

Genetic Problems (II)

TWO or MORE GENE INHERITANCE

1. What are the expected phenotypic and genotypic ratios in the F1 generation?

Where black guinea pigs are dominant and white are recessive and short hair guinea pigs are dominant to long hair guinea pigs.

- a. P= Pure bred black, short hair mated with white, short hair
- b. P= Hybrid black, short hair mated with white, short hair hybrid
- c. P= Heterozygous black, long hair mated with homozygous black, short hair hybrid

2. What are the expected parental phenotypes and genotypes? (how confident are you?)

Where two guinea pigs produce...

- a. 3 black, long hair offspring, 1 white, long hair offspring, 2 white, short hair offspring
- b. 39 black, short offspring, 19 black, long hair offspring
- c. 19 white, long hair offspring

3. If black guinea pigs are dominant and white are recessive and short hair guinea pigs are dominant to long hair guinea pigs..

3. How can one determine the genotype of a black, short hair guinea pig?

- a. What result would be definitive in nature?
- b. What is this procedure called?

4. If a black, short hair guinea pig is crossed with a white, long hair guinea pig what is its genotype?

Where black guinea pigs are dominant and white are recessive and short hair guinea pigs are dominant to long hair guinea pigs.

- a. If 47 pigs are black, short hair
- b. If 12 pigs are black, short hair and 1 is white, long hair
- c. If 27 pigs are black, short hair and 1 is white, short hair

5. In a dihybrid cross between guinea pigs, what is the probability of producing the following:

Where black guinea pigs are dominant and white are recessive and short hair guinea pigs are dominant to long hair guinea pigs..

- a. 1 black, short hair pig
- b. 2 black, short hair pigs, 2 white, long hair pigs in that order
- c. 3 black, long hair male pigs
- d. 1 black, long hair female pig, 1 white, long hair male pig

6. If you cross two hybrid guinea pigs, what is the probability of producing the following:

Where black guinea pigs are dominant and white are recessive.

- a. 2 black pigs, 1 long hair pig, in any order
- b. 2 black, short hair pigs, 2 white pigs, in any order
- c. 2 male black, short hair pigs, 1 female white, long hair pig, in any order

7. If a dihybrid cross between two guinea pigs with cream colored, short hair produce the following hair colors and lengths in their offspring: yellow-short, cream-short, white-short, yellow-long, cream-long and white-long what type(s) of gene interaction(s) are at work?

8. What are the expected genotypic and phenotypic ratios?

Where short hair in guinea pigs is dominant over long hair and hair color is determined by two dominant genes, (yellow = $C^Y C^Y$) (cream = $C^Y C^W$) and (white = $C^W C^W$).

- a. Yellow colored, short pure bred mated with white, long hair
- b. Cream colored, short hybrid mated with white, long hair
- c. Cream colored, short hybrid mated yellow, short hybrid

9. What are the expected phenotypes in the adult progeny?

Where normal leg size, characteristic of the Kerry type cattle, is produced by the homozygous genotype DD. Short-legged Dexter type cattle possess the heterozygous genotype Dd. The homozygous genotype dd is lethal, producing grossly deformed stillbirths called "bulldog calves." The presence of horns in cattle is governed by the recessive allele of another gene locus p, the polled condition (absence of horns) being produced by its dominant allele P.

- a. Dexter (DdPp) X Dexter (DdPp)
- b. Dexter (DdPp) X Dexter, Horned
- c. Kerry, Horned X Dexter, Polled (pure bred)

10. What are the expected phenotypes?

Where stem color of tomato plants is known to be under the genetic control of at least one pair of alleles such that A₁ results in the production of anthocyanin pigment (purple). The recessive genotype aa lacks this pigment and hence is green. The edge of the tomato leaf may be deeply cut under the influence of a dominant allele C. The recessive genotype cc produces smooth-edged leaves called "potato leaf." The production of two locules in the tomato fruit is a characteristic of the dominant allele M, multiple locules are produced by the recessive genotype mm.

- a. purple, potato, biloculed X green, cut, multiloculed (all pure breeds)
- b. AaCCMM X Aaccmm
- c. AACCMm X AaCcm

11. How many progeny flies are expected in each phenotypic class?

Where in drosophila, ebony body is produced by recessive gene e and wild type gray body is produced by dominant gene e⁺. Vestigial wings are governed by recessive gene vg and normal wings by the dominant gene vg⁺.

- a. wild type dihybrid cross, 256 total progeny
- b. gray, normal winged hybrids X ebony, vestigial winged, 312 total progeny
- c. vg⁺ vg e⁺ e⁺ X vg vg e⁺ e

12. List all the different gametes.

by the following individuals:

- a. AABBCc
- b. aaBbCc

13. Calculate all the number of different gametes.

by the following individuals:

a. AaBbccDd

b. AABbCcddEeFf

c. AaBbCCddEeFfGgHh

14. What are the phenotypes of the parents?

Where radishes are long (LL), round (L'L') or oval (LL'). Their color may be red (RR), white (R'R') or purple (RR').

suppose a cross produces

a. 16 long white, 31 oval purple, 16 oval white, 15 long red, 17 oval red, and 32 long purple

b. 103 round purple, 56, round red, and 47 round white

c. 212 oval purple

15. How many different phenotypes can appear in the progeny?

a. AaBbCcDd is testcrossed

b. AaBbCc X AabbCc

c. AABbCcDd X Aabbccdd

16. How many different genotypes can appear in the progeny?

a. AaBbCcDdEe is intercrossed

b. AaBbCc X AabbCc

c. AaBbCcDD X AabbCCDd

17. How many different phenotypes can appear in the progeny?

a. $G^1G^2 H^1H^2 J^1J^2$ intercrossed

b. $G^1G^2 H^1H^2 J^1J^2$ X $G^1G^1 H^1H^2 J^1J^2$

c. $G^1G^2 H^2H^2 J^1J^2 K^1K^2$ X $G^1G^1 H^2H^2 J^1J^2 K^1K^2$

18. How many different phenotypes can appear in the progeny?

a. AaH^1H^2 test crossed

b. $AaH^1H^2 J^1J^2 \times AaH^1H^2 J^1J^2$

c. $aaH^2H^2 J^1J^2Mm \times AaH^2H^2 J^1J^2Mm$

19. List all the possible genotypes for each of the phenotypes in the series below?

Where in the Chinese primrose:

A = Alexandria white eye > a^n = normal type yellow eye > a = queen type large yellow eye.

20. Determine genotypic and phenotypic ratios.

Where: plumage color in Mallard ducks is dependent on a set of three alleles: M^R for restricted Mallard pattern, M for Mallard and m for dusky Mallard. The dominance hierarchy is $M^R > M > m$.

a. $M^R M^R \times M^R M$

b. $M^R M \times M^R m$

c. $M^R m \times M m$