Strawberry DNA Extraction

**Background:** Cells are the basic unit of life and make up all plants, animals, and bacteria. DNA is the molecule that controls everything that happens in the cell. DNA contains instructions that direct the activities of cells and, ultimately, the body. This DNA is organized into chromosomes located in the nuclei of all plant and animal cells. Strawberries have **eight** copies of each chromosome whereas humans have only **two** copies. As a result, strawberries contain a large amount of DNA that can easily be isolated and viewed with the naked eye.

<https://letstalkscience.ca/educational-resources/backgrounders/dna-extraction>

**Objective:** To show that DNA can be isolated from strawberries and see a large sample of DNA.

**MATERIALS:**

Please ensure that everything is cleaned and returned to appropriate bins. The ethanol and soap-salt solution is in an ice bath to keep the materials cold.

* One frozen strawberry, 1 ziploc bag, 1 coffee filter; 20 mL of cold extraction (soap-salt) solution in graduated cylinder; 1-25 mL & 1- 250 mL beaker; 1 paper clip uncoiled into a hook,   
  1 piece of paper towel
* ICE cold ethanol in in small graduated cylinder (5-10 mL)

**Prelab Questions:**

1. **Why are the liquids used in this lab ice-cold?** The cold \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the DNA and RNA to smaller pieces.  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **What is the purpose of the salt in the extraction solution?** Salt in the solution helps the DNA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_by attracting the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DNA.
3. **What is the purpose of the soap in the extraction solution? Detergent** cleans dishes by removing \_\_\_\_\_\_\_. It acts the same way in the **DNA extraction** by pulling apart the \_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_\_\_\_ that make up the membranes surrounding the cell and nucleus. Once these membranes are \_\_\_\_\_\_\_\_\_\_\_\_ apart, the \_\_\_\_\_\_ is released.

**PROCEDURE:**

\*Reminder: Do not eat the strawberries or anything else in this lab. **Ethanol is poisonous!**

1. **Wear safety googles.**
2. Put the frozen strawberry into the ziploc bag. Remove air from the bag, seal and then gently “crush” strawberry for 2- 5 min. Make sure the strawberry is completely broken down.
3. Measure out 20 mL of soap-salt solution into graduated cylinder and **carefully** pour into Ziploc bag with the crushed strawberry contents. Seal and mix together gently for 1 min. Avoid bubbles.
4. Let the bag sit for 5 minutes at room temperature.
5. Place the coffee filter over large beaker like a funnel in a cup. Hold onto the filter so it does not fall into beaker while carefully pouring the contents of the Ziploc bag into the filter. Allow the filtered juices to empty into the breaker. You may gently squeeze the filter to help the juice filter through but be careful not to puncture the filter. Put used filter in the compost and emptied Ziploc into the garbage can.
6. Pour some of the filtered juice into the 25 mL beaker so that the beaker is full. There will be some juice left over in the large beaker.
7. Transfer enough cold ethanol into a small, graduated cylinder to fill the small beaker to  
    full (5-10 mL). Extra ethanol can be poured back into the ethanol beaker.
8. Carefully pour the ethanol down the side of the 25 mL beaker without mixing the juice. Do this by tilting the beaker slightly while pouring. Let beaker rest on desk surface.
9. Observe DNA beginning to collect in the interface layer between the alcohol and strawberry solution. (give 1-2 min)
10. Using the paper clip, form a hook and try to fish the DNA out and onto a paper towel. Record your observations of the DNA:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Clean up all the equipment you have used. Pour the strawberry solution from both beakers into the strawberry waste beaker and rinse the beakers into the sink.
12. Return equipment to appropriate bins.
13. Wash your hands in washroom. Then complete lab analysis and conclusion.

**Analysis:**

1. Why do you think it was necessary to crush the strawberries? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What step was required to finally make the DNA visible?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Describe the appearance of the DNA. Is this what you expected? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Do you think the DNA from another organism might have a different appearance? Why or why not?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **/2**

**DNA MODEL FOLLOW UP QUESTIONS:**

1. The structure of DNA is actually in a DOUBLE HELIX arrangement.



DOUBLE HELIX means that the two long chains of nucleotides are arranged in a spiral like a twisted ladder.

The sides (or "uprights") of the ladder are made up of alternating \_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_ molecules. The steps (or "rungs") of the ladder are made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bases that are connected by hydrogen bonds.

1. A nucleotide consists of one \_\_\_\_\_\_\_\_\_\_\_\_\_ molecule bonded to a sugar molecule which is bonded to one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_base.
2. A real DNA molecule consists of THOUSANDS of paired nucleotides. What is the pairing arrangement of the nitrogen bases?

\_\_\_\_\_\_\_\_\_\_\_\_\_ pairs with \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_ pairs with \_\_\_\_\_\_\_\_\_\_\_\_

1. Are there always going to be an EQUAL number of adenine and thymine nucleotides in a molecule? Why?
2. Are there always going to be an EQUAL number of guanine and cytosine molecules in a molecule of DNA? Why?
3. Scientists abbreviate the nitrogen bases by using the first letter of each base. So,  
   A always binds to \_\_\_\_  
   G always binds to \_\_\_\_
4. In the space below, complete the other strand of DNA for the provided sequence of bases.

Sequence: T A C G T A T G A A A C

/3

1. A **single gene** codes for a **single protein**. A gene typically contains hundreds to thousands of base pairs. The gene code is read in 3 letter segments (codons – GAG TCA CAT) to create amino acids, the building blocks for proteins. This nine-letter segment would code for the amino acids: Glutamine-Serine-Histidine.

**Bonus:** If there are only 120 base pairs in a gene, the first and last three base pairs are used to indicate the start and end of a protein, what is the maximum number of amino acids that would make up this protein? Show Work! /1

**CONCLUSION:**

In a paragraph, write what you discovered in completing this lab. How did each step help in the extraction of the DNA? What did you learn? What went as expected? What surprised you? What have you learned about DNA? What did you expect DNA to look like? What did it look like? Be specific! Would DNA extracted from human spit look similar or different? Would the amount of DNA extracted be more or less than for a strawberry? How do you know? /5 marks