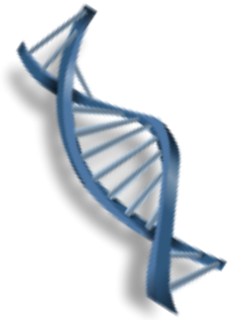
Name _____ Date _____ Period _____

Have Your DNA And Eat It Too!



Background Information: When isolated from a cell and stretched out, DNA looks like a twisted ladder. This shaped is referred to as a "double helix." The sides of the DNA ladder are called the backbone and are made up of sugars (deoxyribose) and phosphates. The rungs, or steps, of the ladder attach to the sugars and are made up of paired nitrogen bases. There are four nitrogen bases found in DNA: Adenine (A), Cytosine (C), Guanine (G), and Thymine (T). These four nitrogen bases pair up in very specific ways:

- ***Adenine always pairs with Thymine***
- ***Cytosine always pairs with Guanine***

Purpose: Your task is to use the following materials and procedure in order to construct an edible model of DNA. When you are finished, you will make a key for your molecule of DNA which will be checked by your teacher for a small lab grade.

You will need:

2 pieces of licorice

Small licorice peels

10 toothpicks

An assortment of marshmallows in four different colors

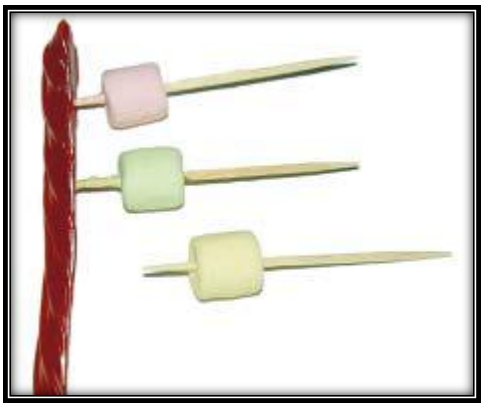
Procedure:

Step One: Construct a key. Using the box below, develop a key for your DNA molecule. You will need to include a key for each of the nitrogen bases, sugar/phosphate backbone, and hydrogen bonds.

A –
T –
C –
G –
Sugar/ Phosphate Backbone –
Hydrogen Bonds –

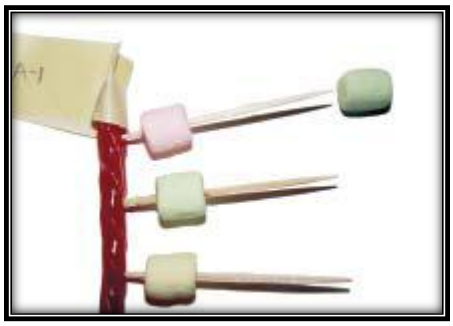
Step Two: Determine the sequence. Construct a sequence for one strand of your DNA double helix. Your strand should consist of TEN nitrogen bases.

DNA Sequence: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____



Step Three: Assemble one side of your DNA molecule. A piece of licorice will form the phosphates of the backbone, the licorice peels will represent deoxyribose, and marshmallows will be the chemical bases. Toothpicks will represent the hydrogen bonds which hold together nitrogen base pairs.

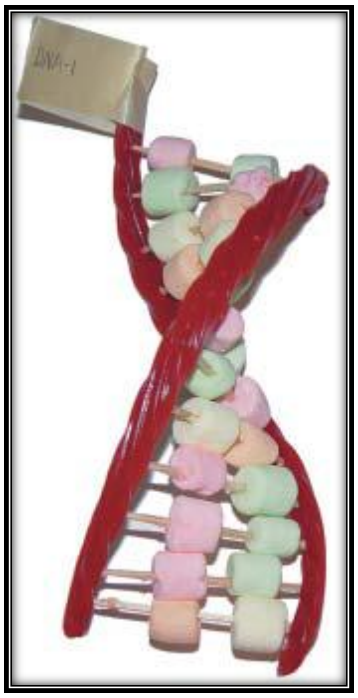
Using your selected sequence as a guide, place a marshmallow on the end of a toothpick so that the toothpick goes all the way through. Anchor the toothpick into the backbone by attaching it to a deoxyribose sugar.



Step Four: Match the chemical base pairs. Using your key and sequence as guides, place the complementary marshmallow on the other end of each toothpick. Remember that A always pairs with T and C always pairs with G! Write both sequences on the lines below.

Original Sequence: _____

Complementary Sequence: _____



Step Five: Complete the DNA molecule. Attach the other backbone (sugars and phosphates) so your model looks like a ladder.

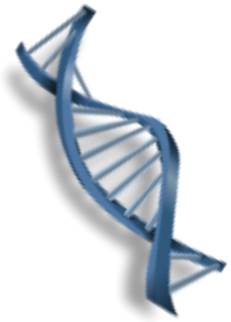
Step 6: Twist your DNA molecule. Carefully twist your DNA model so that it looks like a double helix.

Step 7: Explain your molecule. Have your DNA double helix, key, and DNA sequences checked by your teacher.

Teacher's Initials: _____

Name _____ Date _____ Period _____

Doubling DNA!



Background Information: Your body is constantly producing new cells in order for you to be able to grow, heal injuries, etc. In order to ensure that each new cell receives the full set of genetic information, DNA must first be copied. DNA is replicated during the S (Synthesis) stage of Interphase. It is a simple process involving the unwinding of the double helix and the adding of complementary nitrogen bases. This is accomplished through the use of two enzymes:

- ***DNA Helicase unwinds and unzips***
- ***DNA Polymerase adds appropriate nucleotides***

Purpose: Your task is to use your edible DNA model in order to illustrate the process of DNA replication. When you are finished, your replicated DNA molecules will be checked by your teacher for a small lab grade.

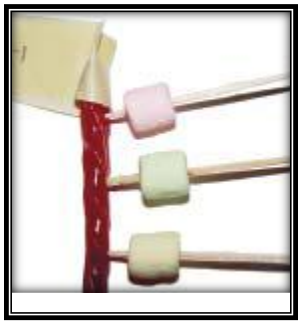
You will need:

Edible model of DNA

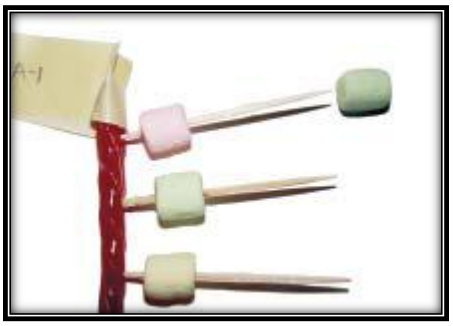
Scissors

A variety of colored marshmallows

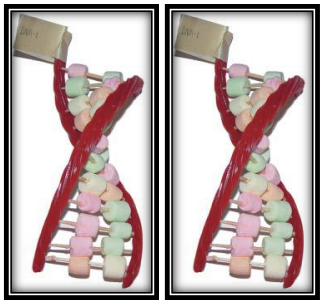
Procedure:



Step One: Unwind and Unzip. In order for DNA to replicate, it must first unwind. Unwind your DNA molecule and then use your scissors to perform the job of the enzyme DNA Helicase.



Step Two: Add complementary nucleotides. Each original strand of DNA will serve as a template. Give one parental strand to your partner and keep one for yourself. You will act as the enzyme DNA polymerase by adding the complementary bases and a new backbone to your separated strands of DNA.



Step Two: Semiconservative model. Use a toothpick and a piece of tape to label the "original strand" and "new strand" on your duplicated DNA molecules. Recoil your DNA and then you and your partner should have your duplicated DNA molecules checked by your teacher. Remember, they should be identical to one another.

Teacher's Initials: _____

Lab Analysis Questions:

1. Why is **DNA** such a critical component of all living things?

2. DNA is an example of which biological **macromolecule**?

3. Describe the ***structure*** of your DNA model using the following words: double helix, deoxyribose, phosphate, adenine, thymine, cytosine, guanine.

4. Where in the cell does DNA replication take place?

5. Explain what is meant by the ***Semiconservative Model*** of DNA replication.

6. Which enzyme did the **scissors** represent when you cut apart your DNA molecule?

7. Which enzyme did **you** represent as you placed on the appropriate complementary nucleotides during the replication of your DNA molecule?

8. What is an *enzyme*?

9. Identify the purpose of the enzymes **DNA Helicase** and **DNA Polymerase** in DNA replication.

   DNA Helicase –

   DNA Polymerase –

10. Give the ***complementary sequence*** to the following DNA strand:

    C G A T T A G C C T A G C A T