

- C1. There are many possible answers. Some common areas to discuss might involve the impact of genetics in the production of new medicines, the diagnosis of diseases, the production of new kinds of food, and the use of DNA fingerprinting to solve crimes.
- C2. A chromosome is a very long polymer of DNA. A gene is a specific sequence of DNA within that polymer; the sequence of bases creates a gene and distinguishes it from other genes. Genes are located in chromosomes, which are found within living cells.
- C3. The structure and function of proteins govern the structure and function of living cells. The cells of the body determine an organism's traits.
- C4. At the molecular level, a gene (which is a sequence of DNA) is first transcribed into RNA. The genetic code within the RNA is used to synthesize a protein with a particular amino acid sequence. This second process is called translation.
- C5. A. Molecular level. This is a description of how an allele affects protein function.
B. Cellular level. This is a description of how protein function affects cell structure.
C. Populational level. This is a description of how the two alleles affect members of a population.
D. Organismal level. This is a description of how the alleles affect the traits of an individual.
- C6. Genetic variation involves the occurrence of genetic differences within members of the same species or different species. Within any population, there may be variation in the genetic material. There may be variation in particular genes so that some individuals carry one allele and other individuals carry a different allele. An example would be differences in coat color among mammals. There also may be variation in chromosome structure and number. In plants, differences in chromosome number can affect disease resistance.
- C7. An extra chromosome (specifically an extra copy of chromosome 21) causes Down syndrome.
- C8. You could pick almost any trait. For example, flower color in petunias would be an interesting choice. Some petunias are red and others are purple. There must be different alleles in a flower color gene that affect this trait in petunias. In addition, the amount of sunlight, fertilizer, and water also affects the intensity of flower color.
- C9. The term *diploid* means that a cell has two copies of each type of chromosome. In humans, nearly all of the cells are diploid except for gametes (i.e., sperm and egg cells). Gametes have only one set of chromosomes.
- C10. A DNA sequence is a sequence of nucleotides. Each nucleotide may have one of four different bases (i.e., A, T, G, or C). When we speak of a DNA sequence, we focus on the sequence of bases.
- C11. The genetic code is the way in which the sequence of bases in RNA is read to produce a sequence of amino acids within a protein.
- C12. A. A gene is a segment of DNA. For most genes, the expression of the gene results in the production of a functional protein. The functioning of proteins within living cells affects the traits of an organism.
B. A gene is a segment of DNA that usually encodes the information for the production of a specific protein. Genes are found within chromosomes. There are many genes within a single chromosome.
C. An allele is an alternative version of a particular gene. For example, suppose a plant has a flower color gene. One allele could produce a white flower, while a different allele could produce an orange flower. The white allele is an allele of the flower color gene.
D. A DNA sequence is a sequence of nucleotides. The information within a DNA sequence (which is transcribed into an RNA sequence) specifies the amino acid sequence within a protein.
- C13. The statement in part A is not correct. Individuals do not evolve. Populations evolve because certain individuals are more likely to survive and reproduce and pass their genes to succeeding generations.
- C14. A. How genes and traits are transmitted from parents to offspring.
B. How the genetic material functions at the molecular and cellular levels.
C. Why genetic variation exists in populations, and how it changes over the course of many generations.