

## Topic 1.1 Assessment

### Check Your Understanding Answers

#### Understanding Key Ideas

1. Sample answer: The geese would not be identical. They might be a different size or have longer wings. The coloration of the feathers would be different. They would not be genetically identical (unless two birds were identical twins). There is genetic variation within the population and the species.
2. DNA is a molecule made up of two strands of nucleotides linked together. The structure of DNA looks like a twisted ladder, or double helix. The sides of the ladder are made up of the sugar and phosphate groups. Each rung of the ladder is made up of two nitrogenous bases bonded together as a base pair.
3. DNA stores genetic material that has the instructions for cell function.
4. a) C = 23%  
  
b) A = 27%  
  
c) G = 23%
5. The complete DNA sequence in each cell of an organism is called the organism's genome.
6. Diagrams or flowcharts should show that nucleotides are the building blocks of DNA and that chromosomes are condensed chromatin, which is condensed DNA. Genes are segments of DNA and alleles are different forms of the same gene.
7. Homologous means having the same relation, relative position, or structure, which is how homologous chromosomes are related. They are not identical, which means exactly the same.
8. They are similar in length and shape. They have similar banding patterns. They may have different alleles for the same trait.
9. The drawing should show three pairs of chromosomes with each pair being similar in size, shape, and banding pattern.
10. X and Y chromosome determine the genetic gender of an organism. XX is a genetic female. XY is a genetic male.
11. DNA replication results in identical strands of DNA in daughter cells, which means they can produce the same proteins.

#### Connecting Ideas

12. Diagrams could show that genetic diversity ultimately leads to species diversity and that ecosystem diversity allows for species diversity because species can adapt to different habitats. All of these types of

diversity tie to biodiversity on Earth. Without any of these types of diversity, biodiversity of Earth would be lower than it is.

13. Genes are sections of DNA that contain genetic information for the inheritance of specific traits. Different forms of the same gene are called alleles. Differences in genes and the alleles individuals inherit lead to diversity among living things.

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BC Science Connections 10 Teaching Notes Topic 1.1 How does an understanding of DNA help us investigate living things?

### **Making New Connections**

14. The distance covered by the genetic railroad track:  $3\,000\,000\,000$  base pairs  $\times$   $1$  m/base pair  $\times$   $1$  km/1000 m =  $3\,000\,000$  km. The number of base pairs that do code for proteins is  $30\,000$  genes  $\times$   $3000$  base pairs/gene =  $90\,000\,000$  base pairs. That leaves  $3\,000\,000\,000$  base pairs –  $90\,000\,000$  base pairs =  $2\,910\,000\,000$  base pairs that do not code for proteins, equivalent to 97% of the human genome!
15. a) karyotype; to prepare a karyotype, a cell sample is collected and treated to stop cell division during metaphase of mitosis. The sample is stained, which produces a banding pattern on the chromosomes that is clearly visible under a microscope. The chromosomes are then sorted and paired.  
  
b) The individual is a genetic male.  
c) Yes, there are 23 pairs of chromosomes (22 pairs of autosomes and 1 pair of sex chromosomes).