

BIOLOGY

DNA Extraction



STEPS

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The Field of Biology

What is biology?

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Careers in Biology

What can you do with biology?

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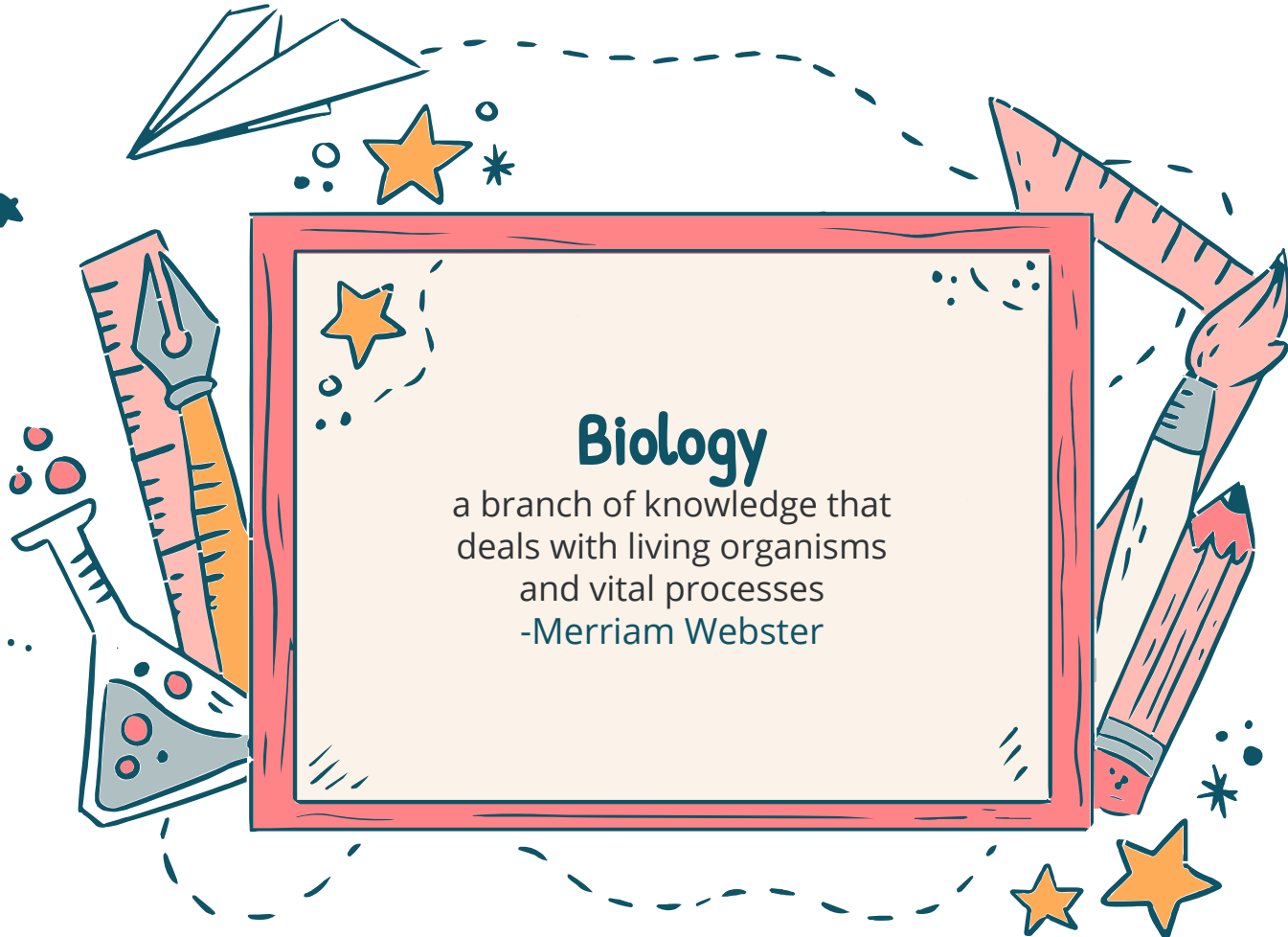
Deep Dive Into DNA

What is DNA?

04

Activity

A quick biology experiment!





01

Biology

The study of life

Fields of Biology



• **Botany**



Ecology



Genetics



Medicine



Evolution



Microbiology



Molecular Biology



Physiology



Zoology

Biology Classes You Can Take in High School

01

Biology

02

AP Biology

03

AP Environmental
Science

04

Anatomy & Physiology

**These classes may or may not be offered at your school and some may have prerequisites. Your school might also offer different biology courses, but these are just suggestions!

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02

Careers in Biology



Avg of \$108,000/yr

with a bachelor's degree in biology

60%

of biology degree holders are women

2.73M

People in the biology workforce

Common Occupations



Biochemist

Studying biology equips them with the laboratory and scientific research skills and knowledge to design and execute studies for developing new products.



Physician's Assistant

Physician assistants and nurse practitioners must have a sound understanding of human biological systems, anatomy, and physiology to diagnose medical problems.



Biological Technician

Biological technicians use the laboratory skills and techniques that biology majors learn in their labs, academic research, and collaborative research with faculty.

The background is white with colorful illustrations of leaves in dark blue, orange, and pink. There are also small stars, dots, and geometric shapes like a pencil and a protractor scattered around. The number '03' is prominently displayed in a dark blue, rounded font inside a light beige, irregular shape.

03

DNA



What is DNA?


DNA or deoxyribonucleic acid is the hereditary material in humans and almost all other organisms.






DNA

The DNA molecule consists of two strands that wind around one another to form a shape known as a double helix. Each strand has a backbone made of alternating sugar (deoxyribose) and phosphate groups. Attached to each sugar is one of four bases--adenine (A), cytosine (C), guanine (G), and thymine (T). The two strands are held together by bonds between the bases; adenine bonds with thymine, and cytosine bonds with guanine. The sequence of the bases along the backbones serves as instructions for assembling protein and RNA molecules.



DNA is organized structurally into chromosomes and then wound around nucleosomes as part of those chromosomes. Functionally, it's organized into genes, of which are pieces of DNA, which lead to observable traits. The central dogma, so-called of molecular biology, is that genes, which are made of DNA, are made into messenger RNAs, which are then made into proteins.







04

Activity
Banana DNA Extraction





What Do You Need?

1. $\frac{1}{2}$ peeled ripe banana
 2. $\frac{1}{2}$ cup hot water
 3. 1 tsp salt
 4. $\frac{1}{2}$ tsp liquid dishwashing soap
 5. Resealable zip-lock bag (quart size)
 6. Very cold rubbing alcohol (isopropyl alcohol) placed in freezer ahead of time
 7. Coffee filter
 8. Narrow glass
 9. Wooden stirrer
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DNA Extraction

1. Mash half of the banana in the zip bag for about a minute until all the lumps are gone and it looks like pudding.
 2. Fill a cup with the hot water and salt.
 3. Pour the saltwater mix into the bag. Close the bag and very gently squeeze and move the saltwater and banana mush together. Do this for 30 to 45 seconds.
 4. Add the dishwashing soap into the bag and gently mix the contents. Avoid making too much foam.
 5. Place the coffee filter in a clear glass cup, securing the top of the filter around the lip of the cup.
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DNA Extraction

6. Pour the mix into the filter a little bit at a time to avoid breaking the filter. Let it sit until all of the liquid drips down into the cup.
7. Remove and throw away the used coffee filter.
8. Tilt the glass and slowly add cold alcohol down the side of the cup. You want the alcohol to form a layer on top of the banana mix, staying separated, so be careful not to pour it too fast. Make a layer of alcohol that is 2.5-5cm (1-2in) thick.
9. After the alcohol layer is set up, wait for eight minutes. You may see some bubbles and cloudy material moving around in the alcohol. This material is DNA clumping together.
10. Use the wooden stirrer to start poking the cloudy stuff in the alcohol layer. Spin the stirrer in place to start gathering the cloudy stuff. When you are done, take a closer look at the stuff on the stirrer. You are looking at DNA!





What Happened?

You may understand that mashing a banana can break cells apart and help break apart cell walls, but why was all that other stuff added? And how did we get inside the cells and get the DNA to stick together? Let's think of three of the main items we added to the bananas.

1. Saltwater - The bananas were mashed with saltwater before anything else was added. But this was a special step preparing for the addition of the dish soap. Once the dish soap helps release the DNA, this salt will help the DNA strands to stick to each other in clumps large enough for you to see.

2. Dish soap - Dish soap can break apart a type of molecule called lipids. Think of fats and oils. Dish soap "cuts through grease" because it actually breaks down those greasy molecules. Now, the molecules that make the membranes around cells and the nucleus (which holds DNA) are lipids. So when dish soap is added, the cell membrane and the nuclei are broken apart, releasing the DNA.

3. Alcohol - The DNA clumps are soluble (can be dissolved) in some liquids, but not in alcohol. So adding alcohol helps the clumps of DNA to form. DNA doesn't dissolve in alcohol, so this step helps DNA clumps form.





THANKS!

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