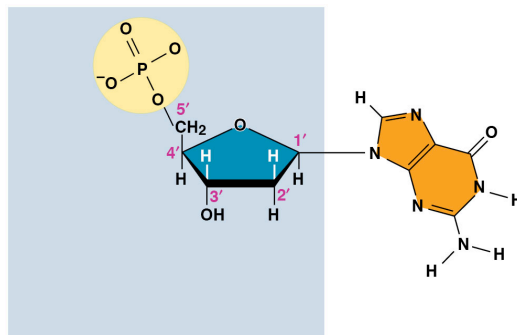


Chapter 13 Reading Guide: The Molecular Basis of Inheritance

Concept 13.1: *DNA is the genetic material*

1. What are the two chemical components of chromosomes?
2. Why did researchers originally think that protein was the genetic material?
3. What did Griffith, Avery and others accomplish by studying bacteria?
4. Define **transformation**.
5. What is a **bacteriophage**? What is it made of?
6. In the experiments that Alfred Hershey and Martha Chase performed, they found that the _____ of the phage entered the bacterial host cells, but that the _____ of the phage did not. Their results showed the _____ inside the cell played an ongoing role during the infection process.
7. What are **Chargaff's rules**? How did he arrive at them?
8. If the DNA of a certain fly species consists of 35% adenine, use Chargaff's rules to determine the percentages of cytosine, guanine, and thymine.
9. **Label** the following diagram of a **nucleotide**.



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10. What were the contributions of the following scientists to the discovery of the 3-D structure of DNA?

- James Watson & Francis Crick
- Maurice Wilkins and Rosalind Franklin

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

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

Concept 13.2: Many proteins work together in DNA replication and repair

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

14. What occurs at the DNA replication fork?

15. What are the functions of the following enzymes involved in replication?

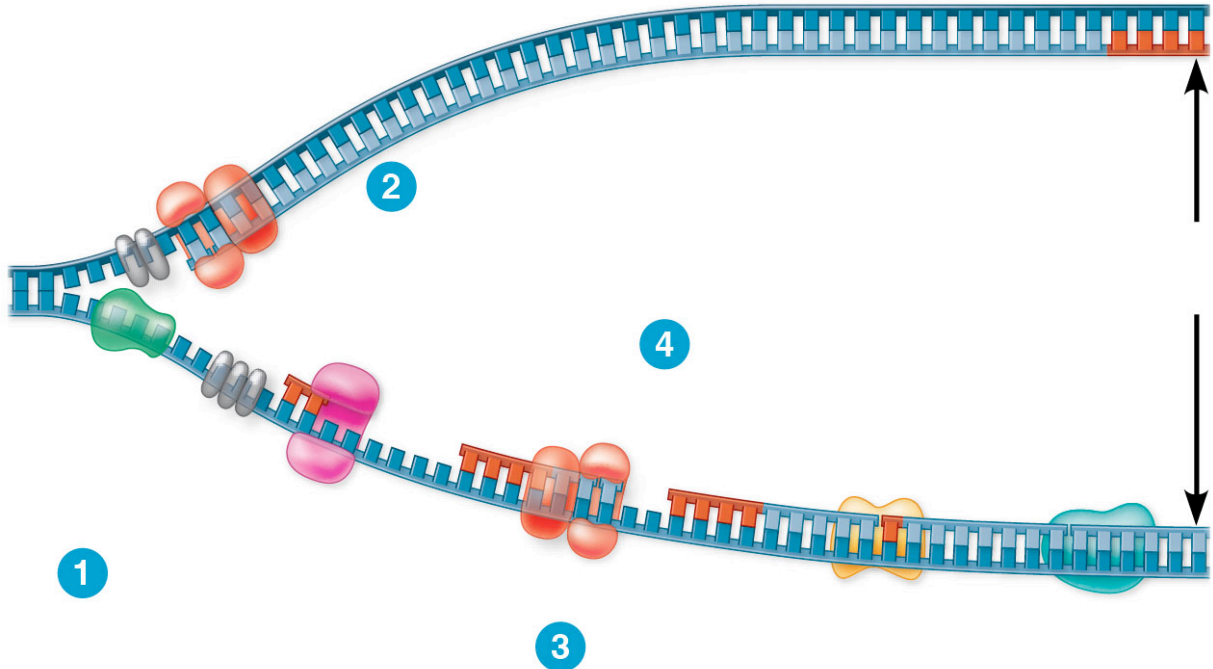
- a. Helicase
- b. Topoisomerase
- c. Primase
- d. DNA polymerase
- e. Ligase

16. Why are nucleotides added in the 5' to 3' direction?

17. Contrast the **leading strand** vs. the **lagging strand** during DNA replication.

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

19. **Label** the diagram of the summary of DNA replication below. **Include** the **directions** (3', 5') and the **terms** (*origin of replication, replication fork, helicase, SSBP, RNA primer, primase, leading strand, lagging strand, Okazaki fragment, DNA pol I, DNA pol III, DNA ligase, parental DNA, new DNA*).



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

- DNA polymerase
- Nuclease
- Ligase
- Repair enzymes

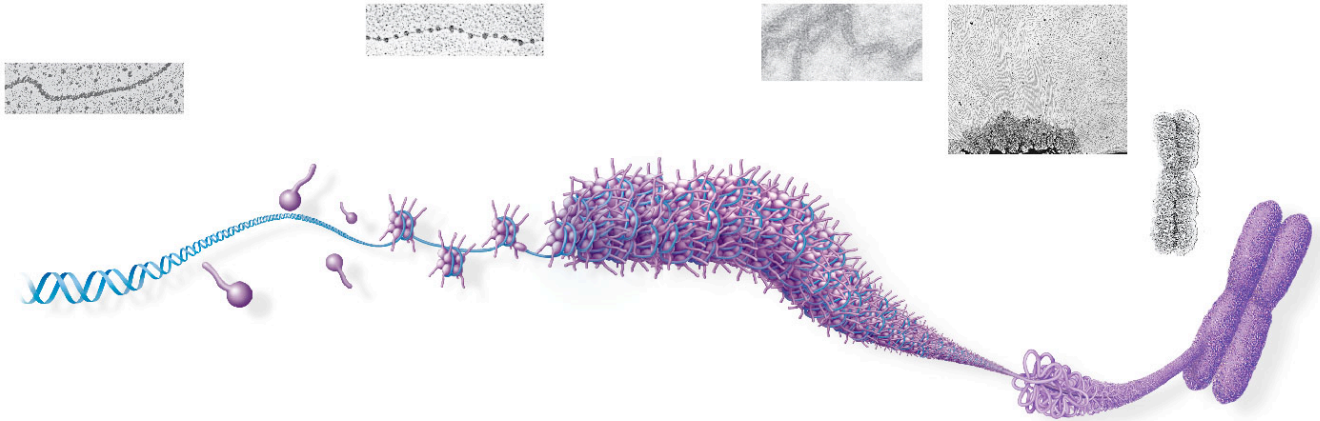
21. What is the problem that occurs at the ends of the eukaryotic chromosome during replication?

22. What is a **telomere**?

23. Why is **telomerase** an active target in cancer research?

Concept 13.3: A chromosome consists of a DNA molecule packed together with proteins

24. On the diagram below, **identify** the following: 30-nm fiber, double helix, histone proteins, nucleosome, looped domains (300-nm fiber), protein scaffold, and metaphase chromosome.



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25. Distinguish between *heterochromatin* and *euchromatin*.

Concept 13.4: Understanding DNA structure and replication makes genetic engineering possible

26. Define the term *genetic engineering*.

27. What is the purpose for each of the following important techniques used in genetic engineering?

- a. Gene cloning
- b. Restriction enzymes
- c. Gel electrophoresis
- d. Polymerase chain reaction (PCR)
- e. DNA sequencing
- f. CRISPR-Cas9 system