BIO 182 Spring 2015 Lab 1.

Mendelian Genetics Review Worksheet

1. A research botanist is trying to replicate Gregor Mendel's work with peas. The scientist crosses a true breeding purple flowered plant with a true breeding white flowered plant. All of the offspring have purple flowers. The scientist then self pollinates one of the F1 offspring, and harvests 125 seeds.

a. which is the dominant gene?

b. how many of the offspring of the F1 would you expect to have purple flowers?

c. how many of the offspring of the F1 would you expect to be heterozygous?

2. The research botanist in the previous question is now also looking at wrinkled and smooth seeds. The scientist crosses a true breeding smooth seeded plant with a true breeding wrinkle seeded plant. All of the F1 offspring produce smooth seeds and are allowed to self pollinate. The botanist then harvests from the F2 generation 535 seeds.

a. which is the dominant gene?

b. how many of the offspring of the F1 would you expect to have wrinkled seeds?

c. how many of the offspring of the F1 would you expect to be homozygous dominant?

3. The botanist then breeds a plant that has white flowers and is heterozygous for seed type with a wrinkled seed plant that is heterozygous for flower color.

a. draw the Punnett Square for this cross.

b. what do you expect to be the phenotypic ratio in the offspring?

4. In corn, red kernel color is dominant to the yellow kernel color and a tall plant is dominant to a short one. A geneticist breeds a plant that is heterozygous for both traits with a plant that is homozygous for the red kernel allele and heterozygous for height. What is the expected ratio of phenotypes for this cross?

5. In humans, a hairline above the forehead that comes to a point is referred to as a widow's peak. The trait is controlled by two genes at a single locus, with a peak being dominant over a relatively straight hairline. Given this, which is not possible: two parents with widow's peaks having a child without one, or two parents without a peak having a child that has one? Justify your answer.

6. In mice, the allele for a brown coat is dominant to the allele for a white coat, and the allele for a long tail is dominant to the allele for a short tail. A geneticist breeds a white mouse that is heterozygous for tail length with a short tailed mouse that is heterozygous for coat color. What is the expected ratio of phenotypes from this cross? What are the phenotypes of the parents?

7. In humans, blood groups A and B have codominance with each other, while both genes are dominant over group O. A woman with type A blood gives birth to an infant with type O blood.

a. Which of the following blood types could possibly be the father?

O A B AB

b. What is the mother's genotype?

AO AA AB

8. A woman with type O blood gives birth to an infant with type B blood.

a. Which of the following blood types could possibly be the father?

O A B AB

b. What is the child's genotype?

OO AA AO BB BO AB

9. A woman with type A blood has three children, one with type O blood, one with AB blood and one with type A blood. What are the mother and father's genotypes?

10. In humans, the gene for color blindness is carried on the X chromosome. Human gender is determined by the X and Y chromosome, where XX is female and XY is male.

a. What is the probability that a female is carrying the color blindness gene if both her parents had normal vision but her maternal grandfather was colorblind?

b. If a male with normal vision mates with a female that is a carrier (she is heterozygous for the color blind gene), what is the probability that their daughter is a carrier?

11. A girl has color vision, and so do both her parents. Her maternal grandfather however was color blind. Draw a pedigree and use it to determine the following:

a. What are the genotypes of her parents?

b. What is the probability that the girl is a carrier for the colorblind gene?

12. In Labrador retrievers, coat color is controlled by alleles at two loci. For one gene pair, black fur color is dominant to brown, but another gene determines if any melanin pigment is deposited in the hair shaft. Two recessive alleles of this gene block deposition, and a yellow fur results. Thus a retriever with at least one dominant allele at both loci is black, a retriever with two recessive alleles at the second loci is yellow, and a retriever with two recessive alleles at the first loci and at least one dominant allele at the second is chocolate. A dog breeder crosses a chocolate lab that is heterozygous for the deposition allele with a black lab that is heterozygous at both loci. What is the expected phenotypic ratio from this cross?