New Paltz High School **Name**:……..……..……**Due Date**:…....
Science Department

Lab Title:…*Candy DNA*……**Lab #..….**

Lab Partners:……

Your Lab Score will be based on the following:

Neatness: All labs must be **well-written and done in pencil** unless directed otherwise. There are to be no cross-outs or misspelled words. Questions should be answered in complete sentences.

Accuracy: Certain **questions will be checked** for accuracy.

Completeness: All questions are to be answered completely. There are to be **NO BLANKS** or incomplete sections.

Lab Class Procedure: You are to **follow directions** and use lab equipment properly, work for the entire period, and follow proper clean-up procedures

Rubric:

Lab Score Category	Points Earned
Neatness	0 1
Accuracy	0 1 2 3 4
Completeness	0 1 2 3
Lab Class Procedure	0 1 2
Total Lab Score	0 1 2 3 4 5 6 7 8 9 10

You are to submit all lab material with this lab report:

Comments:

Mr. Ulrich
Reproduction and Development 10R

CANDY DNA AND REPLICATION LAB

Objective: Students will show how the basic structure of DNA is important in the process of DNA replication

Materials: Twizzlers chunks (red and black) - 24 piece each color
Dots (4 different colors) - 6 of each color
wooden toothpicks– about 70

Note: Be sure that working surfaces and hands have been cleaned before starting this activity, if you intend to consume your models after finishing (and I know that's your intention).

Pre lab:
Of course, you remember learning about the nucleus in middle school – how it is the "control center of the cell." Though that isn't implicitly incorrect, it skips over a lot of important stuff as to how it actually influences cellular activity. Now that you have such sophisticated high school brains, you should be ready for more complexity. The nucleus stores DNA. That's it. Does DNA then control the cell? Indirectly. **The function of DNA is to store the directions for protein construction.** It does NOT tell the cell where to go, what to let in and out of the cell, or even if something is food or not. It "codes for" proteins. It is the array of different proteins that allow the cell to "know" where to go, what to let in or out and what is food. Proteins are the key to metabolism. They're driving the bus.

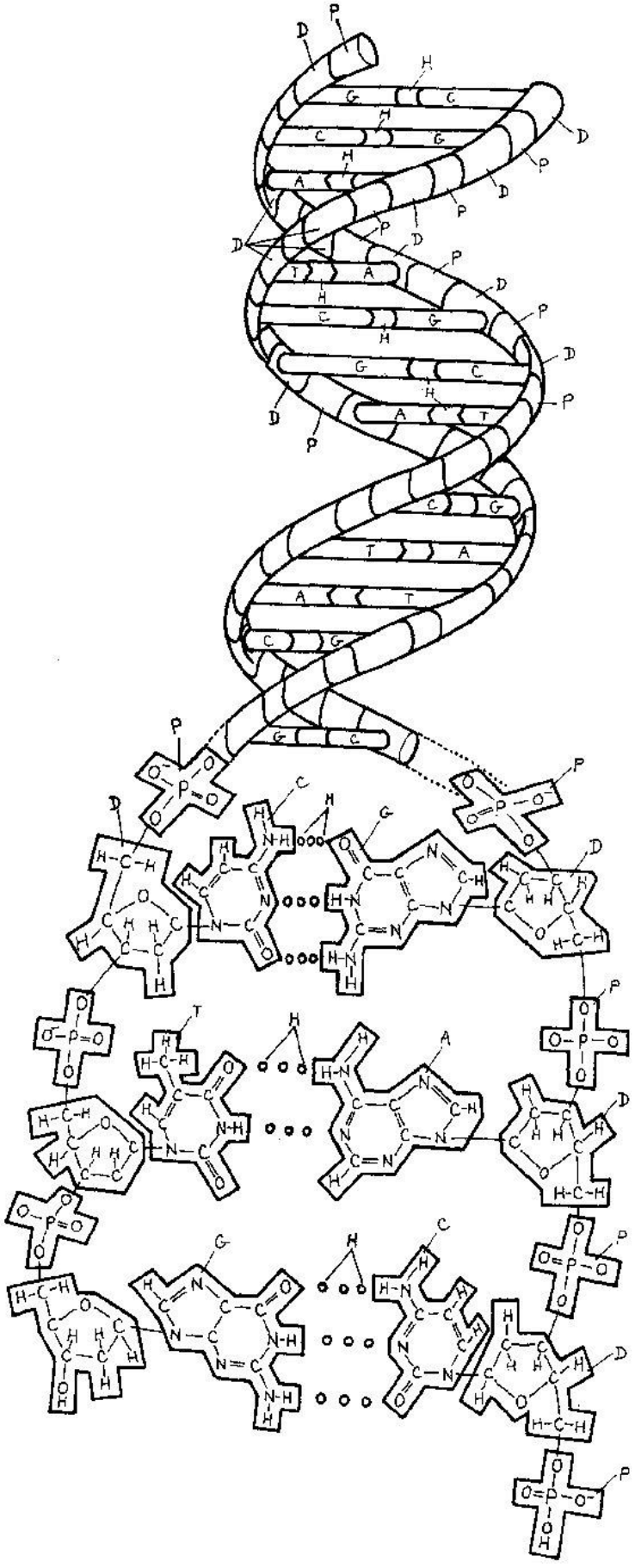
How does DNA "code for" a protein? DNA is a polymer of nucleotides. Each nucleotide is made of a deoxyribose sugar, a phosphate and a nitrogenous base. There are four different nitrogenous bases in DNA, each often referred to by their first letter: adenine (A), thymine (T), guanine (G), and cytosine (C). That means each nucleotide is either an A, T, G or C. When these nucleotides are bonded together in a chain, the bases form a sequence. But there's more to DNA than a single string of bases. DNA forms parallel chains of nucleotides hydrogen bonded together at the bases. But the bonding is not random. Only complimentary bases can bond to hold the two DNA strands to one another. **The complimentary bases are A to T and G to C.** This specificity allows the code to stay the same when a copy is made. Take time to color in the diagram in figure 1. Assign a different color for each subunit. Circle an individual nucleotide and label it as well.

Much like the order of letters make up words which we can decode into concepts, the order of bases is decoded by ribosomes in the cell to synthesis particular proteins. **Sections of DNA that code for particular proteins are called genes.** We will discuss protein synthesis later.

Color in the parts of DNA. Be sure to circle and label a nucleotide as well

Key

DEOXYRIBOSE$_D$
PHOSPHATE$_P$
ADENINE$_A$
THYMINE$_T$
CYTOSINE$_C$
GUANINE$_G$
HYDROGEN BOND$_H$



Procedure:

1. Get a pack of candy from Mr. U. Clear off a spot on a lab table. You may want to set up your DNA on some paper towels

2. Assign one nitrogen base to each of the four colors of Dot candy.
   Adenine =_____
   Thymine =_____
   Cytosine =_____
   Guanine =_____

3. What do the black Twizzlers represent?_____

4. What do the red Twizzlers represent?_____

5. What structure is formed from a red Twizzler, a black Twizzler and a Dot?
   _____

6. Prepare six individual nucleotides: use toothpicks to connect one black to one red Twizzler piece. Then add one Dot perpendicularly to the black candy.

7. Have at least one person in your lab group take a picture of one your nucleotides. Print a picture and label the bases, phosphate group, and deoxyribose, If your picture is printed in black and white, indicate the colors of each subunit. Include the picture with your finished lab.

8. Assemble nucleotides into a *poly*nucleotide strand by connecting the red piece of one nucleotide to the black of another. Continue until a strand of six nucleotides has been constructed. You may want to use the diagram we went over last class as a guide.

9. Which combinations of two bases form the complimentary base pair "rungs" of DNA?
   _____

10. Assemble a strand that is complementary to the strand that you have already built. Place the second strand next to the first so that the complimentary "bases" touch.

11. Write the order of base pairs in your polynucleotide here:

12. Have at least one person in your lab group take a picture of your completed strand of DNA. Print a picture and label the bases, phosphate group, deoxyribose, covalent bond and hydrogen bond. If your picture is printed in black and white, indicate the colors of each subunit. Include the picture with your finished lab. It would be best if you could fit both pictures on one page.

13. Show Mr. Ulrich your DNA model. Politely ask him to initial your lab paper here.

You are now ready to REPLICATE!!!!

14. To demonstrate replication, first make 12 more nucleotides with the same nitrogen bases as the first two strands.

15. "Unzip" the DNA double strand one "rung" at a time. Don't unzip the whole strand at once. Assemble the proper nucleotides, one by one according to the bases that are now "available" after being unzipped.

16. Continue unzipping and adding the proper nucleotides until you have two complete strands.

17. Record the base pair sequence of the resulting strands here:

18. Do they bases match that of the parent strand sequence in the parent strand (question 9)?

19. Once you have finished replicating, politely ask Mr. Ulrich to initial here _____.

20. After you demonstrate this to Mr. Ulrich, you may dispose of your models. This is one case where you may eat your science project, if you have kept everything clean **and Mr. Ulrich gives permission**. *Be sure to remove toothpicks before you eat!!!* Clean up, being sure that no toothpicks or sticky residue is left behind. Wash your hands!

Conclusion Questions:

1. What is the function of DNA?

2. Why is it so important that the order of base pairs stays the same?

3. What would happen if there was a change in the base pair sequence?

4. What special proteins make the process of DNA replication possible?

You may have to hunt for these next two. Check your text

5. What do the toothpicks represent? Why don't we put toothpicks between the complimentary bases?

6. At which stage of cell division (mitosis) does replication take place?