

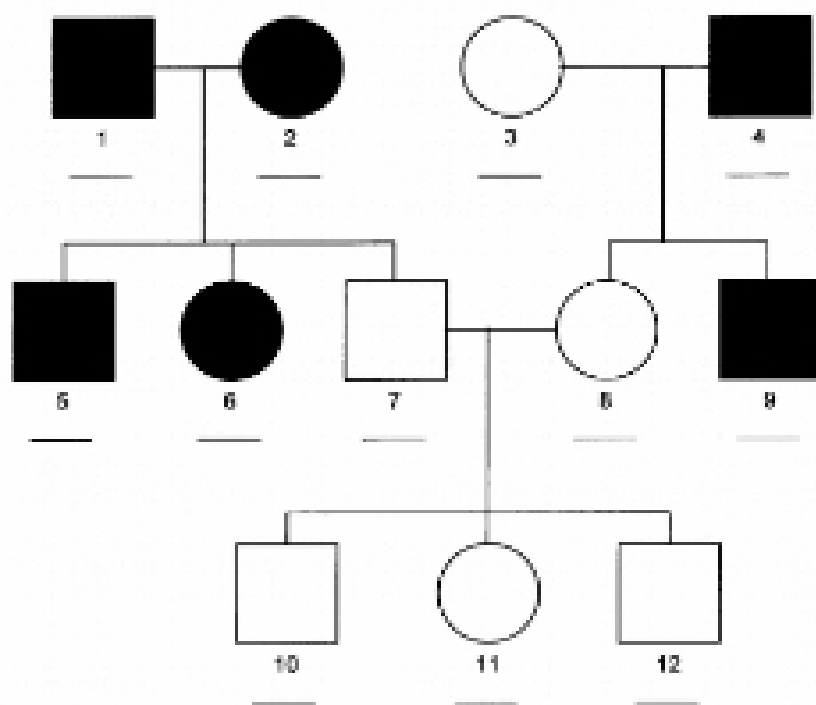
Some genetics problems - I (Ch. 14)

1. In guinea pigs, a recessive allele results in fuzzy ears. If a guinea pig that is **heterozygous** for this trait is mated with a fuzzy-eared guinea pig, what percentage of their offspring are expected to have fuzzy ears?

2. Albinism (lack of melanin pigmentation) in humans is a recessive trait controlled by a single gene. A man and woman are both of normal pigmentation; each has had an albino child in previous marriages. What is the probability that their **first child** together will be albino?

3. The pedigree below represents the phenotypes resulting from a single gene that produces an extra digit on the hand. **Darkened** circles or squares represents individual females or males, respectively, who **express** the trait.

- Is the trait dominant or recessive? How do you know?
- Indicate the genotypes of each individual in the pedigree as far as can be determined.



4. A black rat crossed with an albino rat produces 9 black offspring. When the albino is crossed with a second black rat, 8 black and 6 albino rats are the progeny. What are the genotypes of the parents and offspring involved?

5. When you cross true-breeding yellow-seeded and true-breeding green-seeded pea plants, all the offspring (F<sub>1</sub>) are yellow-seeded.

(a) If you take these F<sub>1</sub> yellow-seeded plants and crossed them to green-seeded plants, what phenotypic and genotypic ratios are expected among the F<sub>2</sub> offspring?

(b) If you crossed the F<sub>1</sub> with the **parental** yellow seeded plants, what phenotype and genotype ratios would be expected among the offspring?

6. A sexually reproducing organism is heterozygous for two genes located on different chromosomes. Its genotype is AaBb. Which of the following is a possible **genotype** of a **GAMETE** produced by this organism?

- A. AB
- B. AaBb
- C. Aa
- D. bb
- E. A

7. A gene controlling flower color in pea plants has two alleles (B, b) producing either blue or white flowers; a separate gene controlling height has alleles (T, t) producing either tall or short plants. When **true-breeding** plants that are **blue-flowered** and **tall** are crossed with true-breeding plants that are **white-flowered** and **short**, all the F<sub>1</sub> plants are **blue-flowered and tall**.

(A) What are the genotypes of the true breeding parents?

(B) What are the genotypes of the F<sub>1</sub> plants?

(C) Assuming the genes assort independently, what are the genotypes of the GAMETES that the **F<sub>1</sub>** plants will produce?

(D) What phenotypes do you then expect among the F<sub>2</sub>, and in what proportions? Show your work in a Punnett square.

(E) If the two genes above instead showed *dependent* assortment, explain what gametes genotypes would *not* be produced by the F<sub>1</sub> plants, and how this would affect the phenotypes seen in the F<sub>2</sub>.

8. In peas, seed shape and color are each controlled by single genes on different chromosomes, with round (R) dominant over wrinkled (r)

and yellow (Y) dominant over green (y). A true-breeding pea plant with round, green seeds is crossed with a dihybrid for these traits.

(A) What are the genotypes of the gametes that each parent produces?

(B) What are the phenotypes of the offspring and in what proportions?

9. A man has type O blood, while his mother has type A and his father has type B. What are the genotypes of these three persons? Assuming the man has many sisters and brothers, what genotypes and phenotypes would be expected among them, and in what proportion?

10. A girl has blood type A. If her father had blood type A, what are the possible blood types of her mother?

11. Consider the cross  $AaBbCc \times AaBbCc$ . What is the probability that an offspring will be  $AaBBcc$  ?

What is the probability that an offspring will be homozygous recessive for all three traits?

What is the probability that an offspring will be heterozygous for **all three** traits?

12. Consider the cross  $AaBBcc \times AabbCc$ . What is the probability that an offspring will be heterozygous for all three genes?

13. A single gene with two alleles controls flower color in snapdragons. Heterozygotes have pink flowers, whereas homozygotes have red flowers or white flowers. When plants with red flowers are crossed with plants with white flowers,

(a) what proportion of the F-1 offspring is expected to have pink flowers?

(b) When F1 plants are crossed, what phenotype proportions are expected among the F2 offspring?

14. A rooster with gray feathers is mated with a hen of the same phenotype. Among their offspring, 15 chicks are grey, 6 are black, and 8 are white. What is the simplest explanation for the inheritance of these colors in chickens? What phenotypes would you expect among the offspring from a cross between a grey rooster and a black hen?