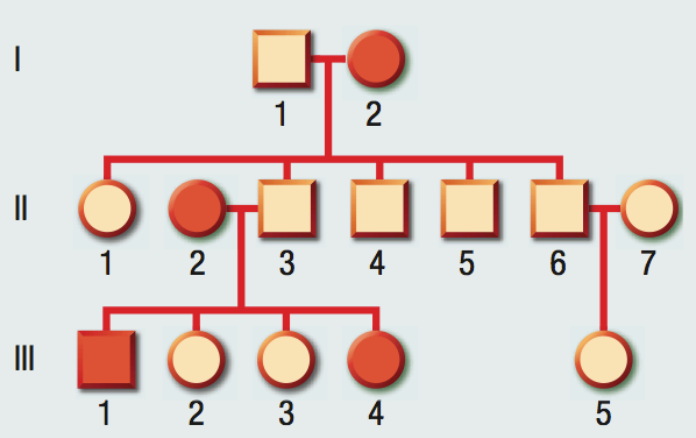
G11 Biology: Class 5 Homework

1. Phenylketonuria (PKU) is a genetic disorder caused by a recessive allele. Individuals with PKU accumulate phenylalanine in their body. High amounts of phenylalanine lead to delayed mental development. The figure below shows the inheritance of the defective PKU allele in one family.

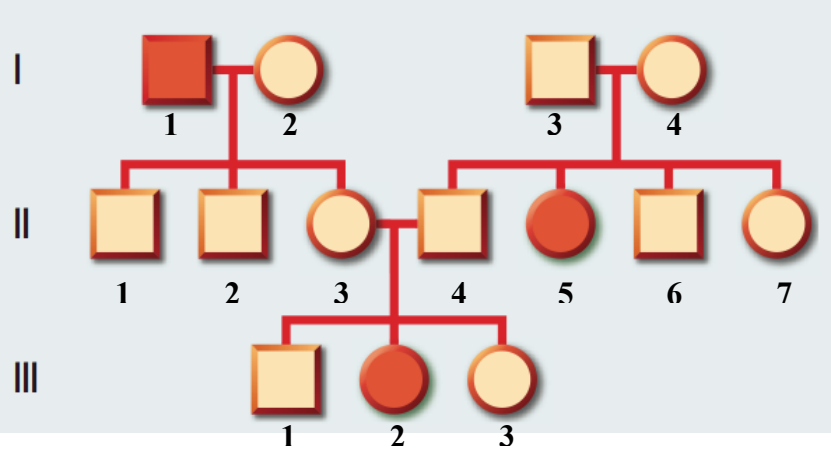


a) How many generations are shown in the pedigree chart? **[1 mark]**

b) Determine the genotypes of the individuals in the chart. Let *p* represent the recessive PKU allele. **[14 marks]**

I-1		II-6	
I-2		II-7	
II-1		III-1	
II-2		III-2	
II-3		III-3	
II-4		III-4	
II-5		III-5	

2. Not all humans react strongly to poison ivy. This trait is thought to be controlled by a single allele. The following pedigree shows the inheritance of sensitivity to poison ivy in one family. Let S be the dominant allele and s be the recessive allele.

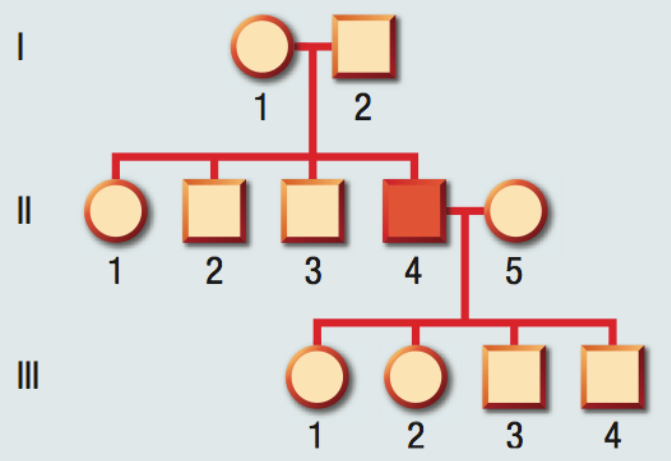


a) Analyze the pedigree chart and determine whether the disorder is inherited as a result of a dominant or a recessive trait. Explain your reasoning. **[2 marks]**

b) Determine the genotype for each individual if possible. **[14 marks]**

I-1		II-4	
I-2		II-5	
I-3		II-6	
I-4		II-7	
II-1		III-1	
II-2		III-2	
II-3		III-3	

3. Hairy ears is a rare condition that is sex-linked. Let *H* be the dominant allele (non-hairy ears) and *h* be the recessive allele (hairy ears). Examine the pedigree chart below and answer the questions.



a) Is this condition X-linked or Y-linked? Explain your reasoning. **[2 marks]**

b) Label all possible genotypes using the sex chromosomes. **[11 marks]**

I-1		II-5	
I-2		III-1	
II-1		III-2	
II-2		III-3	
II-3		III-4	
II-4			

4. Does the presence of a defective BRCA1 or BRCA2 gene in a woman's genes guarantee that she will develop breast cancer? Why or why not? **[2 marks]**

5. In some breeds of dogs, a dominant allele controls the characteristic of barking (*B*) while on e a scent trail. The allele for non-barking trailing dogs is (*b*). In these dogs, an independent gene (*E*) produces erect ears and is dominant over drooping ears (*e*). For each of the following mating situations, draw a Punnett Square and calculate the phenotype ratio of the offspring.

   a) A non-barking trailer with erect ears (heterozygous) is mated with a heterozygous barking trailer with drooping ears (*bbEe* x *Bbee*) **[2 marks]**

   b) A non-barking trailer with drooping ears is mated with a heterozygous barking trailer with drooping ears (*bbee* x *Bbee*) **[2 marks]**

   c) A heterozygous barking trailer with heterozygous erect ears is mated with a heterozygous barking trailer with heterozygous erect ears (*BbEe* x *BbEe*) **[2 marks]**

   d) A heterozygous barking trailer with heterozygous erect ears is mated with a non-barking trailer with drooping ears (*BbEe* x *bbee*) **[2 marks]**