AP BIO INSTA-REVIEW

TOPIC 6.2

Replication

IST-1.M.1

DNA replication ensures continuity of hereditary information–

a. DNA is synthesized in the 5' to 3' direction.
b. Replication is a semiconservative process–that is, one strand of DNA
serves as the template for a new strand of complementary DNA.
c. Helicase unwinds the DNA strands.
d. Topoisomerase relaxes supercoiling in front of the replication fork.

AP BIO INSTA-REVIEW

TOPIC 6.2

Replication

IST-1.M.1

DNA replication ensures continuity of hereditary information–

e. DNA polymerase requires RNA primers to initiate DNA synthesis.

f. DNA polymerase synthesizes new strands of DNA continuously on the leading strand and discontinuously on the lagging strand.

g. Ligase joins the fragments on the lagging strand.

AP BIO INSTA-REVIEW

TOPIC

6.2

Which direction is DNA read for DNA replication?

A. 3' -> 5'

B. 5' -> 3'

C. C terminus to N terminus

D. N terminus to C terminus

AP BIO INSTA-REVIEW

TOPIC 6.2

Which direction is DNA read for DNA replication?

A. 3' -> 5'

DNA is antiparallel, so it is read 3' -> 5' and synthesized 5' -> 3'. Recall the 5' end is the phosphate group and the 3' end is the hydroxyl of the deoxyribose.

AP BIO INSTA-REVIEW

TOPIC

6.2

Which direction is DNA synthesized in DNA replication?

A. 3' -> 5'

B. 5' -> 3'

C. C terminus to N terminus

D. N terminus to C terminus

AP BIO INSTA-REVIEW

TOPIC 6.2

Which direction is DNA synthesized in DNA replication?

B. 5' -> 3'

DNA is antiparallel, so it is synthesized 5' -> 3' and read 3' -> 5'. Recall the 5' end is the phosphate group and the 3' end is the hydroxyl of the deoxyribose.

AP BIO INSTA-REVIEW

TOPIC

6.2

What is found at the 3' end and 5' ends of DNA?

AP BIO INSTA-REVIEW

TOPIC 6.2

What is found at the 3' end and 5' ends of DNA?

5' end: phosphate

3' end: hydroxyl

Students a couple years ago would say the DNA is synthesized in the order of "P-OH".

AP BIO INSTA-REVIEW

TOPIC

6.2

How is DNA replicated?

A. Conservative

B. Dispersive

C. Lagging

D. Semiconservative

AP BIO INSTA-REVIEW

TOPIC 6.2

How is DNA replicated?

D. Semiconservative

The parent strand of DNA separates to provide a template strand for base pairing. The two separate strands base pair to synthesize the daughter strand. Each daughter strand has one parent strand (old) and one daughter strand (new) so the original sequence is conserved.

AP BIO INSTA-REVIEW

TOPIC

6.2

What does it mean to say the DNA replicates semiconservative?

AP BIO INSTA-REVIEW

TOPIC 6.2

What does it mean to say the DNA replicates semiconservative?

The parent strand of DNA separates to provide a template strand for base pairing. The two separate strands base pair to synthesize the daughter strand. Each daughter strand has one parent strand (old) and one daughter strand (new) so the original sequence is conserved.

AP BIO INSTA-REVIEW

TOPIC

6.2

Describe the experiment from Meselson & Stahl that proved semiconservative

AP BIO INSTA-REVIEW

TOPIC 6.2

Describe the experiment from Meselson & Stahl that proved semiconservative

They grew bacteria in the presence of nitrogen 15 (heavy nitrogen). Then put the bacteria into presence of nitrogen 14 (light nitrogen). After one round of replication, the DNA was a hybrid of heavy and light nitrogen. After two rounds of replication, there was a hybrid of heavy & light and a light strand.

AP BIO INSTA-REVIEW

TOPIC 6.2

Enzymes responsible for sealing phosphodiester linkage

A. Helicase

B. Ligase

C. Polymerase

D. Topoisomerase

AP BIO INSTA-REVIEW

TOPIC 6.2

Enzymes responsible for sealing phosphodiester link

B. Ligase

DNA ligase is used to form the phosphodiester linkage between two fragments of DNA on the sugar-phosphate backbone. This will seal the Okazaki fragments together (and the fragments from different origins of replication)

AP BIO INSTA-REVIEW

TOPIC

6.2

Enzymes responsible for relieve strand of double helix

A. Helicase

B. Ligase

C. Polymerase

D. Topoisomerase

AP BIO INSTA-REVIEW

TOPIC 6.2

Enzymes responsible for relieve strand of double helix

D. Topoisomerase

As helicase pulls apart the two strands of DNA (breaks the H bonds between the two strands), the strand gets supercoiled upstream. The topoisomerase will break the H bonds relieve the strain and then re-form the bonds.

AP BIO INSTA-REVIEW

TOPIC

6.2

Enzymes responsible for breaking H bonds between strands

A. Helicase

B. Ligase

C. Polymerase

D. Topoisomerase

AP BIO INSTA-REVIEW

TOPIC 6.2

Enzymes responsible for breaking H bonds between strands

A. Helicase

The helicase will break the H bonds between the two strands to allow access to the nucleotides for DNA replication. Recall, enzymes tell you what they do... helicase will break the bonds in the helix.

AP BIO INSTA-REVIEW

TOPIC

6.2

Enzymes responsible for synthesis of new DNA

A. Helicase

B. Ligase

C. Polymerase

D. Topoisomerase

AP BIO INSTA-REVIEW

TOPIC 6.2

Enzymes responsible for synthesis of new DNA

C. Polymerase

DNA polymerase synthesizes the new DNA strand. It will bind to an open 3' end to add the next nucleotide to the polynucleotide strand. Recall, enzymes tell you what they do... DNA polymerase makes a DNA polymer.

AP BIO INSTA-REVIEW

TOPIC

6.2

DNA polymerase can start replication independently

A. True

B. False

AP BIO INSTA-REVIEW

TOPIC 6.2

DNA polymerase can start replication independently

B. False

DNA polymerase requires an open 3' end for synthesis.

Primase will synthesize an RNA primer of 5-10 RNA nucleotides before the DNA strand.

AP BIO INSTA-REVIEW

TOPIC

6.2

What does DNA Polymerase require to initiate replication?

AP BIO INSTA-REVIEW

TOPIC 6.2

What does DNA Polymerase require to initiate replication?

An open 3' end. To initiate replication, primase will make an RNA primer. This primer has the open 3' end that is required for DNA polymerase for replication. The RNA will be replaced later with DNA by another type of DNA polymerase.

AP BIO INSTA-REVIEW

TOPIC

6.2

DNA is...

A. Antiparallel

B. Parallel

AP BIO INSTA-REVIEW

TOPIC 6.2

DNA is...

A. Antiparallel

The strands of DNA are antiparallel. The strands are equidistant due to a purine and pyrimidine bonding. The strands run in opposite directions. Notice in the figure, there's a 5' across from a 3'.

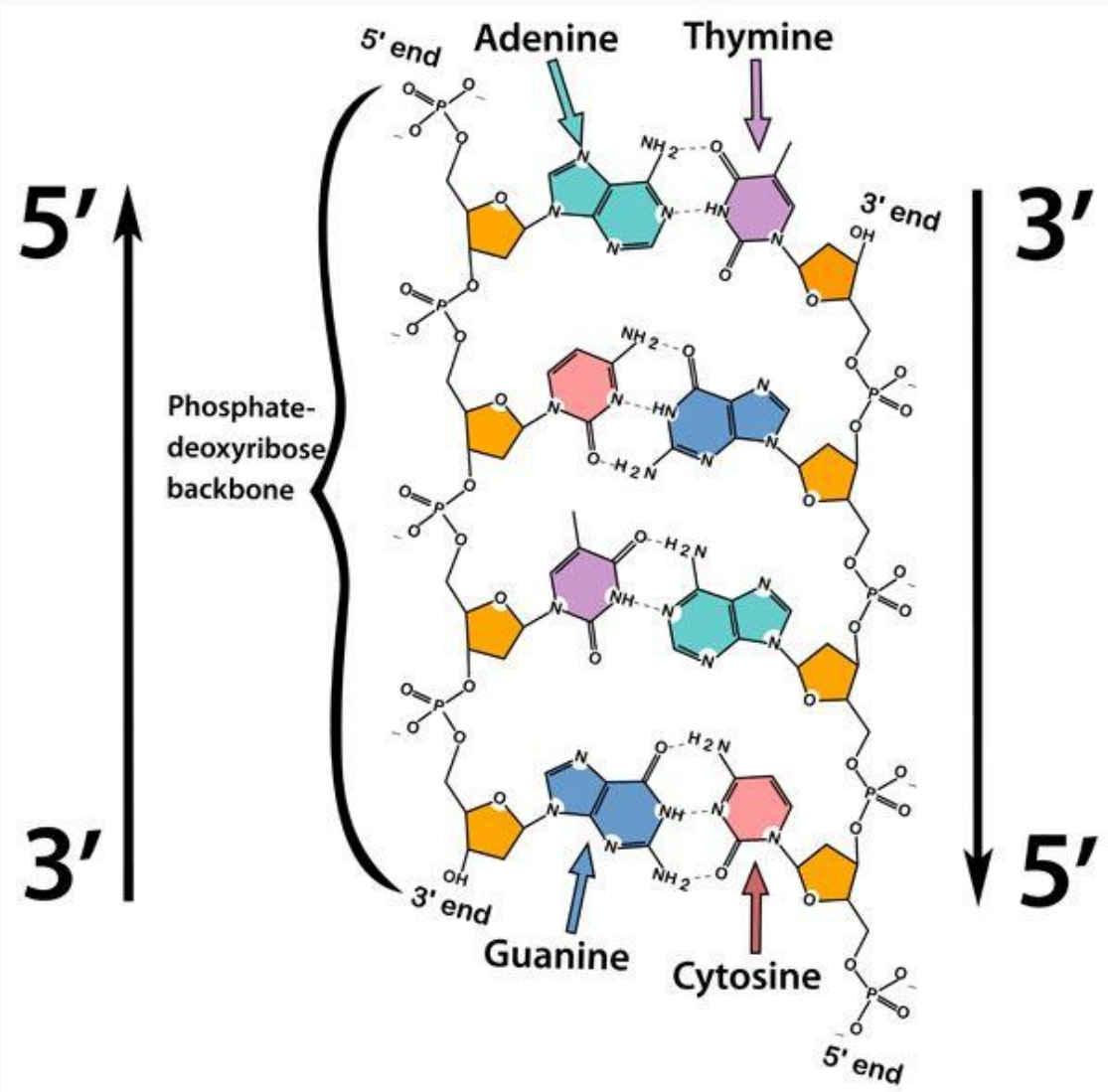
AP BIO INSTA-REVIEW

TOPIC

6.2

DNA is...

A. Antiparallel



AP BIO INSTA-REVIEW

TOPIC

6.2

What is meant by leading and lagging strand?

AP BIO INSTA-REVIEW

TOPIC 6.2

What is meant by leading and lagging strand?

Leading is synthesized continuous with replication fork with the replication fork while lagging strand is synthesized discontinuously. This occurs due to the antiparallel nature of DNA. The two strands when pulled apart only have one strand that can be read 3' to 5'(leading strand's template). Due to this, the lagging strand needs to move away from the replication fork so it can read the template strand in 3' to 5' direction.

AP BIO INSTA-REVIEW

TOPIC

6.2

Which enzyme connects the Okazaki fragments (lagging)

A. Helicase

B. Ligase

C. Polymerase

D. Topoisomerase

AP BIO INSTA-REVIEW

TOPIC 6.2

Which enzyme connects the Okazaki fragments (lagging)

B. Ligase

DNA ligase will form the phosphodiester linkage between DNA fragments to form a continuous sugar-phosphate backbone.

AP BIO INSTA-REVIEW

TOPIC

6.2

What is at the 5' end of DNA?

A. Hydrogen

B. Hydroxyl

C. Nitrogenous Base

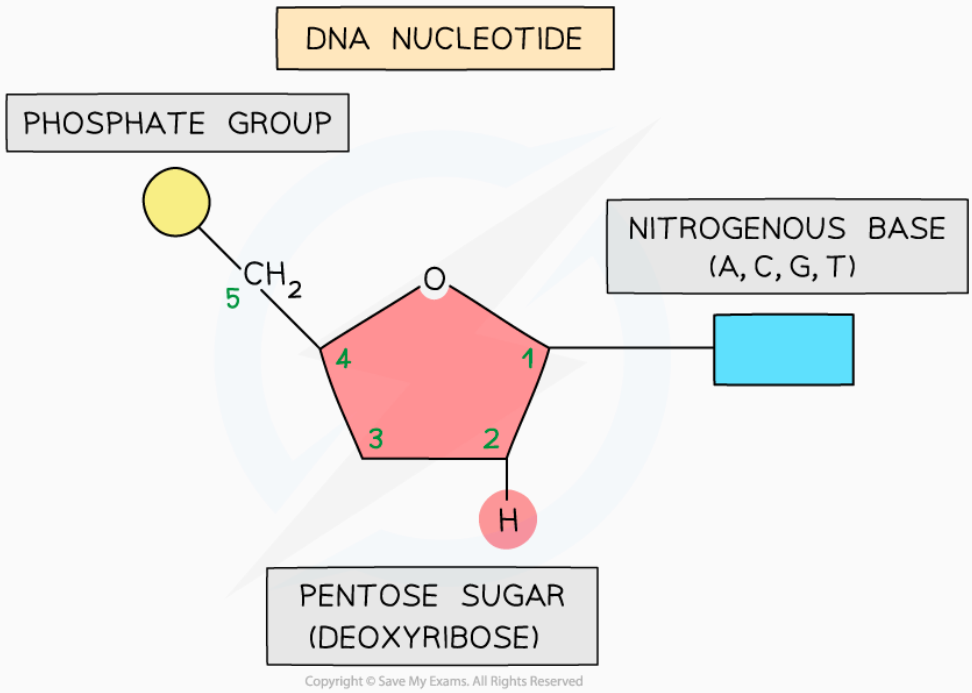
D. Phosphate

AP BIO INSTA-REVIEW

TOPIC 6.2

What is at the 5' end of DNA?

D. Phosphate



The 5' end has the phosphate group.
The 1' end has the nitrogenous base.
The 3' end has the hydroxyl group of the pentose sugar.

AP BIO INSTA-REVIEW

TOPIC

6.2

What is at the 3' end of DNA?

A. Hydrogen

B. Hydroxyl

C. Nitrogenous Base

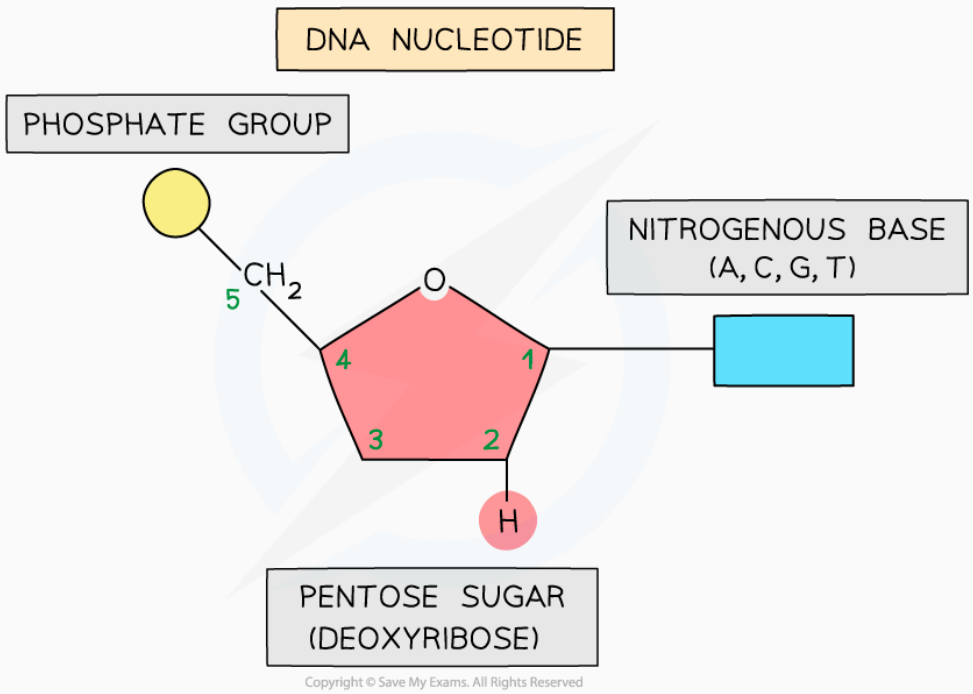
D. Phosphate

AP BIO INSTA-REVIEW

TOPIC 6.2

What is at the 3' end of DNA?

B. Hydroxyl



The 3' end has the hydroxyl group of the pentose sugar.

The 5' end has the phosphate group.

The 1' end has the nitrogenous base.

AP BIO INSTA-REVIEW

TOPIC

6.2

Describe the directionality of DNA

A. Antiparallel

B. Parallel

C. Perpendicular

D. Single Stranded 5' to 3'

AP BIO INSTA-REVIEW

TOPIC 6.2

Describe the directionality of DNA

A. Antiparallel

The strands of DNA are antiparallel. The strands are equidistant due to a purine and pyrimidine bonding. The strands run in opposite directions.

AP BIO INSTA-REVIEW

TOPIC

6.2

What does it mean that the DNA is antiparallel?

AP BIO INSTA-REVIEW

TOPIC

6.2

What does it mean that the DNA is antiparallel?

DNA is equidistant (recall it's a purine and pyrimidine so it has the same width). The two strands fun in opposite directions.

$$5' \rightarrow 3'$$
$$3' \leftarrow 5'$$

AP BIO INSTA-REVIEW

TOPIC

6.2

What is the enzyme responsible for breaking hydrogen bonds between nitrogenous bases?

A. DNA polymerase

B. Helicase

C. Ligase

D. Primase

AP BIO INSTA-REVIEW

TOPIC 6.2

What is the enzyme responsible for breaking hydrogen bonds between nitrogenous bases?

B. Helicase

Helicase will break the hydrogen bond between the nitrogenous bases. Recall, the enzymes tell you what they do so helicase will separate the helix.

AP BIO INSTA-REVIEW

TOPIC

6.2

What enzyme is responsible for synthesizing RNA start?

A. DNA polymerase

B. Helicase

C. Ligase

D. Primase

AP BIO INSTA-REVIEW

TOPIC 6.2

What enzyme is responsible for synthesizing RNA start?

D. Primase

DNA polymerase requires an RNA primer to provide the open 3' end to attach the DNA nucleotides. Recall, enzymes tell you what they do so primase will make a primer.

AP BIO INSTA-REVIEW

TOPIC

6.2

What enzyme is responsible for making the new DNA strand?

A. DNA polymerase

B. Helicase

C. Ligase

D. Primase

AP BIO INSTA-REVIEW

TOPIC 6.2

What enzyme is responsible for making the new DNA strand?

A. DNA polymerase

DNA polymerase will synthesize the new DNA strand. Recall, enzymes tell you what they do so DNA polymerase makes a DNA polymer.

AP BIO INSTA-REVIEW

TOPIC

6.2

Why does DNA require an RNA start (primer)?

AP BIO INSTA-REVIEW

TOPIC 6.2

Why does DNA require an RNA start (primer)?

DNA polymerase requires an open 3' end to build upon for replication

AP BIO INSTA-REVIEW

TOPIC

6.2

Which direction is DNA read?

A. 3' to 5'

B. 5' to 3'

C. Right to Left

D. Left to Right

AP BIO INSTA-REVIEW

TOPIC 6.2

Which direction is DNA read?

A. 3' to 5'

DNA is antiparallel, so it is read 3' -> 5' and synthesized 5' -> 3'. Recall the 5' end is the phosphate group and the 3' end is the hydroxyl of the deoxyribose.

AP BIO INSTA-REVIEW

TOPIC

6.2

Which direction is DNA synthesized?

A. 3' to 5'

B. 5' to 3'

C. Right to Left

D. Left to Right

AP BIO INSTA-REVIEW

TOPIC 6.2

Which direction is DNA synthesized?

B. 5' to 3'

DNA is antiparallel, so it is synthesized 5' -> 3' and read 3' -> 5'. Recall the 5' end is the phosphate group and the 3' end is the hydroxyl of the deoxyribose.

AP BIO INSTA-REVIEW

TOPIC

6.2

Which strand is formed continuously into the replication fork?

A. Lagging strand

B. Leading strand

AP BIO INSTA-REVIEW

TOPIC 6.2

Which strand is formed continuously into the replication fork?

B. Leading strand

The leading strand is synthesized continuously. This strand is synthesized towards the replication fork. DNA is antiparallel so moving in one direction, one strand will be in the correct orientation of 3' to 5' while the other strand will be "backwards" in the 5' to 3' orientation.

AP BIO INSTA-REVIEW

TOPIC

6.2

Which strand is formed discontinuously away from the replication fork?

A. Lagging strand

B. Leading strand

AP BIO INSTA-REVIEW

TOPIC 6.2

Which strand is formed discontinuously away from the replication fork?

A. Lagging strand

The lagging strand is synthesized discontinuously. This strand is synthesized away from the replication fork. DNA is antiparallel so moving in one direction, one strand will be in the correct orientation of 3' to 5' while the other strand will be "backwards" in the 5' to 3' orientation.

AP BIO INSTA-REVIEW

TOPIC

6.2

Lagging strand is made 3' to 5' and leading strand is made 5' to 3'.

A. True

B. False

AP BIO INSTA-REVIEW

TOPIC 6.2

Lagging strand is made 3' to 5' and leading strand is made 5' to 3'.

B. False

DNA is ALWAYS synthesized 5' to 3'. The leading strand is synthesize contineously towards the replication fork while the lagging strand is synthesized discontinuously away from the replication fork.