AP Biology
Miss Provost

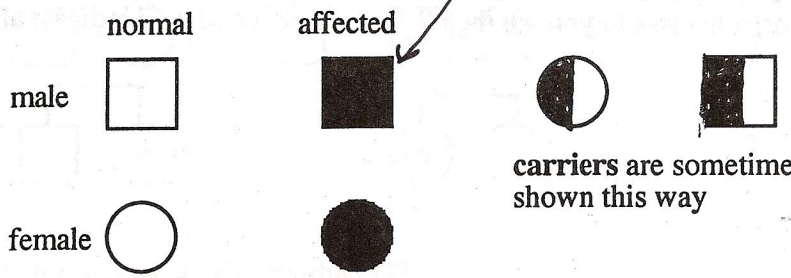
Name _____

Genetics Pedigrees

PEDIGREES

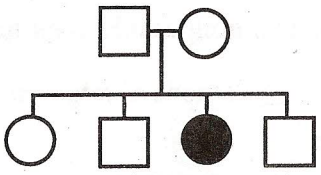
- family tree showing transmission of a **form of a trait** through the generations. By looking at the inheritance pattern of a **phenotype**, you can determine the **genotypes** of individuals in a family.
- **the colored symbols represent the FORM OF THE TRAIT you are following.**
- pedigrees can show whether a trait is dominant or recessive, sex-linked or autosomal.

The following symbols are commonly used:



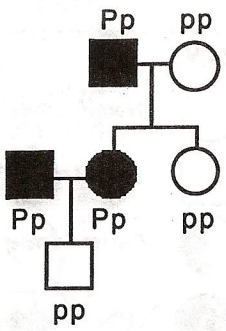
FYI:
Huntingtons D
Marfans D
Cystic fibrosis R
Sickle cell R

A **horizontal** line between 2 symbols represents marriage, and the progeny are displayed below the parents.

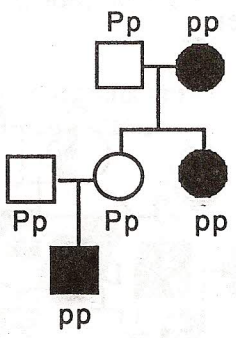


Example: albinism versus normal pigmentation. (albinism is recessive)

A. **Tracing normal pigmentation**



B. **Tracing albinism**



NOTE: You can follow either form of a trait in a pedigree, dominant or recessive, by filling in the appropriate symbols. For example, in the pedigree above, when following normally pigmented individuals, all non-albinos will be colored in. You could choose instead to follow albino individuals by filling in all symbols that represent albinos in the family. Filling in one form of the trait will allow you to determine whether the trait is dominant or recessive, and whether it is sex-linked or autosomal. Notice, however, that regardless of which form you choose to follow, the individual genotypes in the family will not change.

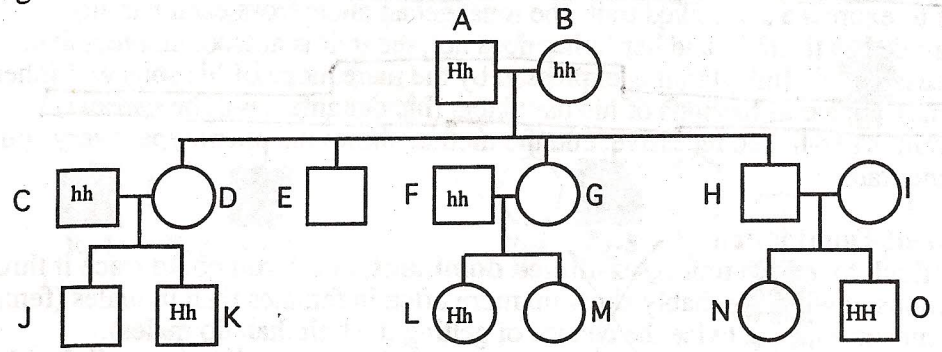
Look for Patterns to determine if Dominant or Recessive & if sex linked or not.

Problem 2

Huntington's chorea, a disease of the nervous system, is caused by an **autosomal dominant gene**. The pedigree chart below illustrates a family with individuals who have Huntington's chorea. Use the chart to answer the questions that follow:

H = Huntington's chorea gene

h = Normal gene

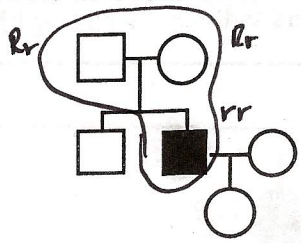


1. What is the probable genotype of individual D? _____
2. What are the probable genotypes of individuals H and I? _____
3. What is the probability that N will **not** have Huntington's chorea? _____
4. Will individuals A, H, and D have Huntington's chorea? _____

HOW TO TELL IF A TRAIT IS AUTOSOMAL DOMINANT OR AUTOSOMAL RECESSIVE

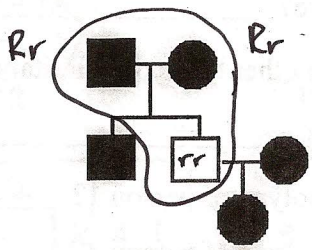
Recessive

- If 2 parents do **not** have the trait, and their children show the trait
- Recessive traits tend to skip generations and don't show up as often



Dominant

- If 2 parents have the trait and their child does not have the trait
- Usually dominant traits are present in all generations



NOTE: ANY TIME TWO PARENTS ARE PHENOTYPICALLY DIFFERENT FROM THE CHILD, THE PARENTS MUST BE HETEROZYGOUS, AND THE CHILD WILL BE HOMOZYGOUS RECESSIVE. After you determine the genoyptes in this pattern, then you can determine whether the form of the trait you are following is dominant or recessive simply by seeing which symbols are filled in. If the parents are filled in, you are following the dominant form of the trait. If the child is filled in, you are following the recessive form of the trait.

HOW TO TELL IF A TRAIT IS SEX-LINKED

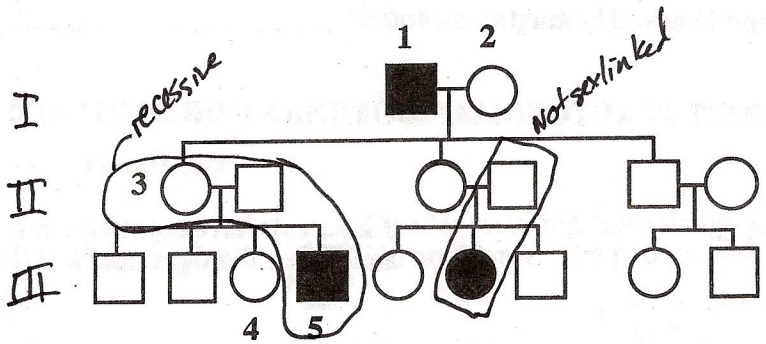
(*examine the sex ratio of affected individuals*)

1. **Sex–Linked Recessive**
   - A recessive sex–linked trait is expressed more often in males than in females (it is necessary to look at large numbers of individuals over many generations before you can determine that the pattern of mostly male inheritance is due to sex-linkage, and not just to chance alone)
   - If a female has the trait, her father must also express it; her mother may or may not (for a female to express a sex-linked trait, she must get an allele from each parent)
     If a female has the trait, and her father does not, the trait is autosomal recessive.
   - If a recessive sex–linked trait is expressed by the male, none of his sons will inherit it from him; but it may appear in the sons of his daughters (his daughters will be carriers).
   - If the trait is sex-linked recessive, and the mother shows the phenotype, every son would have to show the trait.

2. **Sex–linked Dominant**
   - It is difficult to tell if a trait is **sex-linked dominant**, but if you could trace it through many generations, it would probably show up more often in females than in males (females, having 2 X chromosomes, have twice the chance of getting the trait than do males).
   - If the trait is **sex-linked dominant**, and the male shows the phenotype, all daughters will have to show the trait.

Problem 3

Look at the following pedigree, in which the affected trait is myopia (near-sightedness), and determine the mode of inheritance:



What is the most probable mode of inheritance for myopia?

Dominant or recessive? _____ Autosomal or sex-linked? _____

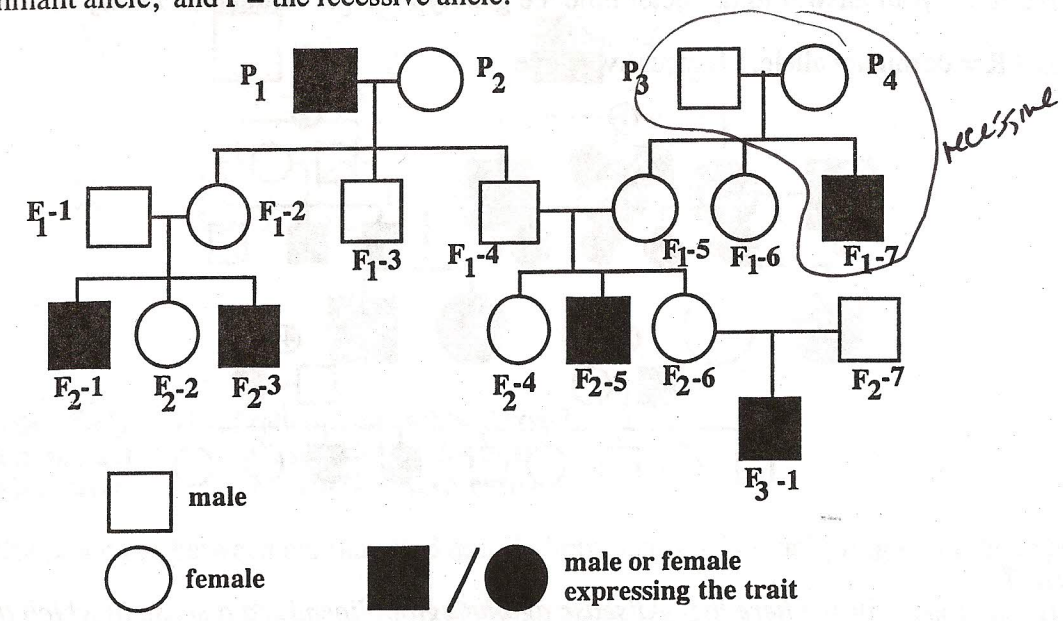
How did you exclude other types of inheritance? _____

_____

1. What is the genotype of person 1? _____
2. What is the genotype of person 2? _____
3. What is the genotype of person 3? _____
4. What is the genotype of person 4? _____
5. What is the genotype of person 5? _____

Problem 4
Using the pedigree below, answer the following questions:

Let **R** = the dominant allele, and **r** = the recessive allele.



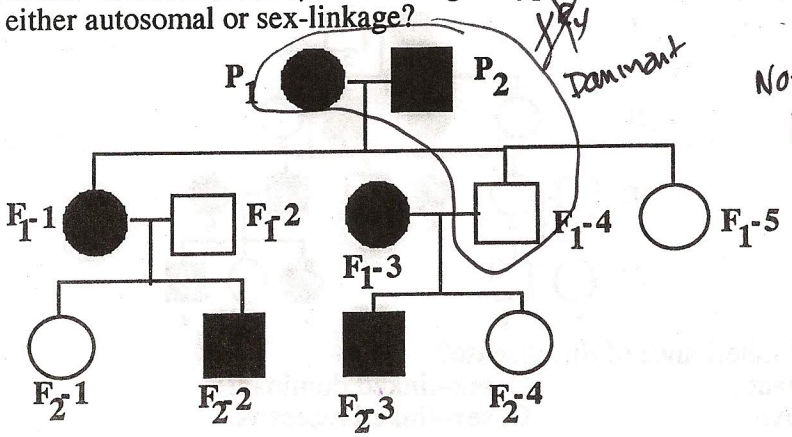
1. What is the most likely mode of inheritance of this disease?
   A. autosomal dominant
   B. autosomal recessive
   C. sex–linked dominant
   D. sex–linked recessive

2. The most probable genotypes for individual F_2–1 is
   A. rr B. X^rY C. X^RY D. RR E. cannot be determined

3. What is the most probable genotype of individual F_1–5?
   A. X^RX^R B. RR C. X^RX^r D. X^rX^r E. rr A.B. cannot be determined

4. What is the most probable genotype of individual P_2?
   A. X^RX^R B. RR C. X^RX^r D. X^rX^r E. rr A.B. cannot be determined

Problem 5
Using the pedigree below. determine the mode of inheritance (autosomal dominant, autosomal recessive, sex–linked dominant, or sex–linked recessive). Fill in all genotypes.
How did you exclude either autosomal or sex-linkage?



Dominant

Not sex linked because daughter F1,5 must have dominant trait b/c Dad has it