DNA Replication Grade 12 Biology

Watch the following video to complete the questionnaire

https://www.youtube.com/watch?v=IjVLhoyfGAM&t=1s

Complete the multiple-choice questions. Note: some questions may have more than one answer-one, two or three answers. Marks will be lost if you do not choose all the correct answers.

1. Which components constitute a single nucleotide molecule?

A. A deoxyribose sugar, a phosphate, and a phosphodiester bond

B. A deoxyribose sugar, a phosphate, and one of four nitrogenous bases

C. An alternating sugar and phosphate group

D. A guanine base, a cytosine base, and three hydrogen bonds

2. Which characteristics accurately describe complementary base pairing in DNA?

A. Adenine forms three hydrogen bonds with Cytosine.

B. Thymine forms two hydrogen bonds with Adenine.

C. Cytosine forms three hydrogen bonds with Guanine.

D. Guanine forms two hydrogen bonds with Thymine.

3. The structure of double-stranded DNA is aided by the fact that the two strands are oriented in opposite directions (one 5' to 3' and the other 3' to 5'). This characteristic is known as the DNA strands':

A. Complementary nature

B. Semi-conservative structure

C. Antiparallel nature

D. Phosphodiester backbone

4. The process of DNA replication is considered "semi-conservative" because:

A. Replication occurs in segments called Okazaki fragments.

B. Only half of the double helix is replicated at a time.

C. Each original strand (parent strand) is used as a template for a new double strand.

D. DNA gyrase ensures the double-stranded areas do not supercoil.

5. In which specific direction does DNA replication occur, based on the addition of new nucleotides?

A. 3 prime to 5 prime, moving away from the replication fork

B. 3 prime to 5 prime, moving toward the replication fork

C. 5 prime to 3 prime, adding to the 3 prime end of the newly forming strand

D. 5 prime to 3 prime, adding to the 5 prime end of the parent strand

6. Which enzymes or proteins help stabilize the replication fork and manage the stress on the double helix before DNA polymerase begins its work?

A. DNA gyrase

B. Primase

C. Helicase

D. Single-stranded binding proteins

E. DNA polymerase 1

7. Why is the enzyme primase necessary for DNA replication to begin?

A. Primase separates the two strands of the double helix.

B. DNA polymerase cannot begin to add nucleotides without a short RNA primer sequence.

C. Primase ensures bonding between fragments on the lagging strand.

D. Primase catalyzes the addition of deoxyribose sugars.

8. Which statements accurately describe the characteristics of the *leading strand* during replication?

A. It is the parent strand oriented 5 prime to 3 prime.

B. It uses continuous synthesis.

C. It moves continuously toward the expanding replication fork.

D. It requires the synthesis of Okazaki fragments.

9. The discontinuous synthesis that occurs on the lagging strand results in the formation of short sequences of nucleotides called:

A. Primers B. Replication forks

C. Okazaki fragments D. Beta clamps

10. After the Okazaki fragments have been synthesized, which enzyme is responsible for replacing the short RNA primers with DNA nucleotides?

A. DNA polymerase 3 B. Primase

C. DNA ligase

D. DNA polymerase 1

11. Which roles are performed by accessory proteins like beta clamps and the clamp loader?

A. They make sure the double-stranded areas outside the fork do not super coil.

B. They help hold the DNA polymerase in place on the DNA.

C. They stabilize the single-stranded regions after separation.

D. They catalyze the addition of new nucleotides to the growing daughter strand.

12. Prokaryotic cells, like *E. coli*, rely on the fast and accurate process of DNA replication to ensure which critical outcomes?

A. The cells can successfully undergo crossing over.

B. Future generations of cells will have the same genetic instructions as the parent cell.

C. The process of protein synthesis is sped up.

D. Bacterial populations can grow, increasing the number of individuals in a colony.