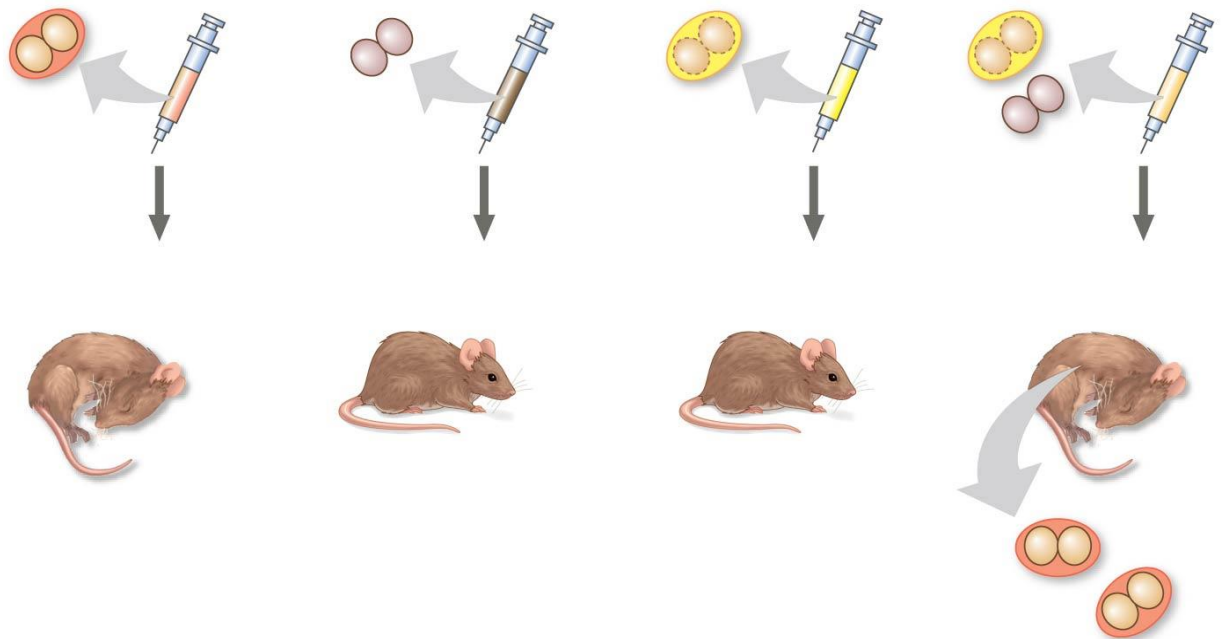


Chapter 16 Guided Reading: The Molecular Basis of Inheritance  
10ed.

1. What are the two chemical components of chromosomes?
2. Why did researchers originally think that protein was the genetic material?
3. Distinguish between the virulent and nonvirulent strains of *Streptococcus pneumoniae* studied by Frederick Griffith.
4. Use this figure to summarize the experiment in which Griffith became aware that hereditary information could be transmitted between two organisms in an unusual manner.



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5. Define *transformation*.
6. What did Oswald Avery, McCarty, and MacLeod determine to be the *transforming factor*?
7. Sketch a *T2 bacteriophage* and label its *head*, *tail sheath*, *tail fiber*, and *DNA*.
8. How does a bacteriophage destroy a bacterial cell? Look ahead to Chapter 19, Figure 19.5 to explain this.
9. How did Hershey and Chase “label” viral DNA and viral protein so that they could be distinguished? Explain why they chose each radioactive tag in light of the chemical composition of DNA and protein.
10. Describe the means by which Hershey and Chase established that only the DNA of a phage enters an *E. coli* cell. What conclusions did these scientists draw based on these observations?
11. What are *Chargaff's rules*? How did he arrive at them? Go to the Scientific Skills Exercise on page 316 and see if you can apply these rules to fill in the numbers missing in the chart.
12. List the components of a nucleotide.
13. Who are the two men who build the first molecular model of DNA and shared the 1962 Nobel Prize for the discovery of its structure?
14. What was Rosalind Franklin's role in the discovery of the *double helix*?

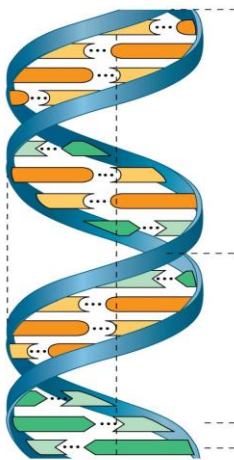
15. Distinguish between the structure of *pyrimidines* and *purines*. Explain why adenine bonds only to thymine.
16. Given that the DNA of a certain fly species consists of 27.3% adenine and 22.5% guanine, use Chargaff's rules to deduce the percentages of thymine and cytosine.
17. Name the five nitrogenous bases, and put a checkmark in the correct column for each base. Also indicate if the base is found in **DNA** (D), **RNA** (R), or both (B).

Nitrogenous Base	Purine	Pyrimidine	D,R, or B

18. What DNA base is complementary to adenine? \_\_\_\_\_

What DNA base is complementary to guanine? \_\_\_\_\_

19. Describe the structure of DNA relative to each of the following. Indicate the distance in the correct location on the figure as well, and label a hydrogen bond.
- Distance across the molecule \_\_\_\_\_
  - Distance between nucleotides \_\_\_\_\_
  - Distance between turns \_\_\_\_\_
  - Components of the backbone \_\_\_\_\_
  - Components of the "rungs" \_\_\_\_\_



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20. Explain what is meant by *5' and 3' ends* of the nucleotide.

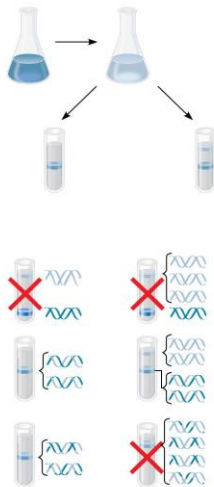
21. What do we mean when we say the two strands of DNA are *antiparallel*?

22. What is the *semiconservative model of replication*?

23. Who performed the experiments that elucidated the correct mechanism of DNA replication?

24. How did Meselson and Stahl create “heavy” DNA for their experiments?

25. Use Figure 16.11 in your text to explain how Meselson and Stahl confirmed the semiconservative mechanism of DNA replication.



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26. Define *the origins of replication*.

27. Distinguish between the *leading* and the *lagging strands* during DNA replication.

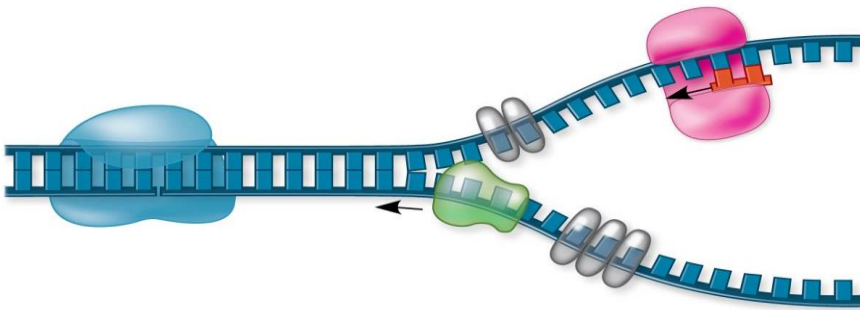
28. What is the direction of synthesis of the new strand?

29. What are *Okazaki fragments*? How are they welded together?

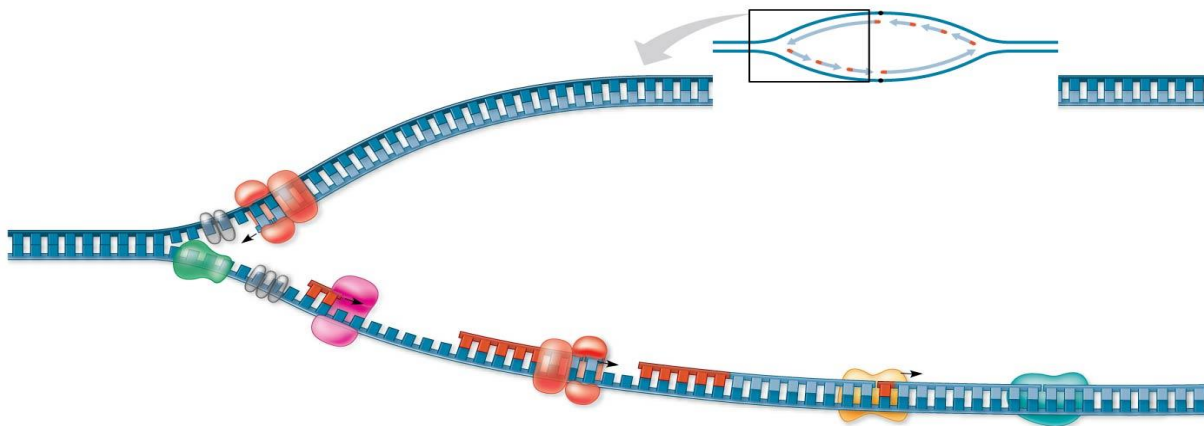
30. Which enzyme does each of the following?

a. untwists and separates strands	
b. holds DNA strands apart	
c. synthesize RNA primer	
d. adds DNA nucleotides to new strands	
e. relieves strain caused by unwinding	
f. joins DNA fragments together	
g. removes RNA primer and replaces it with DNA	

31. Label the following figures. Include 3' and 5' strands, RNA primer, primase, SSBP, topoisomerase, helicase, leading strand, lagging strand, DNA pol I, DNA pol III, DNA ligase, parental DNA, and new DNA. On the second figure, also add arrow to indicate the direction of synthesis.



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32. Make a detailed list of the steps that occur in the synthesis of a new strand.

33. Explain the roles of each of the following enzymes in DNA proofreading and repair.

Enzyme	Role
DNA polymerase	
Nuclease	
Ligase	
Repair enzymes	

34. What is a *thymine dimer*? (see Figure 16.19.) How might it occur? How is it repaired?

35. Make a sketch of a chromosome and label the *telomeres*.

36. Explain telomere erosion and the role of *telomerase*.

37. Why are cancer cells immortal even though most body cells have a limited life span?