AP BIOLOGY · UNIT 1 · TOPIC 1.6

Nucleic Acids

Learning objective 1.6.A Describe the structure and function of DNA and RNA.

Name: Date: Period:

Use the tool **Ends and Pairs**. On the **Build a strand** tab you drag a phosphate, a sugar and a base together to make a nucleotide. Do Parts 1 and 2 there, then switch to **Pair and separate** for Parts 3 and 4.

Part 1 · Build a nucleotide

Press **Add one of each part**, then drag the three parts together until they snap into one nucleotide. Do it twice more, then press **Assemble a 6-nucleotide strand** and study what you get.

Question	What the tool shows
The three parts of a nucleotide	
The sugar in DNA	
The sugar in RNA	
The base DNA has that RNA does not	
The base RNA has that DNA does not	

Part 2 · The two ends

Look at the assembled strand. The tool labels one end 5′ and the other 3′.

1. Describe the structural features of the 5′ end and the 3′ end of a single nucleotide chain.

2. (a) Explain why the sugar-phosphate backbone of a strand carries no genetic information.

(b) Identify where the genetic information in a strand is stored.

Part 3 · Pair the strand

On the Build a strand tab, make sure DNA is selected. Then switch to **Pair and separate**. Press bases to write this template strand, then read the counts off the tool.

Template strand (5′ to 3′)	Complementary strand (3′ to 5′)	A–T pairs	G–C pairs	Hydrogen bonds
T A C G G A T C C A				

3. Using the numbers of A–T pairs and G–C pairs, calculate the total number of hydrogen bonds between the two strands. Show your work.

Part 4 · Break the hydrogen bonds

Press **Add a chemical that disrupts hydrogen bonds** and watch carefully. Then answer these in complete sentences.

4. Explain how the addition of a chemical that disrupts hydrogen bonds alters the structure of DNA.

5. (a) Identify the part of the DNA structure that the chemical does not change.

(b) Explain why the part identified in part (a) is not affected by the chemical.

6. Two DNA samples are the same length. One is rich in G–C pairs, and the other is rich in A–T pairs. Predict which sample requires more energy to separate into single strands. Justify your prediction.

What the model simplifies

The strand is drawn flat and straight. Real DNA is a twisted double helix, and its two strands run antiparallel (one 5′ to 3′ and the other 3′ to 5′), which is why the tool labels the ends in opposite directions.

Parts are drawn as colored shapes rather than real structures. The five-carbon sugar, the phosphate and each of the bases have distinct molecular structures the tool does not attempt to draw.

On the bench a nucleotide assembles as soon as its three parts are close enough, and nucleotides link on contact. In a cell both steps require enzymes and energy.