

## DNA Structure

### Purpose

To model the structure of a DNA molecule and to demonstrate the variety that can be generated using only four bases.

### Concepts

- Probability
- Monomers vs. polymers
- Chargaff's rules

### Background

Recall that early in the search for the genetic material, scientists did not believe that DNA was complex enough to account for the diversity of living things. In this activity you will discover that four base pairs are indeed enough to provide for all of the combinations necessary to spell out a living organism!

### Materials

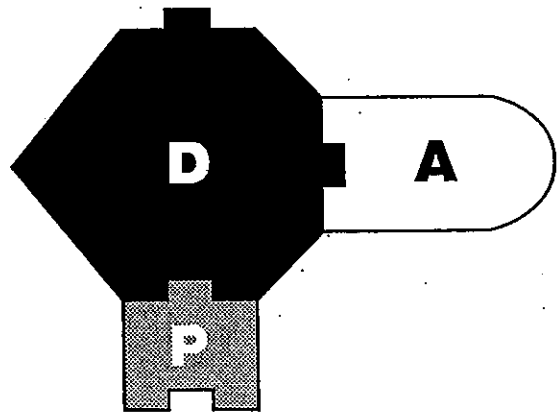
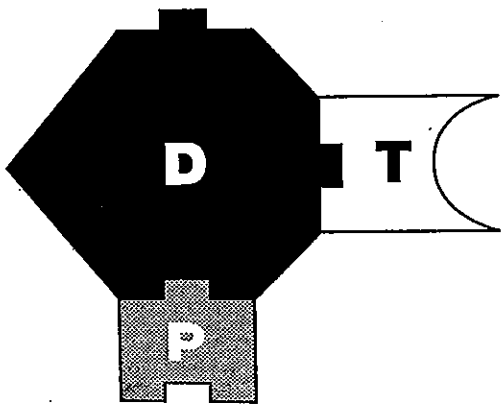
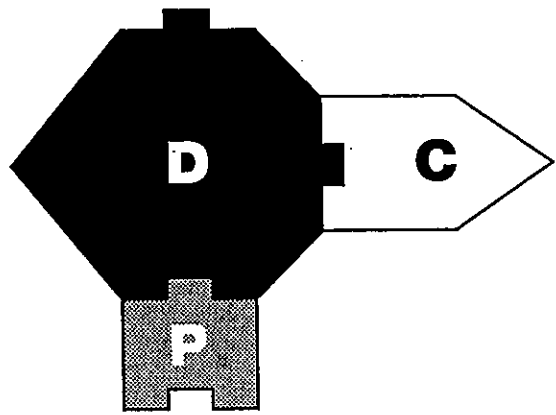
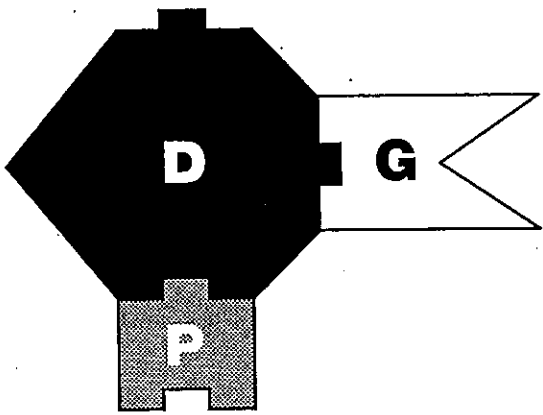
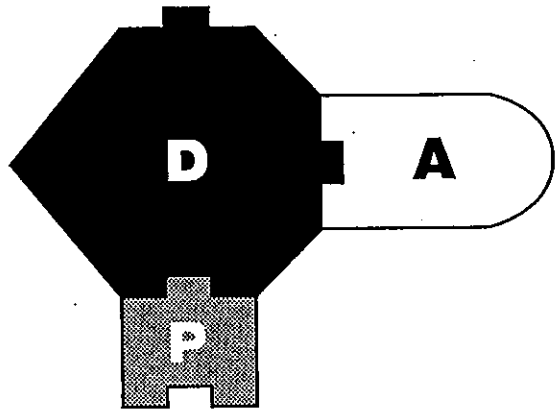
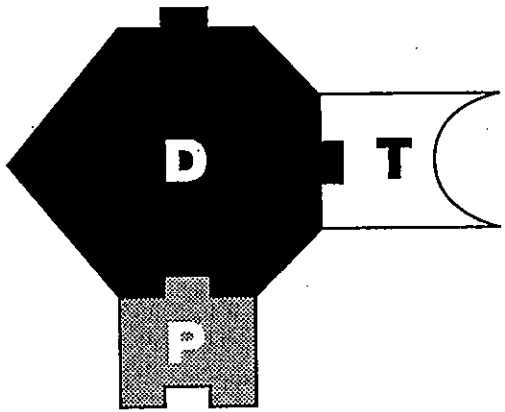
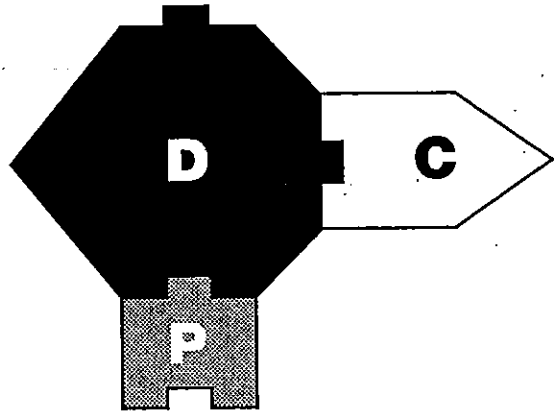
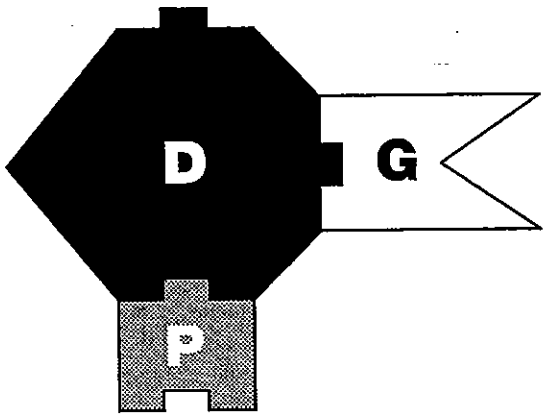
Nucleotide pieces  
Scissors

### Safety

Be careful when cutting with scissors.

### Procedure

1. Choose six of the nucleotides, making certain that you have at least one A, T, C, and G. Place the six nucleotides face down on your table and mix them up. Now turn over one nucleotide. This will be the first part of the left strand of DNA. Randomly turn over the other nucleotides, one by one, and put each in place in the strand.
2. Compare your left strand with your partner's. Is the order of nucleotides the same in your partner's strand as in yours?
3. Following base-pairing rules, each partner should find the correct piece that matches with the first nucleotide and fit it in. What do you have to do to the piece to get it to fit? Continue fitting the matching pieces to make a right strand of DNA.
4. Record the data and observations on the DNA Structure Worksheet. Answer the Analysis and Conclusions questions on the worksheet.



Name: \_\_\_\_\_

## DNA Structure Worksheet

### Data and Observations

Left Side

Right Side

Partner's Left Side

Right Side

### Analysis and Conclusions

1. Name the molecules that alternate to form the "sides of the ladder":
2. What nitrogen bases are attached to which part of the nucleotide?
3. What part of the nucleotide forms the half rungs of the ladder?
4. What do you need to do to get the right pieces to fit with the left?
5. Does the order of your six nucleotides compare with anyone else's at your table?
6. What is the possible number of combinations of six nucleotides? What is the mathematical equation for this problem?
7. How many possible combinations of 12 nucleotides are there?
8. How many possible combinations of 24 nucleotides are there?
9. If there were five guanines in a strand of 24, how many *cytosines* would there be? How many *adenines* would there be?
10. What is the name of the scientist who determined this rule?