Genetics

Use this key to check answers and read the explanations.

1. A pea plant can inherit two different versions of a gene. What is the name for those versions?

A. Alleles
B. Organs
C. Tissues
D. Organelles

Correct answer: A. Alleles
Alleles are alternative versions of a gene. In a typical diploid plant, each parent contributes one allele for the gene.

2. Which option gives a genotype for a single classroom trait?

A. Green stem
B. Broad leaf
C. Bb
D. Tall plant

Correct answer: C. Bb
The letter pair names the alleles for the gene. The visible plant characteristics are examples of phenotypes.

3. A plant has the genotype tt for a height gene. How would you describe its alleles at that gene?

A. Heterozygous
B. Homozygous recessive
C. Homozygous dominant
D. Codominant

Correct answer: B. Homozygous recessive
The alleles match, so the plant is homozygous. Two lowercase letters represent two recessive alleles in this model.

4. In a model with complete dominance, an Rr pea plant has round seeds. Which other genotype would have the same seed shape?

A. A single recessive allele with no second allele
B. Two recessive alleles (rr)
C. No other genotype
D. Two dominant alleles (RR)

Correct answer: D. Two dominant alleles (RR)
One dominant R allele is sufficient for the round phenotype. Plants with RR or Rr therefore have round seeds.

5. A plant has genotype Aa at a single gene. Its gametes each receive one allele at that gene. Which gametes can it make?

A. Only gametes with both alleles
B. Some with A and some with a
C. Only gametes with the dominant allele
D. Only gametes with the recessive allele

Correct answer: B. Some with A and some with a
The two alleles separate when gametes form, so each gamete receives either A or a.

6. A pea plant with genotype Pp is crossed with a plant with genotype pp. Which fraction of offspring is expected to be heterozygous?

A. One-half
B. One-quarter
C. Three-quarters
D. All

Correct answer: A. One-half
The pp parent contributes only p. Half the gametes from the Pp parent carry P, so half the expected offspring are Pp.

7. Two plants have genotype Gg. In the simple complete-dominance model, what fraction of their offspring is expected to show the recessive phenotype?

A. All
B. One-half
C. Three-quarters
D. One-quarter

Correct answer: D. One-quarter
The four equally likely allele combinations are GG, Gg, gG, and gg. Only gg shows the recessive phenotype.

8. In a cross between two heterozygous pea plants, an offspring shows the dominant phenotype. What is the probability that this particular offspring is heterozygous?

A. One-half
B. One-quarter
C. Two-thirds
D. Three-quarters

Correct answer: C. Two-thirds
Among the three equally likely outcomes that show the dominant phenotype, two carry both allele types and one carries two dominant alleles.

9. In a fictional flower model, RR flowers are red, WW flowers are white, and RW flowers are pink. What fraction of offspring from two pink parents is expected to be white?

A. One-quarter
B. One-half
C. Three-quarters
D. None

Correct answer: A. One-quarter
Each pink parent can pass R or W. Two W alleles occur in one of four equal combinations, giving the white phenotype.

10. A fictional flower with genotype AB has separate patches of the A-associated color and the B-associated color. Which pattern best describes this model?

A. Recessive inheritance of both colors
B. Complete dominance of A
C. Incomplete dominance producing an intermediate color
D. Codominance

Correct answer: D. Codominance
The heterozygote visibly expresses both colors. This distinguishes codominance from incomplete dominance, which yields an intermediate phenotype in the usual classroom model.

11. Two genes assort independently. A plant with genotype AaBb is crossed with a plant with genotype aabb. What fraction of the offspring is expected to have genotype Aabb?

A. One-half
B. One-sixteenth
C. One-quarter
D. Three-quarters

Correct answer: C. One-quarter
The aabb parent always contributes ab. A quarter of gametes from AaBb are Ab under independent assortment, giving Aabb offspring.

12. Plants AaBb and Aabb are crossed. The genes assort independently and both show complete dominance. What is the chance that an offspring shows the dominant A phenotype and the recessive b phenotype?

A. One-eighth
B. Three-eighths
C. One-quarter
D. Three-quarters

Correct answer: B. Three-eighths
Aa × Aa gives a three-quarter chance of the dominant A phenotype. Bb × bb gives a one-half chance of bb. Multiply the independent probabilities to get three-eighths.

13. Each offspring from a cross has a one-quarter chance of showing a recessive trait. For two independently formed offspring, what is the chance that at least one shows it?

A. One-half
B. One-sixteenth
C. One-quarter
D. Seven-sixteenths

Correct answer: D. Seven-sixteenths
The chance neither shows it is three-quarters times three-quarters, or nine-sixteenths. Subtract that from one to get seven-sixteenths.

14. A test cross produces 45 AB, 45 ab, 5 Ab, and 5 aB offspring, classified by the type of gamete from the heterozygous parent. What pattern does this suggest?

A. The A and B genes are linked, with AB and ab as parental combinations.
B. The genes assort independently, producing all four types equally.
C. The Ab and aB types are parental combinations.
D. Only one allele can be inherited at a time.

Correct answer: A. The A and B genes are linked, with AB and ab as parental combinations.
The two abundant classes are the parental combinations. The relatively infrequent Ab and aB classes are consistent with recombination between linked genes.

15. A test cross produces 200 offspring. There are 14 offspring in one recombinant class and 10 in the other. What is the observed recombination frequency?

A. 24 percent
B. 6 percent
C. 12 percent
D. 88 percent

Correct answer: C. 12 percent
Count both recombinant classes. Their total is 24 out of 200, which equals 12 percent.