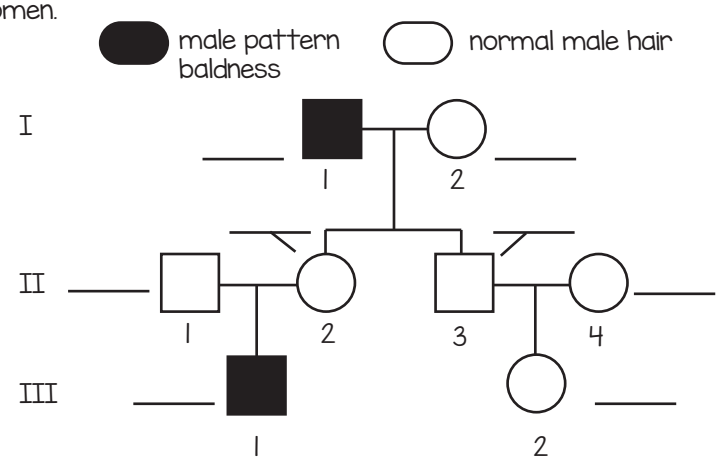
1. Write each individual's genotype in the blank next to each one.

2. If individuals I-1 and I-2 have another daughter, what is the probability that she will have hemophilia? _____

3. If individuals I-1 and I-2 have another son, what is the probability that he will have hemophilia? _____

Allele Notation Key:
X^B = normal male hair X^b = male pattern baldness

A gene on the X chromosome affects how men lose their hair as they age. Male pattern baldness is caused by a recessive allele in that gene. Male pattern baldness does not affect women.



4. Write each individual's genotype in the blank next to each one.
5. Remembering that females are never affected by male pattern baldness, how do you know that individual I-2 has one at least one X^B allele?

_____

6. Remembering that females are never affected by male pattern baldness, how do you know that individual II-2 has one at least one X^b allele?

_____

You are a genetic counselor and you meet with a couple who are planning to have a baby. Fill in the pedigree on the right with their family history details. They are concerned that several members of their family have hemophilia and they want to you to tell them the probability that their future child will have hemophilia, a disorder caused by a x-linked recessive allele. Both the woman and the man are healthy but each of them has a brother who died of hemophilia at a young age. Both parents have healthy parents.

7. In the space provided on the right, draw a pedigree for this family. Make sure you include generation numbers, individual numbers, and a key to describe your shading choices. Write each genotype next to each individual. Decide what the probability is that they will have a child afflicted by hemophilia. Explain your answer below the pedigree.

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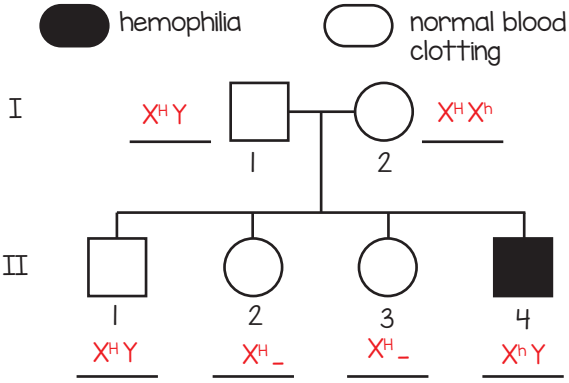

1. Write each individual's genotype in the blank next to each one.

2. If individuals I-1 and I-2 have another daughter, what is the probability that she will have hemophilia? 0%

3. If individuals I-1 and I-2 have another son, what is the probability that he will have hemophilia? 50%

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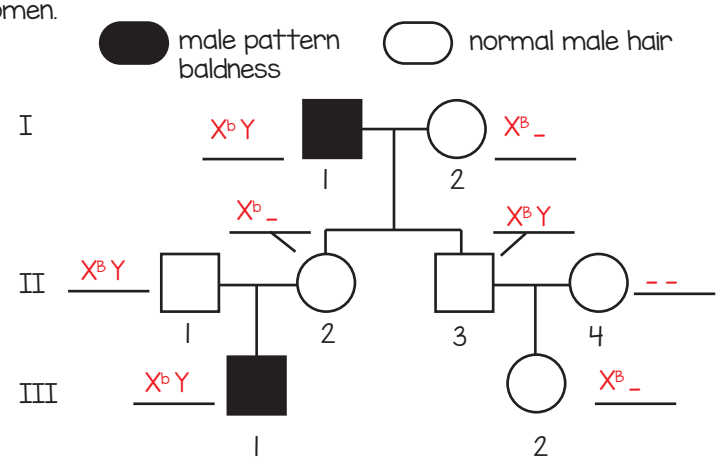

4. Write each individual's genotype in the blank next to each one.
5. Remembering that females are never affected by male pattern baldness, how do you know that individual I-2 has one at least one X^B allele?

she has one unaffected son, so she must have one X^B allele.

6. Remembering that females are never affected by male pattern baldness, how do you know that individual II-2 has one at least one X^b allele?

her father and son are affected, so she must have one X^b allele.

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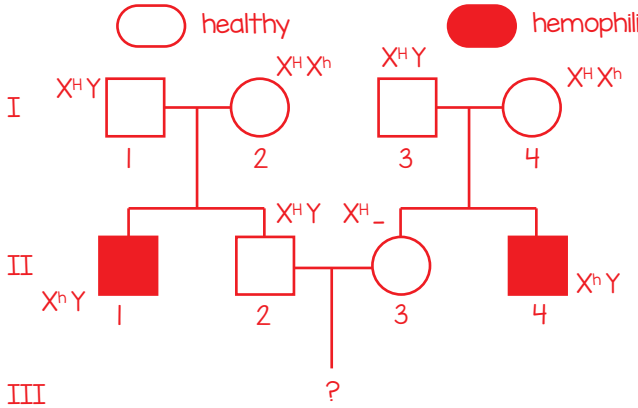
7. In the space provided on the right, draw a pedigree for this family. Make sure you include generation numbers, individual numbers, and a key to describe your shading choices. Write each genotype next to each individual. Decide what the probability is that they will have a child afflicted by hemophilia. Explain your answer below the pedigree.



Because hemophilia is an X-linked recessive allele, it will depend on whether they have a son or daughter and whether the mother (II-3) has the hemophilia allele from her mother (I-4). If the mother(II-3) is a carrier, and they have a son, he has a 50% chance of having hemophilia. If mother (II-3) is a carrier and they have a daughter, she has a 50% chance of being a carrier (but not affected).

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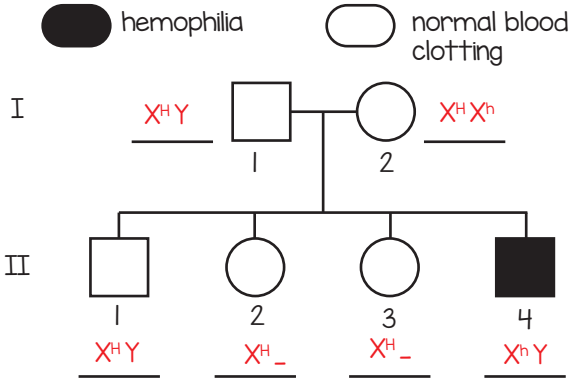

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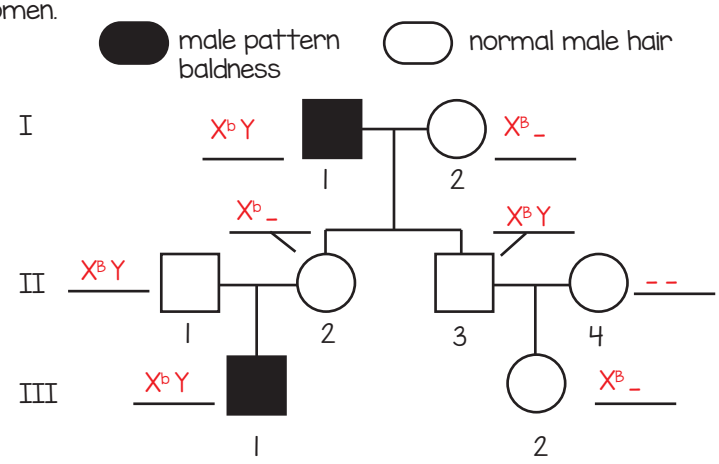

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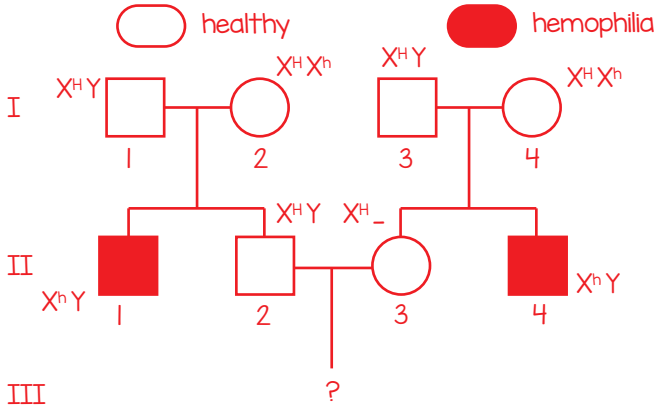

The only way for them to have an affected child is if the mother (II-3) is a carrier and they have a son who inherits her allele.

The chances she is a carrier: 50%
The chances they have a son: 50%

The chances he is affected: 50%
So total chances of having an affected child: 1/2(1/2)(1/2) = 1/8

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