

## Chapter 16

class notes

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### I. Overview: DNA Replication

- DNA → DNA
- Occurs at Interphase in meiosis and mitosis.
- Results in a duplicated chromosome w/ twice the amount of DNA

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### II. Review of DNA structure

#### A. Nucleotide structure

- Deoxyribose sugar
- 5' phosphate
- Nitrogenous base-A, G, T, C
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## II. Review of DNA structure

B. One deoxyribonucleic acid (DNA) strand.

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## II. Review of DNA structure

B. The DNA double helix

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(2 slides)

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## Question 16.1

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### III. Search for the Genetic Material

- 1940: Most scientists thought that proteins were the genetic material.

- 1)
- 2)
- 3)
- 4)

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### III. Search for the Genetic Material

- **1928: Fredrick Griffith's Experiments.**

– Demonstrated that *Streptococcus pneumonia* bacteria containing a rough coat (R strain, nonpathogenic) could develop a smooth coat (strain, pathogenic) though acquisition of genetic material.

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### III. Search for the Genetic Material

- **Griffith's Experiments demonstrated the transforming factor was not a protein.**

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- **1944:**

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### III. Search for the Genetic Material

- **1952: Alfred Hershey and Martha Chase** helped establish DNA as the genetic material.

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### III. Search for the Genetic Material

- **Hershey and Chase**

– T2 viruses contain both DNA and proteins

Question:

Experiment 1:

Experiment 2:

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### III. Search for the Genetic Material

- **Hershey and Chase**

Results:

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### Question 16.2

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### IV. Structure of the Double Helix

- **1952: Watson and Crick**
- Used wire models to deduce the 3-D structure of DNA

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### IV. Structure of the Double Helix

- **1952: Watson and Crick**
- *Additional information:*
  - X-ray crystallography data (Rosalind Franklin & Maurice Wilkins)
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- Chargaff's Rule:
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#### IV. Structure of the Double Helix

- **Watson, Crick and Wilkins won the Nobel Prize in 1962 for their discovery.**

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#### V. Semiconservative Model for DNA Replication

- **First proposed by Watson and Crick**
- **Later confirmed by Meselson and Stahl's experiments.**

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#### VI. DNA Replication: Getting Started

- **Origin of Replication**
  - **Bacteria =**
  - **Eukaryotic DNA =**

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VI. DNA Replication: Getting Started

- **Stand Separation**

- *Helicase:*

- *Single-stranded binding proteins:*

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VII. Synthesis of New DNA Strands

- **DNA polymerase III:** catalyzes the synthesis of a new DNA strand.

- **Step 1.**

- **Step 2.**

- **Step 3.**

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VII. Synthesis of New DNA Strands

- **DNA polymerase III**

- Key Points

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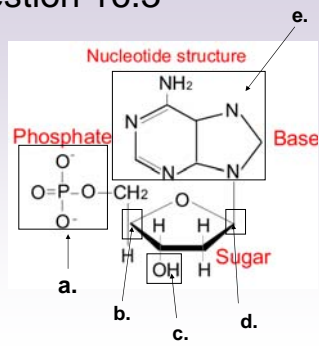
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### Question 16.3

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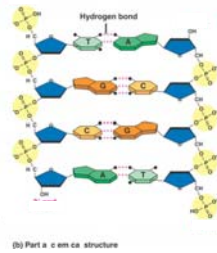
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### Question 16.4

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### VII. Synthesis of New DNA Strands

- **DNA polymerase III**

– Key Points (continued)

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### VII. Synthesis of New DNA Strands

- **Replication Fork** = Y shaped region of replicating DNA where new strands are growing.

– Leading strand =

– Lagging strand =

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### VII. Synthesis of New DNA Strands

- **Okazaki Fragments**

– Short nucleotide fragments

– ~100-200 nucleotides long

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### VIII. Priming DNA Synthesis

- Before new DNA strands can form, there must be small pre-existing primers to start the addition of new nucleotides.

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VIII. Priming DNA Synthesis

- **Primer = Short RNA segment that is necessary to begin DNA replication.**

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VIII. Priming DNA Synthesis

- **Eventually, DNA polymerase I will remove the RNA primer and replace it with DNA.**

- **DNA ligase links (“glues”) strands together.**

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Review DNA Replication

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IX. Ends of the DNA molecules

- Telomeres = .
  - Allows shortening of the chromosome ends after each replication event.
  - May regulate cell division and aging of tissues.
- Telomerase = enzyme found in germ line cells. Elongates the telomeres prior to gamete production.

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X. Repair Enzymes Proofread DNA

- DNA polymerase error rate = ~ 1 in 10,000.
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XI. DNA Damage by Environment

- Changes in DNA can also result from exposure to radioactivity, X-rays, reactive chemicals and ultraviolet light.
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## XII. Mutations

- **Mutations = Mistakes or changes that are not corrected and become permanent.**
- **Most mutations:**
- **Rare:**
- **Very, very, very, rare:**

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