

2.5 Nucleic Acids: Structure & DNA Replication

Question Paper

Course	DP IB Biology
Section	2. Molecular Biology
Topic	2.5 Nucleic Acids: Structure & DNA Replication
Difficulty	Hard

Time allowed: 10
Score: /5
Percentage: /100

Question 1

Which of the following would be the result of analysing a DNA molecule 14 000 base pairs in length?

- A. 28 000 pentose sugars, 14 000 phosphate groups, an equal ratio of cytosine to thymine bases and an equal ratio of guanine to adenine bases
- B. 28 000 pentose sugars, 28 000 phosphate groups, an equal ratio of cytosine to guanine bases and an equal ratio of thymine to adenine bases
- C. 14 000 pentose sugars, 28 000 phosphate groups, an equal ratio of cytosine to thymine bases and an equal ratio of guanine to adenine bases
- D. 28 000 pentose sugars, 28 000 phosphate groups, an equal ratio of cytosine to thymine bases and an equal ratio of guanine to adenine bases

[1 mark]

Question 2

Which of the following would **not** be considered an advantage of complementary base pairing in DNA?

- A. It enables each DNA strand to act as a template for the formation of a new strand during replication
- B. Hydrogen bonding between complementary bases stabilises the structure of the DNA molecule
- C. It ensures genetic continuity between generations of cells so that they all contain the same genetic information as the parent cells
- D. It plays an important role in maintaining the covalent bonds within the DNA molecule

[1 mark]

Question 3

Which of the rows in the following table correctly identifies the function of each enzyme listed?

	Helicase	RNA polymerase	DNA polymerase
A.	Breaks the hydrogen bonds between complementary DNA bases	Links thymine to the adjacent nucleotide through covalent bonds	Binds to a template DNA strand and pairs uracil up with adenine
B.	Responsible for the formation of hydrogen bonds between complementary DNA bases	Binds to a template DNA strand and pairs uracil up with adenine	Links thymine to the adjacent nucleotide through covalent bonds
C.	Breaks the hydrogen bonds between complementary DNA bases	Binds to a template DNA strand and pairs uracil up with adenine	Links thymine to the adjacent nucleotide through covalent bonds
D.	Binds to a template DNA strand and pairs uracil up with adenine	Links thymine to the adjacent nucleotide through covalent bonds	Responsible for the formation of hydrogen bonds between complementary DNA bases

[1 mark]

Question 4

The following events occur in the process of DNA replication.

1. Complementary strands are separated
2. Free DNA nucleotides pair with complementary nucleotides on each template strand
3. Hydrogen bonds are formed between complementary bases
4. Hydrogen bonds are broken between complementary bases
5. Covalent bonds form between the pentose sugar and the phosphate group of adjacent nucleotides

Which of the following is the correct order of the events?

- A. 1 → 3 → 4 → 2 → 5
- B. 3 → 1 → 2 → 4 → 5
- C. 2 → 1 → 3 → 4 → 5
- D. 4 → 1 → 2 → 3 → 5

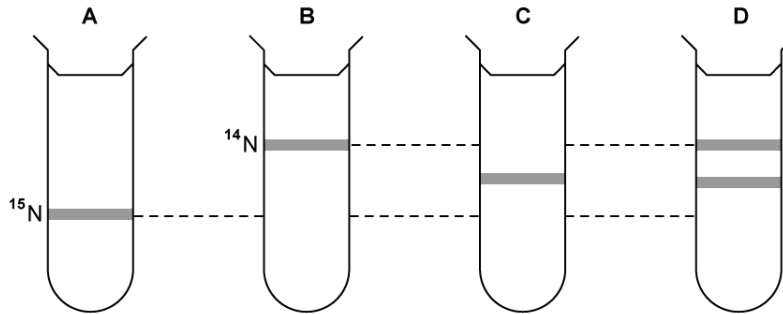
[1 mark]

Question 5

The experiments done by Meselson and Stahl in the 1950s provided evidence that DNA replication was semi-conservative.

They transferred bacteria that contained only ^{15}N in their DNA and transferred them to a medium containing only ^{14}N . They allowed the bacteria to divide twice and then centrifuged the DNA.

The following diagram shows a few test tubes with results from their investigation.



Which of these test tubes shows the predicted results after **two** generations in the medium with the light isotope?

[1 mark]