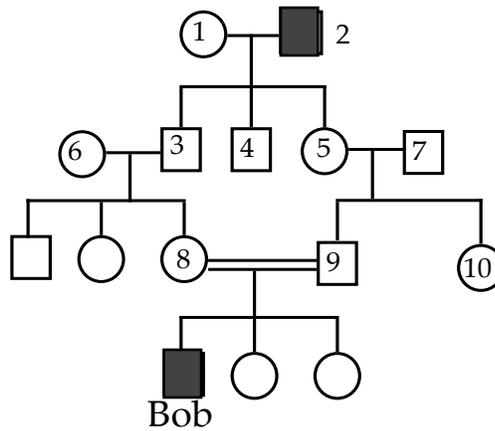
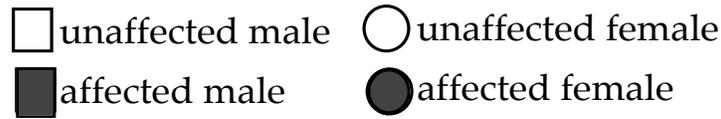


### Question 9

Bob, a sophomore at MIT, failed 8.01 his freshman year. His parents are both physicists, but he remembers that his great-grandfather also failed physics. Bob constructs the following family pedigree and is convinced that his poor performance in physics is an inherited genetic trait.

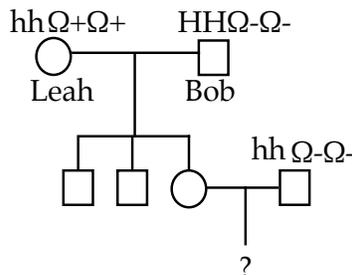


a) If Bob's hypothesis is true, what is the most likely mode of inheritance? \_\_\_\_\_

b) Individuals marrying into the family are homozygous for the wild-type allele. Complete the table below. Use G or g to denote the alleles of this gene. Be sure to note any ambiguities.

individual	genotype
2	
3	
4	
9	
10	

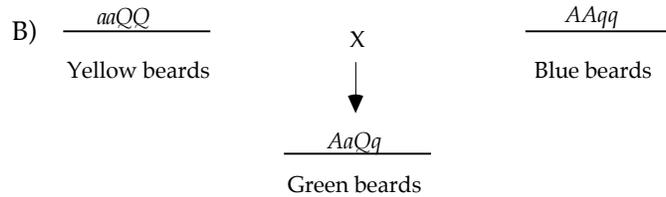
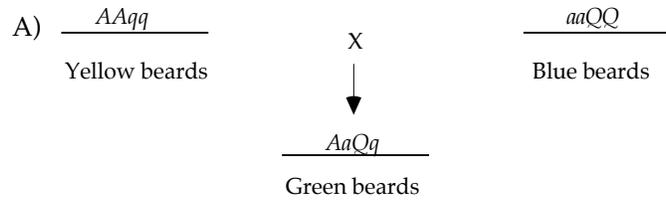
c) Bob meets Leah in his remedial physics class. Bob is a hard worker (homozygous for the H allele). Leah is lazy (homozygous for the h allele). The H locus is linked to a chromosomal marker, which exists in two forms  $\Omega^+$  or  $\Omega^-$ . Circle the non-recombinant genotypes of Bob and Leah's grandchildren.



genotypes

- $hh\Omega^+\Omega^+$       $hh\Omega^-\Omega^-$       $hh\Omega^+\Omega^-$       $HH\Omega^+\Omega^+$       $HH\Omega^-\Omega^-$   
 $HH\Omega^+\Omega^-$       $Hh\Omega^+\Omega^+$       $Hh\Omega^-\Omega^-$       $Hh\Omega^+\Omega^-$

i) Give one genotype in each of the blanks below. Use A and Q to designate the wild-type alleles. Use a and q to designate the loss-of-function alleles.



ii) Given your answer to i) above, draw the pathway for beard color. Be sure to include at which step each of the genes functions.

If A)  $\text{blue} \xrightarrow{\text{gene or enzyme A}} \text{yellow} \xrightarrow{\text{gene or enzyme Q}} \text{green}$

If B)  $\text{blue} \xrightarrow{\text{gene or enzyme Q}} \text{yellow} \xrightarrow{\text{gene or enzyme A}} \text{green}$

**Question 9**

a) *Autosomal Recessive*

b)

individual	genotype
2	gg
3	Gg
4	Gg
9	Gg
10	GG or Gg

c)

genotypes:

- |        |        |
|--------|--------|
| hhΩ+Ω+ | hhΩ-Ω- |
| hhΩ+Ω- | HHΩ+Ω+ |
| HHΩ-Ω- | HHΩ+Ω- |
| HhΩ+Ω+ | HhΩ-Ω- |
| HhΩ+Ω- |        |