

Ch 14 Questions – Due _____

1. In some plants, a true-breeding, red-flowered strain gives all pink flowers when crossed with a white-flowered strain: RR (red) \times rr (white) \rightarrow Rr (pink). If flower position (axial or terminal) is inherited as it is in peas (see Table 14.1), what will be the ratios of genotypes and phenotypes of the F_1 generation resulting from the following cross: axial-red (true-breeding) \times terminal-white? What will be the ratios in the F_2 generation?

Character	Dominant	Recessive
Flower position	Axial (A)	Terminal (a)
Stem length	Tall (T)	Dwarf (t)
Seed shape	Round (R)	Wrinkled (r)

2. A plant that is heterozygous for all three characters above is allowed to self-fertilize, what proportion of the offspring would you expect to be as follows? (Note: Use the rules of probability instead of a huge Punnett square.)

- homozygous for the three dominant traits
- homozygous for the three recessive traits
- heterozygous for all three characters
- homozygous for axial and tall, heterozygous for seed shape

3. A black guinea pig crossed with an albino guinea pig produces 12 black offspring. When the albino is crossed with a second black one, 7 blacks and 5 albinos are obtained. What is the best explanation for this genetic situation? Write genotypes for the parents, gametes, and offspring.

4. A man with type A blood marries a woman with type B blood. Their child has type O blood. What are the genotypes of these individuals? What other genotypes, and in what frequencies, would you expect in offspring from this marriage?

5. Phenylketonuria (PKU) is an inherited disease caused by a recessive allele. If a woman and her husband, who are both carriers, have three children, what is the probability of each of the following?

- All three children are of normal phenotype.
- One or more of the three children have the disease.
- All three children have the disease.
- At least one child is phenotypically normal.

(Note: Remember that the probabilities of all possible outcomes always add up to 1.)

6. The genotype of F_1 individuals in a tetrahybrid cross is $AaBbCcDd$. Assuming independent assortment of these four genes, what are the probabilities that F_2 offspring will have the following genotypes?
- $aabbccdd$
 - $AaBbCcDd$
 - $AABBCCDD$
 - $AaBBccDd$
 - $AaBBCCdd$
7. What is the probability that each of the following pairs of parents will produce the indicated offspring? (Assume independent assortment of all gene pairs.)
- $AABBCC \times aabbcc \rightarrow AaBbCc$
 - $AABbCc \times AaBbCc \rightarrow AAbbCC$
 - $AaBbCc \times AaBbCc \rightarrow AaBbCc$
 - $aaBbCC \times AABbcc \rightarrow AaBbCc$
8. Karen and Steve each have a sibling with sickle-cell disease. Neither Karen nor Steve nor any of their parents have the disease, and none of them have been tested to reveal sickle-cell trait. Based on this incomplete information, calculate the probability that if this couple has a child, the child will have sickle-cell disease.
9. In corn plants, a dominant allele I inhibits kernel color, while the recessive allele i permits color when homozygous. At a different locus, the dominant allele P causes purple kernel color, while the homozygous recessive genotype pp causes red kernels. If plants heterozygous at both loci are crossed, what will be the phenotypic ratio of the offspring?
10. Imagine that you are a genetic counselor, and a couple planning to start a family come to you for information. Charles was married once before, and he and his first wife had a child with cystic fibrosis. The brother of his current wife Elaine died of cystic fibrosis. What is the probability that Charles and Elaine will have a baby with cystic fibrosis? (Neither Charles nor Elaine has cystic fibrosis.)
11. In mice, black color (B) is dominant to white (b). At a different locus, a dominant allele (A) produces a band of yellow just below the tip of each hair in mice with black fur. This gives a frosted appearance known as agouti. Expression of the recessive allele (a) results in a solid coat color. If mice that are heterozygous at both loci are crossed, what is the expected phenotypic ratio of their offspring?