DNA Replication

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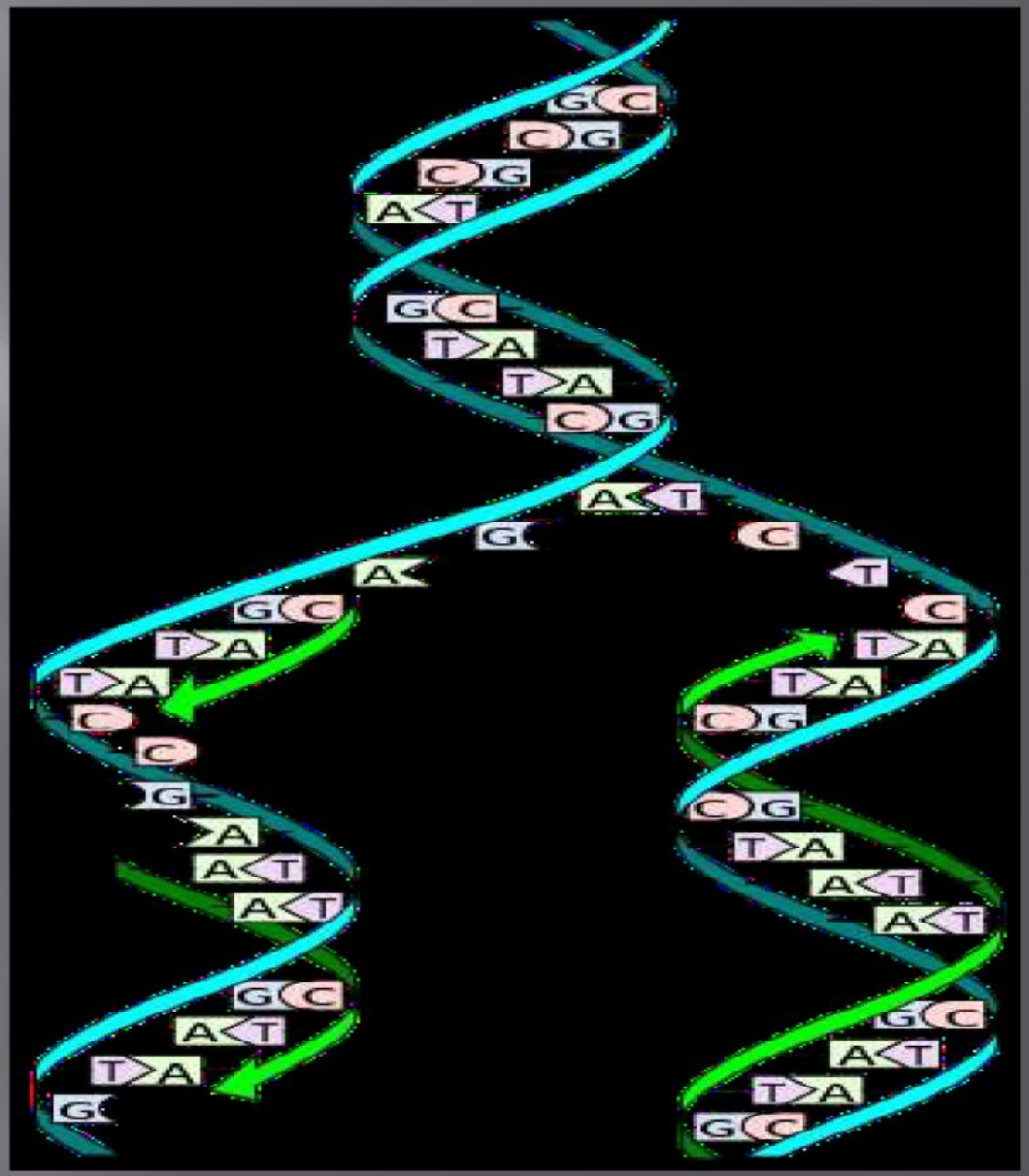
DNA Replication

- DNA replication is the process whereby an entire double-stranded DNA is copied to produce a second, identical DNA double helix



The Replication Factory

- DNA replication is carried out by proteins
- These special proteins cluster together (replication factory)
- DNA is fed through the replication factory
- The incoming DNA double helix is split into two single strands and each original single strand becomes half of a new DNA double helix
- This is a semi-conservative process

DNA Replication Proteins

- Helicase
- Unwinds the DNA double helix into 2 individual strands
- Single-stranded binding proteins (SSBs)
- Coats the single-stranded DNA, preventing the two strands from realigning
- Primase
- Gets each strand ready (or primed) for replication by adding a small amount of RNA to each strand to show DNA polymerase where to start

DNA Replication Proteins

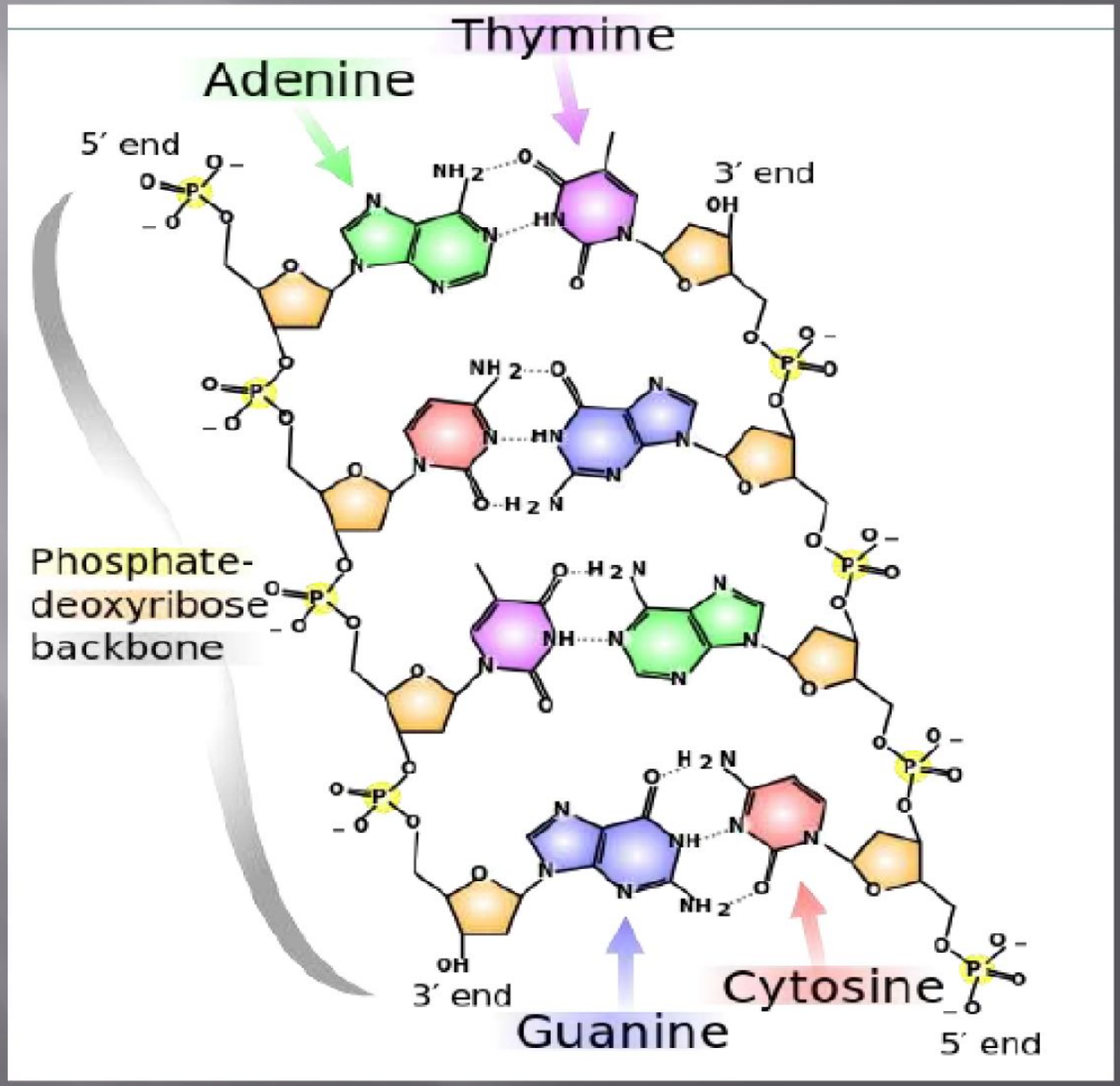
- DNA Polymerase
- Strings nucleotides together to form a new DNA strand
- RNAse H
- Removes the RNA primers (set by primase)
- DNA ligase
- Links short stretches of DNA together to create one long continuous DNA strand

Step 1: Strand Separation

- The two strands that make up the double helix are unwound and separated by the enzyme **helicase**
- **Single-stranded binding proteins (SSBs) quickly coat** the newly exposed single strands
- Without the SSBs, the complementary DNA strands could easily snap back together

Step 2: New Strand Synthesis

- The two single strands of DNA act as templates for the production of two new, complimentary DNA strands
- The two strands that makes up a double helix are **antiparallel**
- Complementary 5′ to 3′ strands running in opposite directions
- **Strand synthesis proceeds in a 5′ to 3′ direction**


Thymine
Adenine
5′ end
3′ end
Phosphate-
deoxyribose
backbone
3′ end
Guanine
Cytosine
5′ end

Primase copies a short stretch of the DNA

strand, creating a complementary RNA segment, showing DNA polymerase where to start

2. DNA polymerase can now begin synthesizing a new complimentary DNA strand

1. Two DNA polymerase enzymes are required, one for each strand
2. Since the strands are antiparallel, the DNA polymerase enzymes begin to move in opposite directions
3. One DNA polymerase copies continuously in one direction. This strand is called the **leading strand**
4. The other must synthesize in small fragments. This strand is called the **lagging strand**
1. The small fragments are called **Okazaki fragments**

3. **RNAse H removes the primers (set by primase)**

4. The gaps left by the primers are filled by **DNA polymerase**

5. Finally, the Okazaki fragments are joined by **DNA ligase**

Thank U