

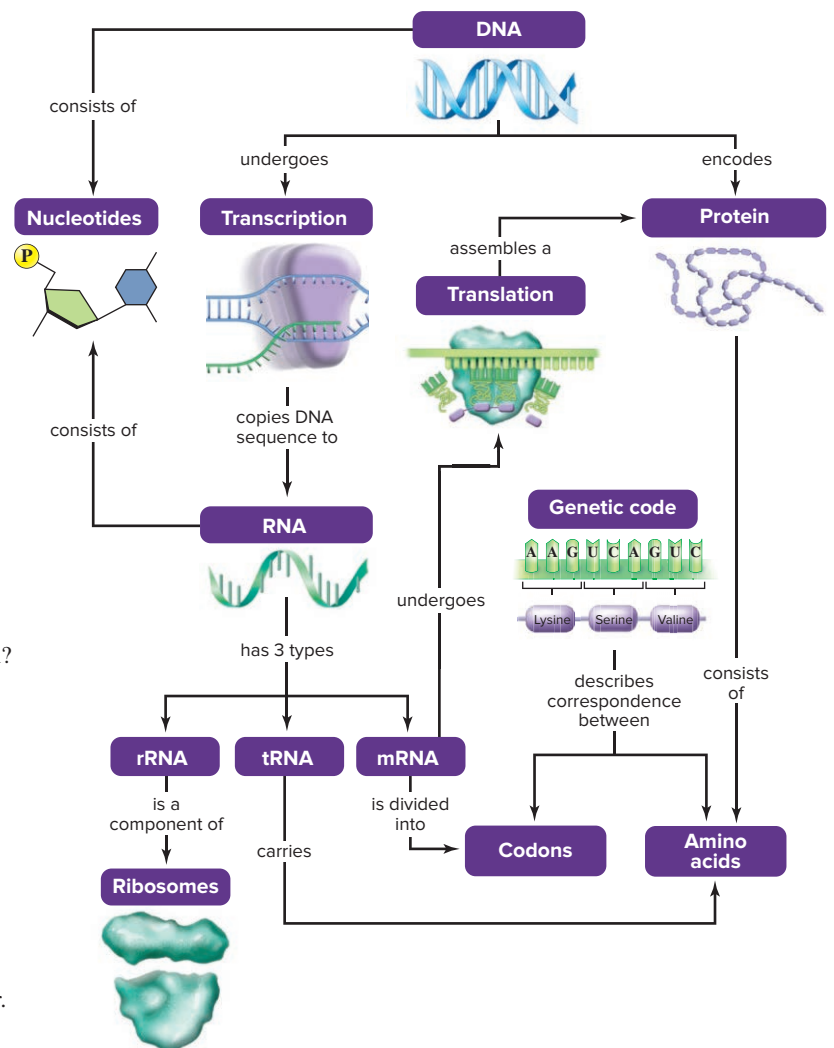
- List the three major types of RNA and their functions.
- Some people compare DNA to a blueprint stored in the office of a construction company. Explain how this analogy would extend to transcription and translation.
- Where in a eukaryotic cell do transcription and translation occur?
- Write the sequence of the mRNA molecule transcribed from the following template DNA sequence:  
G G A A T A C G T C T A G C T A G C A
- How many codons are in the mRNA molecule that you wrote for question 8?
- If the sequence of a template strand of DNA is AAAGCAGTACTA, what would be the corresponding amino acid sequence?
- The roundworm *C. elegans* has 556 cells when it hatches. Each cell contains the entire genome but expresses only a subset of the genes. Therefore, the cells “specialize” in particular functions. List all of the ways that a roundworm cell might silence the unneeded genes.
- If a protein is 1259 amino acids long, what is the minimum size of the gene that encodes the protein? Why might the gene be longer than the minimum?
- If a gene is like a cake recipe, then a mutated gene is like a cake recipe containing an error. List the major types of mutations, and describe an analogous error in a cake recipe.
- A protein-encoding region of a gene has the following DNA sequence: T T T C A T C A G G A T G C A A C A  
Determine how each of the following mutations alters the amino acid sequence:
  - Substitution of an A for the T in the first position
  - Substitution of a G for the C in the seventeenth position
  - Insertion of a T between the fourth and fifth DNA bases
  - Insertion of a GTA between the twelfth and thirteenth DNA bases
  - Deletion of the first DNA nucleotide
- How might the effects of a mutation in a gene’s promoter differ from the effects of a similar mutation in the gene’s protein-encoding region? How might the effects differ if the mutation occurs in an intron versus an exon? Does the type of mutation affect your answer?
- The amount of melanin in the skin is controlled by genes, yet melanin is not a protein. How can this be?
- Describe the basic parts of a virus and how each contributes to viral replication.
- Your biology lab instructor gives you a petri dish of agar covered with visible colonies. Your lab partner says the colonies are viruses, but you disagree. How do you know the colonies are bacteria?
- Imagine a hybrid virus with the protein coat of virus X and the DNA of virus Y. Will a host cell infected with this hybrid virus produce virus X, virus Y, a mix of X and Y viruses, or hybrid viruses? Explain your answer.
- Why do antibiotics such as penicillin kill bacteria but leave viruses unharmed?
- Search the Internet for information about the injectable flu vaccine (a “flu shot”). Why is the flu shot administered annually when many other vaccines last for years? Is it possible for a flu shot to cause influenza?

Answers to Mastering Concepts, Write It Out, Scientific Literacy, and Pull It Together questions can be found in the Connect ebook.  
[connect.mheducation.com](http://connect.mheducation.com)

## SCIENTIFIC LITERACY

Review Burning Question 7.2, which explains why you might be likely to become sick in the winter. Scientists studying the rhinovirus (which infects the nose and air passages) found that it multiplies more quickly when human cells are below normal body temperature because the immune system functions less efficiently. What might you do to keep your airways warm while outside in cold weather? Why might frequent hand-washing be even more important?

## PULL IT TOGETHER



**Figure 7.28** Pull It Together: DNA Structure and Gene Function.

Refer to **figure 7.28** and the chapter content to answer the following questions.

- Why is protein production essential to cell function?
- Where do promoters, terminators, stop codons, transcription factors, RNA polymerase, and ribosomes fit into this concept map?
- How would viruses fit into this concept map?
- Review the Survey the Landscape figure in the chapter introduction, and then explain why a mutation in DNA sometimes causes protein function to change.