Quick Vocabulary

Lesson 1

dominant trait genetic factor that blocks another genetic factor
egg haploid sex cell formed in the female reproductive organ
genetics study of how traits are passed from parents to offspring
heredity passing of traits from parents to offspring
hybrid offspring of two plants or animals with different forms of the same trait
recessive trait genetic factor that is blocked by the presence of a dominant factor
sperm haploid sex cell formed in the male reproductive organs

Lesson 2

allele different form of a gene
codominance occurs when both alleles can be observed in the offspring’s phenotype
conclude to reach a logically necessary end by reasoning
gene section on a chromosome that has genetic information for one trait
genotype two alleles that control the phenotype of a trait
heterozygous having two different alleles of a gene
homozygous having the same two alleles of a gene
incomplete dominance occurs when the offspring’s phenotype is a blend of the parents’ phenotypes
phenotype how a trait appears or is expressed
polygenic inheritance occurs when multiple genes determine the phenotype of a trait
Punnett square model used to predict possible genotypes and phenotypes of offspring

Genetics
Lesson Outline for Teaching

Lesson 2: Understanding Inheritance

A. What controls traits?

1. Inside each cell is a nucleus that contains threadlike structures called chromosomes.

2. Mendel's factors are parts of chromosomes, and each cell in offspring contains chromosomes from both parents.

3. A(n) gene is a section on a chromosome that has genetic information for one trait.

4. The different forms of a gene are called alleles.

5. Geneticists refer to how a trait appears, or is expressed, as the trait's phenotype.

6. The two alleles that control the phenotype of a trait are called the trait's genotype.
   a. In genetics, uppercase letters represent dominant alleles, and lowercase letters represent recessive alleles.
   b. When two alleles of a gene are the same, its genotype is homozygous.
   c. If two alleles of a gene are different, its genotype is heterozygous.

B. Modeling Inheritance

1. In a situation based on chance, such as flipping a coin, the chance of getting an outcome can be represented by a(n) ratio such as 50:50, or 1:1.

2. A(n) Punnett square is a model that is used to predict possible genotypes and phenotypes of offspring.
   a. To create a Punnett square, you need to know the genotype of both parents.
   b. If you count large numbers of offspring from a particular cross, the overall ratio will be close to the ratio predicted by a Punnett square.

3. A(n) pedigree is a diagram that shows phenotypes of genetically related family members. It also gives clues about their genotypes.

C. Complex Patterns of Inheritance

1. Alleles show incomplete dominance when the offspring's phenotype is a blend of the parents' phenotypes.

2. Alleles show codominance when both alleles can be observed in a phenotype.

3. Unlike the genes in Mendel's pea plants, some genes have multiple alleles.

4. ABO blood type is a trait that is determined by multiple alleles.

5. Polygenic inheritance occurs when multiple genes determine the phenotype of a trait.

6. Human eye color is an example of polygenic inheritance.
Lesson Outline continued

D. Genes and the Environment

1. Genes are not the only factors that can affect phenotypes. An organism’s environment can also affect its phenotype.

2. The flower color of one type of hydrangea is determined by the soil in which the hydrangea grows.

3. Healthy choices can affect a person’s phenotype.

Discussion Question
How can environment affect an organism’s phenotype; for example, flower color in hydrangeas?

The soil in which the hydrangea grows affects the flower color. Acidic soil produces blue flowers; basic, or alkaline, soil produces pink flowers.
**PUNNETT SQUARES—CROSSES INVOLVING ONE TRAIT**

In a certain species of animal, black fur (B) is dominant over brown fur (b). Using the following Punnett square, predict the genotypes and phenotypes of the offspring whose parents are both Bb or have heterozygous black fur.

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**Genotypes:**

- 1% homozygous black fur (BB)
- 2% heterozygous black fur (Bb)
- 1% homozygous brown fur (bb)

**Phenotypes:**

- 3% black fur
- 1% brown fur

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Now do the same when one parent is homozygous black and the other is homozygous brown.

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**Genotypes:**

- 0% homozygous black fur (BB)
- 4% heterozygous black fur (Bb)
- 0% homozygous brown fur (bb)

**Phenotypes:**

- 4% black fur
- 0% brown fur

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Repeat this process again when one parent is heterozygous black and the other is homozygous brown.

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**Genotypes:**

- 0% homozygous black fur (BB)
- 2% heterozygous black fur (Bb)
- 2% homozygous brown fur (bb)

**Phenotypes:**

- 2% black fur
- 2% brown fur

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Understanding Inheritance

Directions: On the line before each definition, write the letter of the term that matches it correctly. Each term is used only once.

1. threadlike structures in cells
2. contain instructions for traits
3. two different forms of a gene
4. outward appearance
5. determines outward appearance
6. represented by uppercase letters
7. represented by lowercase letters
8. RR
9. Rr
10. shows possible outcomes of genetic crosses
11. shows inherited traits in a family
12. produces a blend of the parents' phenotypes
13. when both alleles are expressed
14. determines human blood type
15. when multiple genes determine a phenotype
16. can sometimes influence expression of genes

A. dominance
B. pedigree
C. genotype
D. heterozygous
E. chromosomes
F. codominance
G. homozygous
H. incomplete dominance
I. genes
J. environmental factors
K. alleles
L. multiple alleles
M. recessiveness
N. polygenic inheritance
O. Punnett square
P. phenotype
Understanding Inheritance

Directions: On the line before each statement, write the letter of the correct answer.

1. Segments of chromosomes that contain coded information for an organism's traits are called
   A. cells.
   B. genes.
   C. alleles.
   D. genotypes.

2. The outward expression, or appearance, of a genetic trait is its
   A. allele.
   B. pedigree.
   C. phenotype.
   D. inheritance.

3. The designation $Rr$ for a pea-plant's peas shows that the plant is
   A. purple.
   B. a hybrid.
   C. homozygous.
   D. a true-breeding plant.

4. A model that is used to show possible outcomes of cross-breeding is a
   A. ratio.
   B. coin toss.
   C. pedigree.
   D. Punnett square.

5. A cow with red hairs and white hairs in its coat is an example of
   A. codominance.
   B. multiple alleles.
   C. polygenic inheritance.
   D. incomplete dominance.

6. Variations in people's height and eye color are due to
   A. codominance.
   B. multiple alleles.
   C. polygenic inheritance.
   D. incomplete dominance.