

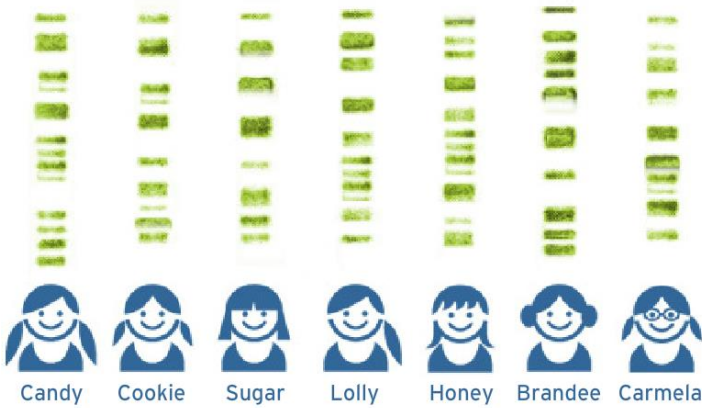
Biotechnology – The Tools of the Trade

Objective: Complete the virtual experiments by visiting the web pages linked on my blog, and then answer the accompanying questions. The purpose of this assignment is to give you a better understanding of biotechnology – technology using living organisms for a specific purpose or product. *This will be graded as a LAB, but you do NOT need to write in complete sentences.*

A) [Gel Electrophoresis and DNA Fingerprinting](#)

- Describe the crime committed against Jimmy Sweet!
- A lollipop cannot be licked without leaving a trace of saliva.
What is found in saliva which can be used to **identify** a culprit? _____
- Perform the virtual experiment and complete the chart below.
List and describe each step of the DNA Fingerprinting process.

Step in Procedure	Purpose of this step
	Works like scissors, cutting the long DNA molecules at different locations. Some fragments will be long, others will be short.
<i>Pour agarose gel into tray on counter</i>	
	DNA fragments are loaded into the agarose gel.
<i>Push “power” button on tray to begin gel electrophoresis</i>	<i>How does the gel act like a strainer?</i>
<i>Place nylon membrane on top of agarose gel</i>	
	Radioactive probes attach to the DNA fragments on the nylon membrane, making the fragments visible on X-Ray film.
<i>Place X-Ray film on top of nylon membrane in tray</i>	
	The film displays the location of the DNA, creating a DNA fingerprint.



4. Circle the DNA fingerprint of the suspect who committed the crime. *Defend your choice with an explanation of the data.*

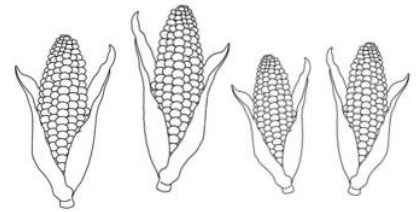
5. **Critical Thinking:** Why is “DNA Fingerprinting” an appropriate nickname for Gel Electrophoresis?



B) GMO's: Genetically Modified Organisms (aka using Genetic Engineering to create “Transgenic” Organisms/)

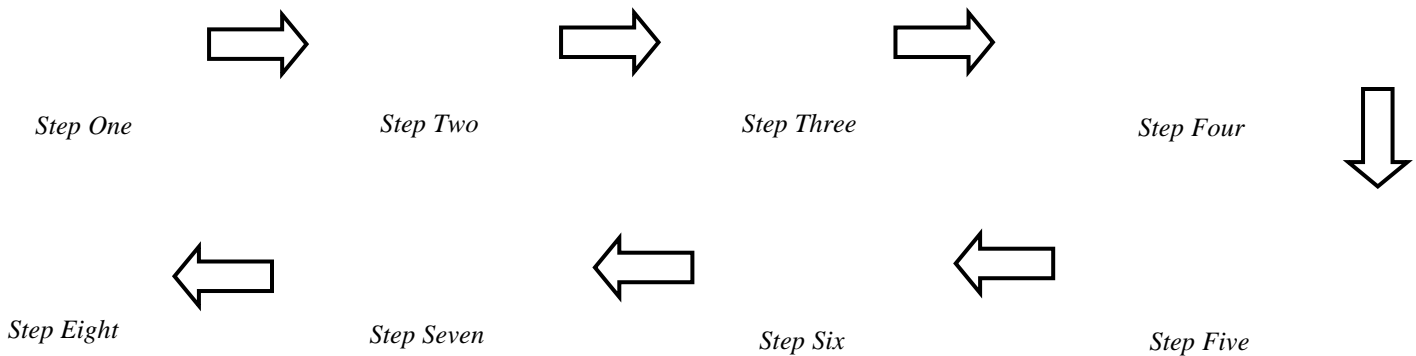
- For almost 10,000 years, humans have been _____ plants by keeping the seeds from the best crops and planting those the next season.
- Describe the methods being used by scientists **today** in order to genetically alter crops.
- True or False:** Genes from organisms as different as bacteria and plants can be successfully inserted into each other. *If false, please explain.*

- Click on “**Selective Breeding**” and complete the activity. In the image to the right, circle the type of corn you would select to breed in order to increase the overall size of the corn over time. *Explain your reasoning below.*



- The change in seed size was (immediate / gradual) and occurred in (all / some) of the offspring corn.
- Go back to “Transgenic Manipulation” on the previous page. What makes a plant **transgenic**?
- Your task in this activity is to produce a tomato plant that is _____ to certain insects by taking a gene from _____ and incorporating that gene into the plant’s chromosomes.
- True or False:** The bacteria Bt (Bacillus thuringiensis) produces toxins that are harmful to both insects and mammals. *If false, please explain.*

9. **Click through the activity.** Outline (in words) the process of transgenic manipulation/genetic engineering.



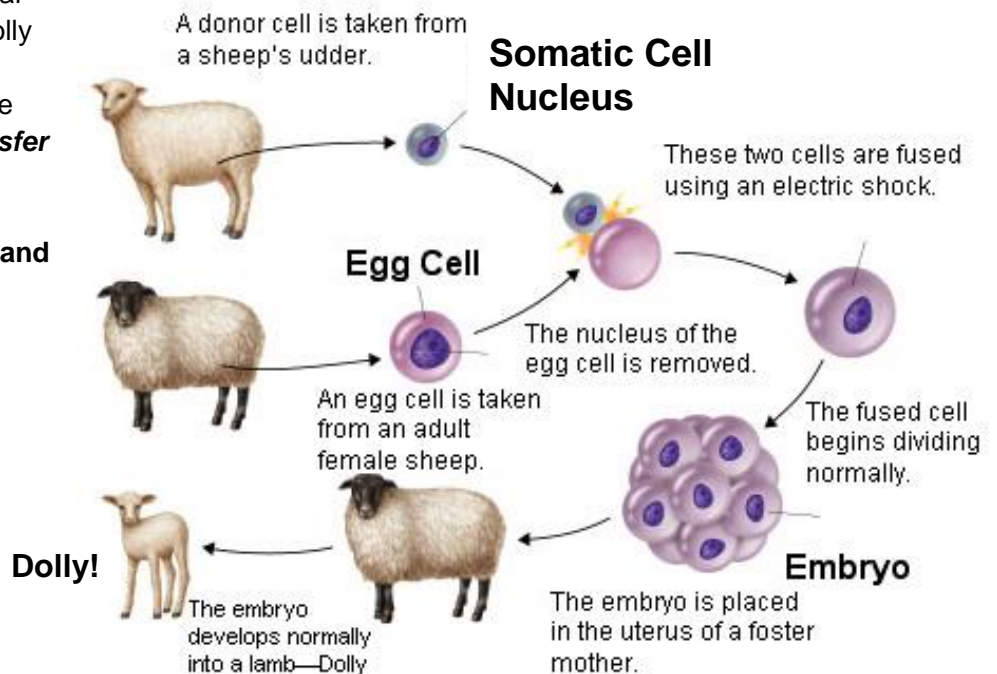
10. The purpose of this virtual experiment was to create a genetically engineered tomato that was resistant to insects. Identify the **dependent variable** used to indicate the success of this experiment?

C) Cloning

1. Select WHAT IS CLONING. Define **cloning**.

2. In 1997. Most people became familiar with the process of cloning when Dolly the Sheep was created through advanced biotechnology! Review the text on ***Somatic Cell Nuclear Transfer*** and analyze the picture to the right.

Place a CIRCLE around Dolly and place a BOX around the adult sheep for which Dolly was an exact replica!



3. Return to the Cloning page and select **CLICK AND CLONE**. Your mission in this activity is to clone which mouse?

4. What type of cell did you take from Mimi? _____ From Megdo? _____

5. You performed an **enucleation** of the egg cell. What does this mean?

- 6. Describe what takes place under the microscope in the “Nuclear Transfer” petri dish.
- 7. The **Divide-A-Lot** liquid chemical helped stimulate cell division, aka _____ , because the chemical mimics the events that follow the fertilization of an egg.
- 8. What role did *Momi the mouse* play in this process?
- 9. The cloned baby mouse was (brown / black / white). WHY?

D) [PCR Virtual Lab](#)

- 1. Define **PCR** and summarize how it is used by scientists all over the world.
- 2. Roughly how many base pairs are in the human genome? _____
- 3. For your Polymerase Chain Reaction, you extracted cells from (saliva / blood / skin / hair).
- 4. Define these terms and describe the role each plays in PCR.

Term	Definition	Role in PCR
<i>Primers</i>		
<i>Nucleotides</i>		
<i>DNA polymerase</i>		

- 5. **True or False:** The **thermal cycler** works to duplicate your DNA by repeatedly heating and cooling the DNA sample. *If false, please explain.*
- 6. How many cycles were needed to **make over a billion copies** of the desired DNA sequence? _____