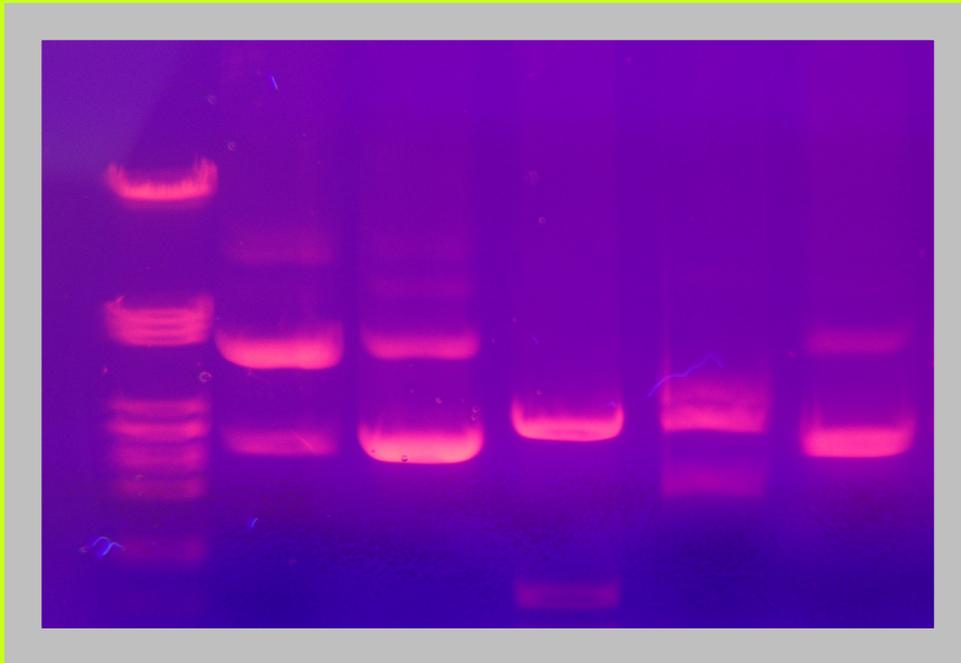


STEM *Sims*TM

DNA Sequencing



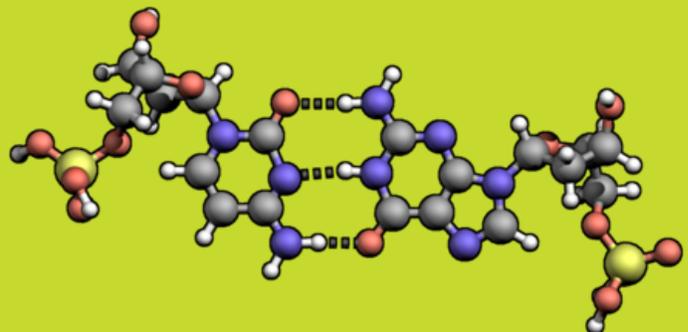
DNA Sequencing

Do you need an idea for a scientific study?

Try out one of our ideas or make one of your own.

Start learning right now about DNA sequencing. Take the following brief quiz to see how much you already know about finding the sequence of nucleotides in DNA strands. See the bottom of page 4 to check your answers.

1. All of the following are current uses of DNA sequencing *except*:
 - a. gene therapy.
 - b. production of human organs.
 - c. production of therapeutic proteins.
 - d. diagnostic tests based on genes.
2. Prior to 1943, most scientists thought that the genetic code in humans was stored in a cell's:
 - a. fats.
 - b. carbohydrates.
 - c. proteins.
 - d. cytoplasmic fluid.
3. What percent of your DNA is similar to all other humans' DNA?
 - a. 50%
 - b. 75%
 - c. 88%
 - d. 99%
4. In terms of genetic material, which invertebrate's DNA is most similar to humans?
 - a. mud worm
 - b. cockroach
 - c. octopus
 - d. spider
5. Genes make up most of the DNA strand.
 - a. true
 - b. false



Going Bananas Over DNA

Humans and bananas share about 60% of their DNA. Can you extract DNA from your “kind of” relative, the fabulous banana?

Materials

- 100-mL ice-water bath
- 1- large banana
- 30 mL of Dawn® dishwashing liquid
- 80 mL of water
- funnel
- 250 mL Erlenmeyer flask
- 10 mL isopropyl alcohol
- resealable plastic bag
- 3 grams sodium chloride
- 500 mL beaker
- filter paper
- glass stirring rod



Always remember to be safe. Wear your safety glasses and other protective items!

Procedure

1. Pour about 10 mL of isopropyl alcohol (rubbing alcohol) into a test tube. Place the test tube in an ice-water bath.
2. Peel the banana and place it in a resealable plastic bag. Remove as much air from the bag as possible, and then seal the bag. Using your hands, crush and squeeze the banana into very small pieces.
3. Add the following to a clean 500-mL beaker: a) 30 mL of Dawn® dishwashing liquid, 3 grams of sodium chloride (table salt), and 80 mL of water. Mix the ingredients.
4. Add 50 mL of the mixture you made in step 3 to the bag with the banana. Thoroughly mix for about one minute.
5. Setup a funnel with filter paper so it drains into a 250 mL Erlenmeyer flask. Slowly pour the crushed banana liquid mixture through the funnel so the liquid drains into the flask.
6. Pour the liquid from step 5 into a clean test tube. Tilt the test tube with the liquid inside to about a 45° angle. Slowly pour the cold alcohol from step 1 down the inside of the test tube containing the banana extract. Avoid mixing the two liquids – you want the alcohol to form a layer on top of the fruit liquid.
7. The white-cloudy material forming between the two layers is the DNA extracted from the cells of the banana. Place a clean, glass stirring rod in the test tube and slowly twirl the rod. The DNA should collect around the rod.

Questions

- 1) What was the purpose of using cold alcohol in this experiment?
- 2) What property allows the DNA to be collected using the stirring rod?

DNA Sequencing

How can DNA sequencing help you?

Deoxyribose nucleic acid (DNA) is the molecule that contains the blueprint for all living things. DNA is used to produce all of the necessary ingredients for growth and maintenance of life. The process of DNA sequencing determines the order of the nitrogen bases that make up the DNA molecule. The nitrogen bases are the chemical building blocks that tell cells what and when to make important substances and structures. The order of the four bases, adenosine, thymine, cytosine, and guanine, determines the actions of the DNA molecule.

DNA sequencing provides medical researchers and practitioners with information regarding inherited factors associated with disease susceptibility and treatment, as well as the influence of a person's genetic makeup and the factors and stresses of the environment that lead to specific disorders.



As the cost of DNA sequencing decreases, the ability for people to have their DNA scanned to detect current and possible future diseases and conditions becomes a strong reality. Within the next decade or so, visits to your family physician may include a scan of your DNA to help guide your lifestyle choices and disease prevention strategies. The future of DNA sequencing during routine medical visits in your lifetime holds great promise.

Please visit our site for more helpful information:
STEMsims.com

Answers: Page 2 Answers: 1) b, 2) c, 3) d, 4) a, 5) b. Page 3 Question Answers: 1) Since alcohol and water mix and usually form a solution, the alcohol needed to be added cold to keep the two substances from mixing and to form separate layers. 2) DNA exists in long strands. The long strands are wrapped around the stirring rod.

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