

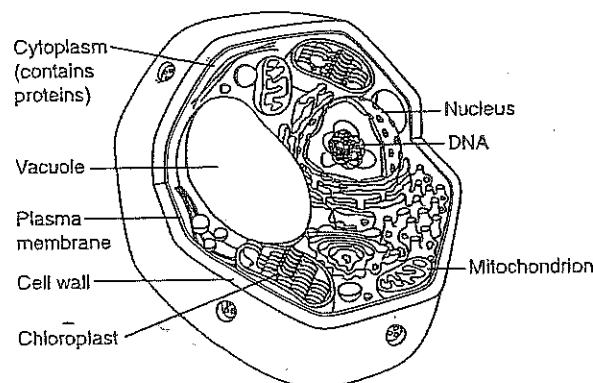
*Exploring Properties of Strawberry DNA*

**Question** What properties of DNA can be observed in a test tube?

**Lab Overview** In this investigation you will break open strawberry cells, prepare a filtered extract containing strawberry DNA, and separate out molecules of DNA in a test tube.

**Background** Every cell in a strawberry contains eight copies of each of its chromosomes. As a result, strawberries contain large amounts of DNA. After this lab, you will never eat a strawberry again without thinking of how much DNA is in it! Strawberry DNA is easy to extract because strawberries are easy to mash, and ripe strawberries produce enzymes that contribute to the breakdown of cell walls. To extract the DNA, you will first break strawberry cells apart mechanically, by crushing them. Next, you will add detergents to dissolve the cell's plasma membranes. A filtering step then removes cell organelles, broken cell walls, membrane fragments, and other cell debris. The result will be a red-colored solution containing DNA and other small dissolved molecules such as sugars and proteins. When cold ethanol is layered on top of this solution, molecules of ethanol repel the DNA molecules, and the DNA clumps together. A ropelike clump of many DNA molecules forms that is large enough to see with the unaided eye.

**Prelab Activity** Observe this sketch of a plant cell. Notice that the DNA is located inside the nucleus. Afterward, answer the Prelab Questions on the next page.

**Prelab Questions****Plant Cell**

- To isolate strawberry DNA, you must separate it from other cell materials. Some of the lab steps you will use are listed in the left column below. Match the letter of each lab step with its effects on strawberry cells and enter your answers in the spaces provided.

Lab Steps	Effects on Strawberry Cells
a. Mash the fruit to a slush.	_____ breaks open the cells
b. Filter the strawberry extract.	_____ dissolves plasma membranes
c. Add detergent solution.	_____ clumps DNA together
d. Layer cold ethanol over filtered extract.	_____ separates organelles and cell debris, such as fragments of cell walls and membranes, from DNA and small dissolved molecules such as proteins and sugars

4pts

3pts each

2. If a molecule of DNA is invisible even under a microscope, how will you be able to see the strawberry DNA you extract?

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3. Why do you think the clump of DNA molecules has a ropelike shape?

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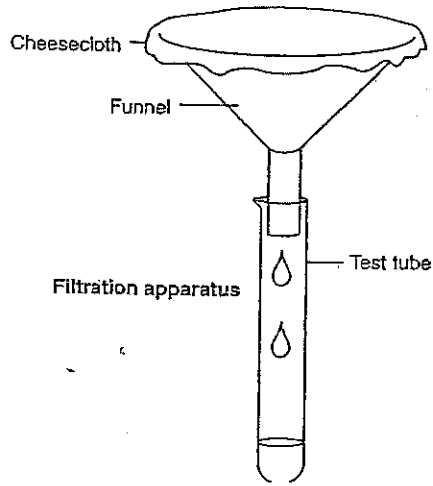
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**Materials**

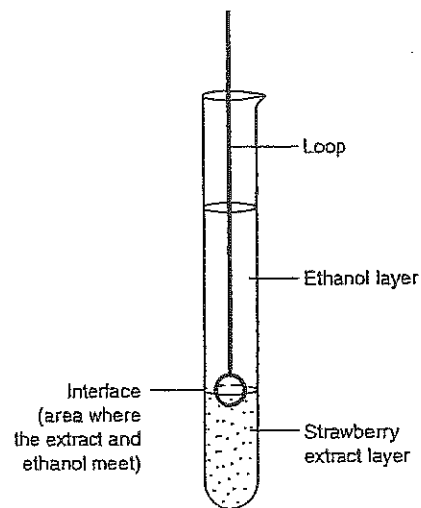
- self-sealing plastic freezer bag
- strawberry
- 10 mL detergent solution
- filtration apparatus: cheesecloth, funnel, and test tube
- ice-cold ethanol
- test tube (clear plastic or glass)
- stirring rod or inoculating loop
- test tube rack (optional)
- microcentrifuge tube (optional)

**Procedure** 

1. Place one strawberry in a self-sealing plastic freezer bag. Press the air out of the bag, and seal it carefully. Mash the bagged strawberry with your fist for 2 min.
2. Add the detergent solution to the bag. Press the air out carefully and seal the bag.
3. Mash the bagged strawberry for 1 min.
4. Set up your filtration apparatus as shown below. If a test tube rack is available, place the test tube securely in the rack.  
**CAUTION:** *Handle glassware carefully to avoid breakage.*



5. Pour the liquid extract into the filtration apparatus, and let it drip directly into the test tube, as shown above.
6. When the test tube is about 1/8 full, remove the funnel. Discard any extra mashed strawberry pulp with the cheesecloth.
7. Slowly drizzle cold ethanol along the side of the test tube, until the test tube is about half full of liquid. The ethanol should form a separate layer on top of the filtered extract.
8. Dip the loop or rod into the tube to where the ethanol and extract layers meet, as shown below. Gently twirl the loop or rod. Keep the tube at eye level so that you can see what is happening. Observe the characteristics of the DNA as it precipitates (clumps together). If a microcentrifuge tube is available, place some of the DNA you prepared into the tube. Be sure to cap the tube tightly. This will give you an opportunity to examine the DNA closely.



## Strawberry DNA Extraction 3 points each

1. A person can't see a single strand of cotton thread from 20 feet away. But if thousands of threads are wound together into a rope, the rope can be seen from a distance. Use this information to figure out how we can see the strawberry's DNA without a microscope.
2. In order to study human genes, scientists must first extract the DNA from human cells. Would you expect the method of DNA extraction for human DNA to be the same as the one that you used to extract strawberry DNA? Why or why not?
3. Would the DNA extracted from any human cell be the same as any other cell from the same person's body? Explain.
4. If you wanted to extract DNA from a living person which cells would you choose and why?
5. List 2 possible scientific questions that could be explored by studying strawberry DNA.