

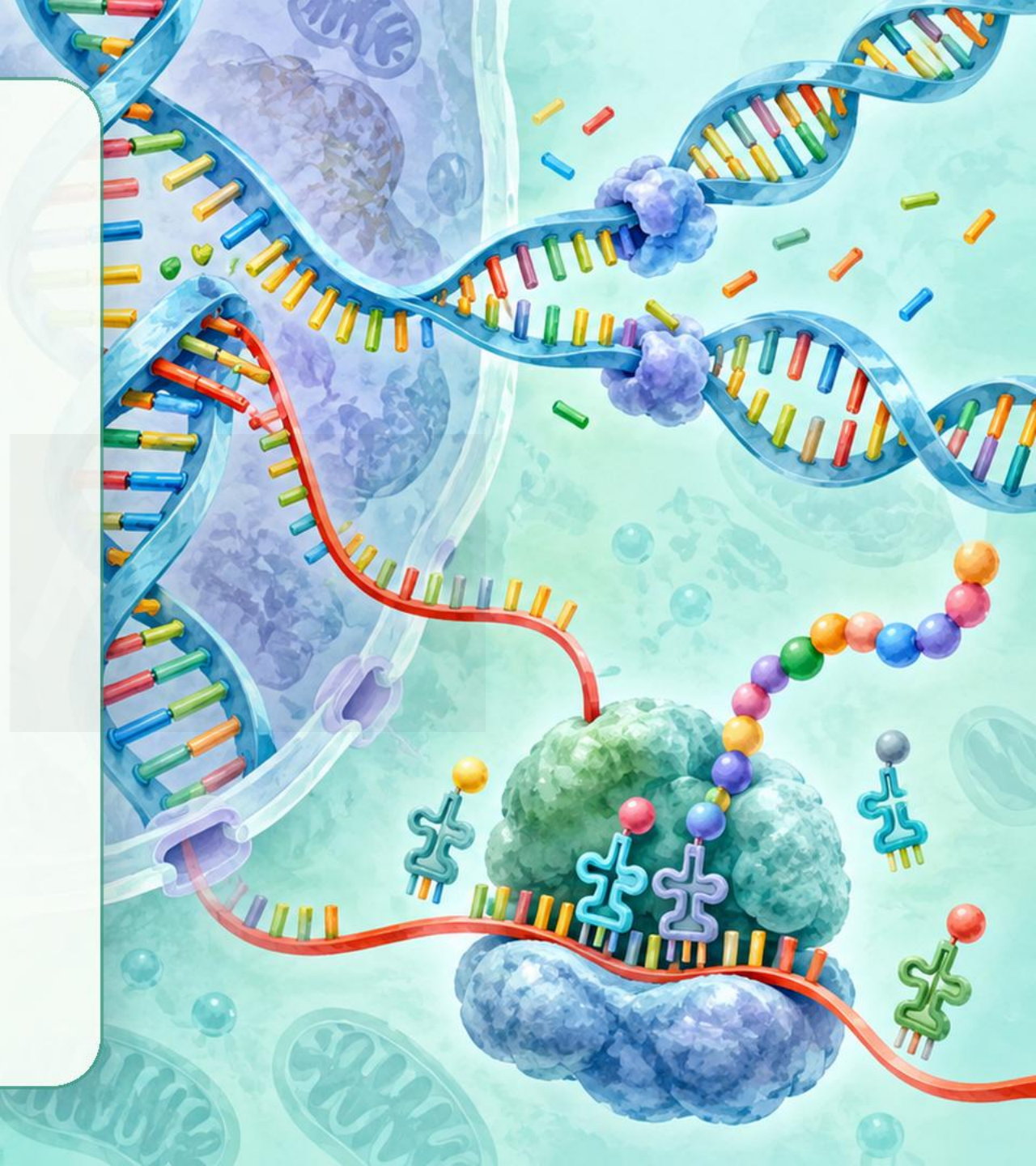
BIOLOGY • CLASS 12

5

CHAPTER

Molecular Basis of Inheritance

NCERT SOLUTIONS



EXERCISE SOLUTIONS: QUESTIONS 1-2

1. Group the following as nitrogenous bases and nucleosides: Adenine, Cytidine, Thymine, Guanosine, Uracil and Cytosine.

Answer:

Nitrogenous bases:

Adenine, Thymine, Uracil, Cytosine.

Nucleosides:

Cytidine, Guanosine.

A nucleoside contains a nitrogenous base joined to a pentose sugar; it has no phosphate group.

2. If double-stranded DNA has 20% cytosine, calculate the percentage of adenine.

Answer:

By Chargaff's rule, cytosine equals guanine and adenine equals thymine.

$$C = G = 20\%$$

$$A + T = 100\% - (20\% + 20\%) = 60\%$$

$$A = T = 60\% \div 2 = 30\%$$

Answer: Adenine = 30%

EXERCISE SOLUTION: QUESTION 3

3. One DNA strand is given below. Write its complementary strand in the 5' → 3' direction.

5' – ATGC ATGC ATGC ATGC ATGC ATGC ATGC – 3'

Spaces only group the bases for easy reading.

Answer:

Base pairing is complementary: adenine pairs with thymine, and guanine pairs with cytosine.

$A \leftrightarrow T$; $G \leftrightarrow C$

First write the complementary strand antiparallel to the given strand:

5' – ATGC ATGC ATGC ATGC ATGC ATGC ATGC – 3'

3' – TACG TACG TACG TACG TACG TACG TACG – 5'

Now read the complementary strand from its 5' end to its 3' end:

5' – GCAT GCAT GCAT GCAT GCAT GCAT GCAT – 3'

EXERCISE SOLUTION: QUESTION 4

4. The coding strand of a transcription unit is given below. Write the sequence of mRNA.

5'-ATGC ATGC ATGC ATGC ATGC ATGC ATGC-3'

Answer: The mRNA sequence matches the coding strand, except that uracil replaces thymine. The coding strand is not the template strand.

Coding DNA: 5'-ATGC ATGC ATGC ATGC ATGC ATGC ATGC-3'

Template DNA: 3'-TACG TACG TACG TACG TACG TACG TACG-5'

mRNA: 5'-AUGC AUGC AUGC AUGC AUGC AUGC AUGC-3'

RNA polymerase reads the template strand and forms complementary RNA.

Template read: 3' → 5'; RNA synthesis: 5' → 3'.

Spaces only separate four-base groups for readability; each sequence has the same length.

EXERCISE SOLUTION: QUESTION 5

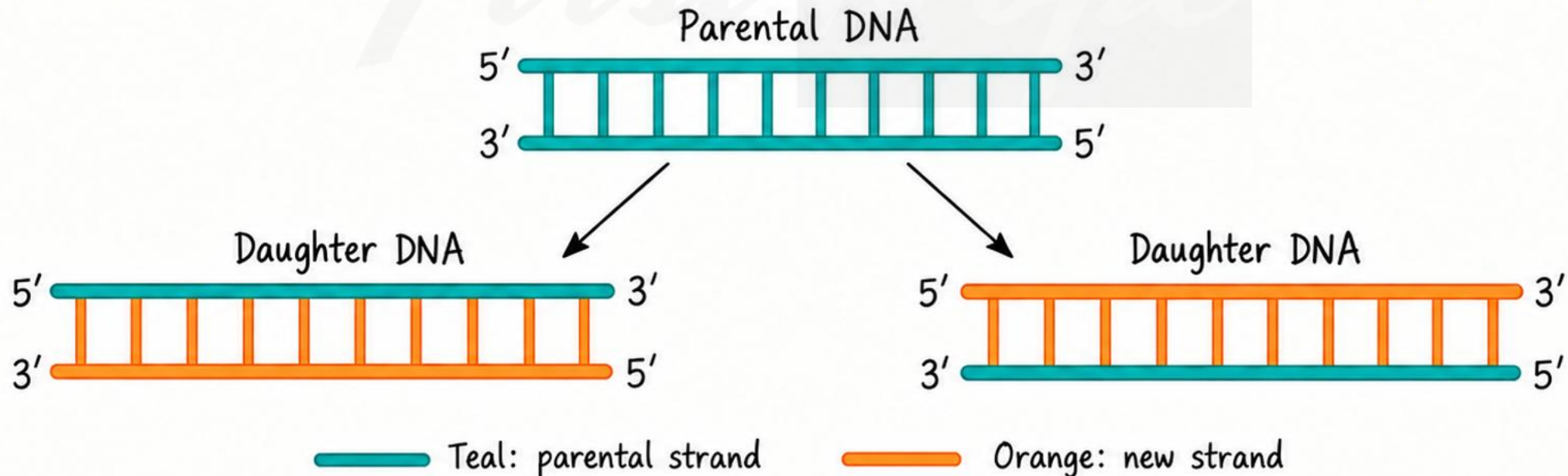
5. Which property of the DNA double helix led Watson and Crick to suggest semiconservative replication? Explain.

Answer:

Complementary base pairing between the two strands suggested a copying mechanism.

A pairs with T; G pairs with C.

- The two parental strands separate.
- Each parental strand acts as a template for a new complementary strand.
- Each daughter DNA molecule therefore contains one parental strand and one newly made strand.



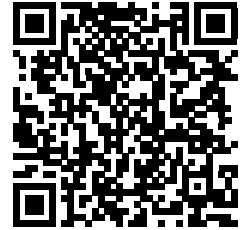


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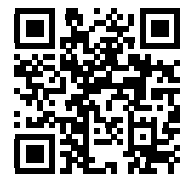


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