

**Topic:** DNA Extraction Lab

**Summary:** Students will extract and compare DNA from both bananas and strawberries.

**Goals & Objectives:** Students will be able to experience how DNA looks the same from one organism to another. Students will be able to describe how genetic engineering is important in today's society.

**Standards:** CA Biology 5a. *Students know* the general structures and functions of DNA, RNA, and protein. 5c. *Students know* how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.

**Time Length:** 60 minutes

**Background Knowledge:** The soap is to dissolve the lipid bilayer around the cell and nucleus. The salt is to neutralize the negative charge of the DNA. The alcohol is used because DNA is soluble in water but not soluble in alcohol. The bubbles on the DNA in the alcohol layer are just dissolved gasses and are not part of the DNA.

**Prerequisite Knowledge:** Students have been introduced to cell organelles and know that DNA has the same structure in all organisms.

### **Pre-Lab**

Set-up stations: alcohol station with ice-cold alcohol and a buffer station with two graduated cylinders. The buffer should be made using a large flask and then be poured into a 100mL beaker.

**Accommodations:** Students with an IEP can take the handout home if they need extra time but must finish the lab procedures in class.

### **Evaluation:**

Questions 1-6 are worth 2 points each for a total of 12 points. Question 7-8 are worth 1 point each for a total of 6 points. The assignment is worth a total of 18 points.

# DNA Extraction Lab

**Problem Statement:**

Does DNA have the same structure in different organisms?

**Hypothesis:**

If \_\_\_\_\_

then \_\_\_\_\_

**Materials:**

- Strawberries (fresh or thawed), and fresh bananas
- Cheesecloth
- Small funnel
- 90% Ethanol *ice-cold*
- Graduated cylinders
- Large test tubes
- Zip-lock freezer bags
- 1L Erlenmeyer flask and 100 mL beaker
- 10 mL graduated cylinder
- 7 mL DNA buffer
  - 50 mL dish soap
  - 15 g salt
  - 900 mL tap water
- Glass stirring rod
- Safety goggles

**Procedures:**

1. In groups of 3: one student is the assistant (gets buffer solution, hold funnel while pouring juice into a test tube, and put away materials), one student is in charge of extracting the strawberry DNA, and the last student is in charge of extracting the banana DNA.
2. Place one strawberry in a zip-lock bag, press the air out, then seal it. Softly mash the strawberry/banana with your fingers until it becomes a juice puree (1-2 minutes).
3. Add 8 mL of buffer to the strawberry/banana and then press the air out of the bag and seal.
4. Mash the strawberry/banana carefully for 1 minute without creating many bubbles.
5. Place the test-tube in a cup. Put the funnel on top of the test-tube. Place the cheesecloth on top of the funnel.
6. Open the bag and drain carefully the strawberries/bananas on top of the cheesecloth to fill the test-tube with  $\frac{1}{4}$  juice. The juice will drain through the cheesecloth but the chunks of strawberries/bananas will not pass through into the test-tube.
7. Tilt the test-tube and pour in an equal amount of alcohol,  $\frac{1}{4}$  of test-tube, through the funnel and down the sides of the test-tube. This will allow for better separation of the DNA.
8. Place the test-tube so that it is eye level. Using the stirring rod, collect DNA at the boundary of alcohol and strawberry juice. Do not stir the strawberry/banana juice; only stir in the above alcohol layer.

9. Gently remove the stirring rod and examine what the DNA looks like. Clean up using the teacher's instructions after you have finished the lab write-up.

**Variables:**

1. Independent Variable \_\_\_\_\_

**Data:**

Draw the DNA you see in each of your test tubes in the sample test tubes below.

Strawberry	Banana
	

**Conclusion:**

3. Was your hypothesis correct? Explain why it was or not. \_\_\_\_\_

4. What did you learn from this experiment? \_\_\_\_\_

5. Where is DNA located in the cell? \_\_\_\_\_ The soap buffer dissolves lipids of the plasma membrane which is composed of two rows of \_\_\_\_\_.

6. DNA is built from nucleotides. Does the phosphate and sugar backbone provide the genetic code? \_\_\_\_\_ Do nitrogen bases provide the genetic code? \_\_\_\_\_

Which part of a nucleotide makes the banana and strawberry different? \_\_\_\_\_

7. Most of the fruit and vegetables today have been genetically modified. If a scientist wanted to genetically engineer a plant, what would the first step be? \_\_\_\_\_

8. Scientists can cut out a gene from one organism and place that gene into another organism, like a fruit plant. Give 4 benefits of genetically engineering food plants.

a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_