Class

Date

Name

12.2 The Structure of DNA

Lesson Objectives

- [] Identify the chemical components of DNA.
- Discuss the experiments leading to the identification of DNA as the molecule that carries the genetic code.
- Describe the steps leading to the development of the double-helix model of DNA.

Lesson Summary

The Components of DNA DNA is a nucleic acid made up of nucleotides joined into long strands or chains by covalent bonds. Nucleotides may be joined in any order.

- A DNA nucleotide is a unit made of a nitrogenous base, a 5-carbon sugar called deoxyribose, and a phosphate group.
- DNA has four kinds of nitrogenous bases: adenine, guanine, cytosine, and thymine.

Solving the Structure of DNA

- Erwin Chargaff showed that the percentages of adenine and thymine are almost always equal in DNA. The percentages of guanine and cytosine are also almost equal.
- Rosalind Franklin's X-ray diffraction studies revealed the double-helix structure of DNA.
- James Watson and Francis Crick built a model that explained the structure of DNA.

The Double-Helix Model The double-helix model explains Chargaff's rule of base pairing and how the two strands of DNA are held together. The model showed the following:

- ▶ The two strands in the double helix run in opposite directions, with the nitrogenous bases in the center.
- ▶ Each strand carries a sequence of nucleotides, arranged almost like the letters in a fourletter alphabet for recording genetic information.
- ▶ Hydrogen bonds hold the strands together. The bonds are easily broken allowing DNA strands to separate.
- Hydrogen bonds form only between certain base pairs-adenine with thymine, and cytosine with guanine. This is called base pairing.
- For Questions 1–5, complete each statement by writing in the correct word or words.
 - 1. The building blocks of DNA are <u>NUCLCONDES</u>

dcoxyribose 2. Nucleotides in DNA are made of three basic components: a sugar called phosphate gnalp___, and a nitrogenous base

- DNA contains four kinds of nitrogenous bases: adenine 3. (VIDSINC, and thyminc.
- 4. In DNA. INCLEON de Scan be joined in any order.
- 5. The nucleotides in DNA are joined by \underline{CNA}
- The nucleotides in DNA are joined by <u>COVALENT</u> bonds. SUGAr/phosphate Hydrogen bonds form between base pairs. = share electrons Weak attraction between pular molecules

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Solving the Structure of DNA

6. Complete the table to describe each scientist's contribution to solving the structure of DNA.

Scientist	Contribution
Erwin Chargaff	% of A=T & % 6=C
Rosalind Franklin	X-ray diffraction revealed double h
James Watson and Francis Crick	built model that explained DNA struct

7. Complete the table by estimating the percentages of each based on Chargaff's rules.

DNA sample	Percent of adenine	Percent of thymine	Percent of guanine	Percent of cytosine
1	31.5	31.5	18.5	18.5
2	30	30	20	20
3	33	33	17	17

The Double-Helix Model

For Questions 8–13, on the lines provided, label the parts of the DNA molecule that correspond to the numbers in the diagram.

A=T G=Cnucleotid nitrogenous base) hydrogen bond (or Chine 8. 10. (S-carbon sugar T $\langle G \rangle$ dcoxyribósa 11, a phosphate group 12. base pair -13.