DNA -chapter Assessment # 1-26
(12/13) INB ✓ 2/25

Lesson 12.1

UNDERSTAND KEY CONCEPTS

1. b 2. d 3. c 4. b

5. A chemical factor can be transferred from dead bacteria to living bacteria that can change the heritable characteristics of the living bacteria.

6. DNA contains phosphorus, but protein does not. Protein contains sulfur, but DNA does not. This allowed radioactive phosphorus and radioactive sulfur to identify each molecule specifically.

THINK CRITICALLY

7. Griffith heated a culture of a disease-causing strain of bacteria, which killed the bacteria but did not destroy the DNA. When he mixed the heat-killed, disease-causing bacteria with live, harmless bacteria, the DNA from the disease-causing bacteria was transferred to the live bacteria. These bacteria and their offspring caused pneumonia in the mice.

8. Avery and his team used enzymes to destroy various biological molecules. They showed that when DNA was destroyed, genetic information could not be transferred. Destroying other biological molecules did not have the same effect.

Lesson 12.2

UNDERSTAND KEY CONCEPTS

9. b 10. a 11. c

12. A nucleotide has three parts: a 5-carbon sugar called deoxyribose, a phosphate group, and a nitrogenous base.

13. Chargaff's rules of base pairing gave Watson and Crick confidence that their model was correct, because their model agreed with Chargaff's observations of the relative percentages of A, T, G, and C in DNA.

14. The scattering pattern of X-rays sent through a sample of DNA showed that the molecule was helical and consisted of two strands.

15. The two strands of DNA are antiparallel, which means that the bases can line up in the two strands and form hydrogen bonds between the A–T and G–C pairs.

THINK CRITICALLY

16. The model showed that hydrogen bonds could create a nearly perfect fit between nitrogenous bases along the center of the molecule. But the bonds could only form between adenine and thymine, and guanine and cytosine.

17. Adenine and guanine are larger than cytosine and thymine. The equal distance between the backbones suggested that a small base must always be paired with a large base.

12 Assessment

12.1 Identifying the Substance of Genes

Understand Key Concepts

1. The process by which one strain of bacterium is apparently changed into another strain is called
   a. transcription. c. duplication.
   b. transformation. d. replication.

2. Bacteriophages are
   a. a form of bacteria. c. coils of DNA.
   b. enzymes. d. viruses.

3. Which of the following researchers used radioactive markers in experiments to show that DNA was the genetic material in cells?
   a. Frederick Griffith
   b. Oswald Avery
   c. Alfred Hershey and Martha Chase
   d. James Watson and Francis Crick

4. Before DNA could definitively be shown to be the genetic material in cells, scientists had to show that it could
   a. tolerate high temperatures.
   b. carry and make copies of information.
   c. be modified in response to environmental conditions.
   d. be broken down into small subunits.

5. Briefly describe the conclusion that could be drawn from the experiments of Frederick Griffith.

6. What was the key factor that allowed Hershey and Chase to show that DNA alone carried the genetic information of a bacteriophage?

Think Critically

7. **Interpret Visuals** Look back at Griffith's experiment shown in **Figure 12–1.** Describe the occasion in which the bacterial DNA withstood conditions that killed the bacteria. What happened to the DNA during the rest of the experiment?

8. **Evaluate** Avery and his team identified DNA as the molecule responsible for the transformation seen in Griffith's experiment. How did they control variables in their experiment to make sure that only DNA caused the effect?

12.2 The Structure of DNA

Understand Key Concepts

9. A nucleotide does NOT contain
   a. a 5-carbon sugar.
   b. an amino acid.
   c. a nitrogen base.
   d. a phosphate group.

10. According to Chargaff's rule of base pairing, which of the following is true about DNA?
    a. A = T, and C = G
    b. A = C, and T = G
    c. A = G, and T = C
    d. A = T = C = G

11. The bonds that hold the two strands of DNA together come from
    a. the attraction of phosphate groups for each other.
    b. strong bonds between nitrogenous bases and the sugar-phosphate backbone.
    c. weak hydrogen bonds between nitrogenous bases.
    d. carbon-to-carbon bonds in the sugar portion of the nucleotides.

12. Describe the components and structure of a DNA nucleotide.

13. Explain how Chargaff's rule of base pairing helped Watson and Crick model DNA.

14. What important clue from Rosalind Franklin's work helped Watson and Crick develop their model of DNA?

15. Why is it significant that the two strands of DNA are antiparallel?

Think Critically

16. **Use Models** How did Watson and Crick's model of the DNA molecule explain base pairing?

17. **Infer** Rosalind Franklin's X-ray pattern showed that the distance between the two phosphate-sugar backbones of a DNA molecule is the same throughout the length of the molecule. How did that information help Watson and Crick determine how bases are paired?

Lesson 12.3

UNDERSTAND KEY CONCEPTS

18. c 19. a 20. a 21. d

22. Base pairing is the principle that hydrogen bonds form only between certain base pairs: adenine and thymine, cytosine and guanine. In replication, base pairing ensures that the new complementary strands are identical to the original strands.

23. In a typical prokaryotic cell, DNA is found in the cytoplasm in a single circular chromosome.

24. DNA separates into two strands. The two new complementary strands are generated following the rules of base pairing. Each new DNA molecule has one strand from the original molecule and one newly synthesized strand, making each new DNA molecule an exact duplicate of the original.

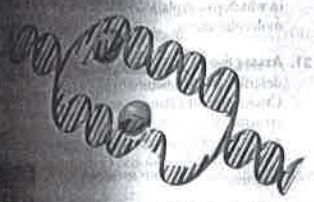
DNA Replication

Key Concepts

c. cytoplasm.
d. histones.

c. cytoplasm.
d. histones.

c. transformation.
d. transpiration.



c. carbohydrase.
d. DNA polymerase.

22. What is meant by the term *base pairing*? How is base pairing involved in DNA replication?
23. Describe the appearance of DNA in a typical prokaryotic cell.
24. Explain the process of replication. When a DNA molecule is replicated, how do the new molecules compare to the original molecule?

Think Critically

25. **Use Analogies** Is photocopying a document similar to DNA replication? Think of the original materials, the copying process, and the final products. Explain how the two processes are alike. Identify major differences.
26. **Compare and Contrast** Describe the similarities and differences between DNA replication in prokaryotic cells and in eukaryotic cells.

solve the CHAPTER MYSTERY

UV LIGHT

The nucleotides in DNA include the nitrogenous bases adenine, cytosine, guanine, and thymine (A, C, G, and T). The energy from UV light can produce chemical changes in these bases, damaging the DNA molecule and producing errors when DNA is replicated.

1. **Predict** Use your understanding of the structure of DNA to predict what sorts of problems excessive UV light might produce in the DNA molecule. How might these changes affect the functions of DNA?
2. **Infer** All cells have systems of enzymes that repair UV-induced damage to their DNA. Some cellular systems block DNA replication if there are base pairing problems in the double helix. Why are these systems important? How might they work?
3. **Relate Cause and Effect** Analyze the effects that UV light might have on skin cells. Why is UV light so dangerous? Why is the skin particularly vulnerable to it?
4. **Connect to the Big idea** Among humans who inherit genetic defects in their DNA-repair systems, the incidence of skin cancer is as much as 1000 times greater than average. Based on this information, what can you infer about the effect of UV light on DNA?

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THINK CRITICALLY

25. Photocopying a document is similar in some ways to DNA replication. In both processes, you start with one copy and end up with two identical copies. However, the copying process is different. In photocopying, the original is copied, so you end up with one original copy and one completely new copy. In DNA replication, the original molecule splits in half, so you end up with two copies that are half original and half new.

26. Similarities: DNA replication in both eukaryotes and prokaryotes proceeds in both directions and results in two identical strands of DNA. Differences: prokaryotic DNA replication occurs in the cytoplasm and begins at a single point on the chromosome; eukaryotic DNA replication occurs in the nucleus and begins in many places on a chromosome.

ASSESSMENT

CHAPTER MYSTERY After students have read through the Chapter Mystery, have a discussion about the connection between UV light and changes in DNA.

Ask What part of the DNA molecule is changed by exposure to UV light? *(the nitrogenous bases)*

Explain that UV light damages DNA by inducing changes in its structure, which consequently affect function. For example, UV light induces the formation of pyrimidine dimers (covalent linking between adjacent pyrimidine bases), which block normal DNA replication.

Ask How might exposure to UV light change DNA's ability to store, copy, or transmit information? *(Any change in the structure of DNA could lead to changes in stored information and could interfere with the accurate copying of the information. This might lead to incorrect information being transmitted to daughter cells during cell division.)*

Ask How could this information be used to inform others of the importance of wearing sunscreen? *(Describing how UV light damages DNA would allow you to use scientific information to support your argument that wearing sunscreen is a healthful action.)*

CHAPTER MYSTERY ANSWERS

1. Sample answer: The energy from UV light can cause chemical changes in the bases. It might cause the formation of new bonds or the breaking of old ones, preventing the DNA molecule from replicating properly.
2. Sample answer: They are important because they prevent damaged DNA from passing along incorrect information when it replicates. They might work by disabling DNA polymerase.
3. UV light is dangerous because it can cause chemical changes in DNA. The skin is particularly vulnerable because it covers and protects most of the body and is the organ that is subject to the greatest exposure to UV light.
4. Big idea Sample answer: The fact that people with genetic defects in their DNA repair systems have a higher incidence of skin cancer, and the fact that excessive exposure to UV light causes skin cancer, provides evidence that for the effect of UV light on DNA—UV light damages DNA, and DNA damage is associated with cancer.