

Name: _____ Hour: _____ Date: _____

Have Your DNA & Eat It Too!

5.2.1: Develop and/or use a model(s) to justify a phenomena.

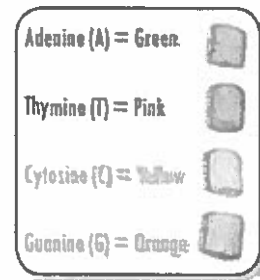
5.2.2: Given resources, develop and/or revise model(s) to show the relationships among processes, systems, etc.

Directions: In this assignment, you will be building a model of DNA out of candy.

Before you start:

Remember which bases pair with each other:

A with _____, C with _____



Supplies: You will need:

- 1 small bag of marshmallows
- 2 red licorice pieces
- 2 black licorice pieces
- 10 toothpicks

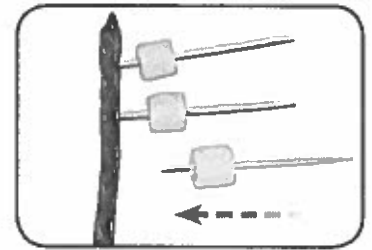


Figure 1

Do not eat the candy or destroy it! We don't have extra.

Make sure your candy all remains on your paper (not your desk) if you intend to eat it afterwards.

Instructions: Part One – Building Your Model

1. Take one piece of red licorice and 10 of the marshmallows. Arrange them in whatever order you like from top to bottom. Try to space the marshmallows evenly.
2. Take a toothpick and stick it all the way through the side of one marshmallow, into the licorice near the top. (*see fig. 1*)
3. Repeat until you have 10 “rungs” with marshmallows on them.
4. On the other end of the toothpick, stick the complementary color marshmallow (look at your key and remember which bases pair up!) Place it close to the first marshmallow so that the toothpick is sticking out the end. (*see fig. 2*)
5. Once all marshmallows are attached, attach the second piece of red licorice to the toothpick ends. (*see fig. 2*)
6. Gently twist your DNA counter-clockwise from the top until it has the correct shape. (*see fig. 3*)

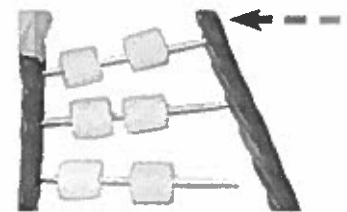


Figure 2

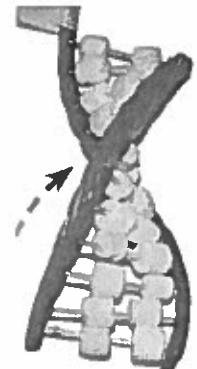


Figure 3

STOP!!!! Have your teacher check your model and initial here: _____

After building: (Use your notes on DNA structure to answer these questions!)

1. DNA's structure is often compared to a ladder. Looking at your model, what are two ways it is similar?

2. What is one way it is different?

3. What do the toothpicks represent? _____

4. What do the marshmallows represent? _____

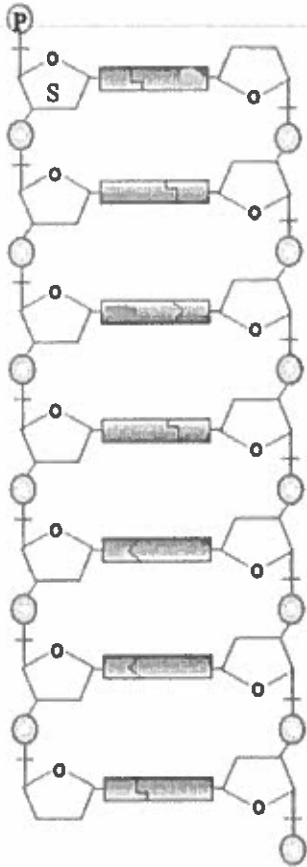
5. What does the licorice represent? The _____, made of _____ & _____

6. What is a limitation of this model? (besides the fact that it is made of candy!) What would be a more accurate way to show DNA's structure?

7. What is the term for matching bases or strands? _____

8. A marshmallow and the section of licorice it is attached to would be called a _____

Use this diagram of the untwisted DNA molecule to do the following:



9. Label each sugar group on the diagram with a letter S. (The first one is done for you).

10. Label each phosphate with a letter P. (The first one is done for you).

11. Label the nitrogenous bases to match the sequence you have on your model. (Write the base letters on the grey boxes.)

12. Circle one nucleotide. What 3 things make up one nucleotide?

a. _____

b. _____

c. _____

13. The sides of the DNA ladder are made up of alternating _____ and _____ groups.

14. The base pairs are held together by _____. (in my model this is represented by: _____).

15. In our cells, the DNA is twisted into a shape called a _____.

Instructions – Part Two: Replication

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 nitrogenous bases. This is accomplished through the use of two enzymes: DNA helicase, which unwinds and “unzips” the DNA, and DNA polymerase, which adds the appropriate nucleotides.

The process of replication is referred to as *semiconservative*, because each of the original strands serves as a template, or pattern, for a new strand. This means that each DNA molecule contains one original and one “new” strand.

Now, you will be modeling this process using your candy DNA.

1. Before you begin, write down the sequence of your left and right strands, starting from the top:

Left Bases:	Right Bases:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

2. Now, you must perform the first step of DNA replication. What is the first thing that must be done to the “twisted ladder” before it can be cut? _____
3. Now, you will “unzip” the helix. Use a pair of scissors to cut the toothpicks, between every base pair.
4. You just modeled the role of an enzyme. Which enzyme? _____
5. Now, you and your partner will each take half of the original model (each of you will take one of the red pieces of licorice with the attached bases). How many bases are on each licorice strand? _____
6. Now, you will use the “old” (red) strand as the template for a new strand of DNA. Each of you will attach new complementary bases to the toothpicks. What enzyme are you modeling now? _____
7. Finally, attach the new backbone to each strand by each placing one black licorice strand on the ends of the toothpicks. (you may have to slide the marshmallows around a little to make room on the toothpick half)

8. Write the DNA sequence you each see now:

Partner 1:		Partner 2:	
(original/red strand)	(new/black strand)	(original/red strand)	(new/black strand)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

STOP! Show your teacher your new model and get initials here: _____

Analysis & Conclusion

1. What do you notice about the sequences of these two DNA molecules? (compare them to each other, and to the original)

2. If you made a new model with seven Adenines in it, how many Thymines would it have? _____ If you made a new model with three Guanines in it, how many Cytosines would it have? _____

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

5. Where in the cell does DNA replication take place? _____

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

7. Give the complementary sequence to the following DNA strand: C G A T T A G C C T A G C A T