

Exploring macro-molecules

1. Nucleic Acids

Strawberry DNA extraction



Directions

1. Put a coffee filter over the top of a plastic cup and secure with a rubber band.
2. Put a single strawberry in a Ziploc bag and close the bag. Remove as much air as you can.
3. Mash up the strawberry with your hand and fingers for 2 minutes. Be careful not to break your bag. The best way to mix it is to massage the mixture at the bottom of the bag.
4. Add 12ml of Lysis Buffer to the bag and zip it closed. Mash again for 1 minute.
5. Tilt the bag so that the mush collects in one bottom corner of the bag, and open the bag. Carefully pour the mush into the coffee filter. Let the liquid drip through the filter into the cup. You can gently stir with the flat wooden stick, but make sure not to rip the filter.
6. After most of the reddish liquid has dripped into the cup, carefully remove the filter paper with the strawberry mush and throw it in the trash. Tilt the cup a little and gently pour the 10ml of Isopropanol in the cup - letting it slowly pour down the side of the cup. **DO NOT MIX!**
7. Observe and wait a little. You'll see the DNA start to collect as a goopy glob, and you can "spool it out" on the tip of the wooden stick.
8. Transfer the spooled DNA into an Eppendorff tub with some isopropanol. You can take the DNA home with you, but keep it tightly closed to avoid evaporation of the alcohol. The DNA is stable in this form for many years.

2. Lipids

A. Testing for the presence of fats: Brown paper test

1. Fold a piece of brown paper so that the folds create 4 equal sections.
2. In each section, write the name of one test substance.

Water	Fat # 1
Fat # 2	Fat # 3

3. Using a cotton swab, rub a small amount of the test substances onto the brown paper until a "wet" spot appears.
4. With a paper towel, rub off any excess.
5. Set the paper aside until spot appears dry.
6. Hold the paper up to a bright light or window.

6. What do you notice?

B. Solubility of lipids

1. Acquire 3 test tubes labeled with "water", "acetone", and "soap water".
2. Add 15 drops of oil (your choice) into each test tube.
3. Recap test tubes and shake well.
4. Allow tubes to stand for a few minutes.
5. What do you observe?

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3. Carbohydrates

I. Test for Glucose or Fructose (Monosaccharide):

1. Put 2-3 ml of the corn syrup (fructose + glucose) solution in a test tube.
2. Add 1ml of the Benedict Reagent, the solution will look blue,
3. Put the tube in a gently boiling water bath. Be careful!
4. After a few minutes look at the color of the mixture.

The glucose present in the solution reacts with the copper sulfate in the Benedict reagent to make copper oxide, an orange to brick-red precipitate. How deep the color is depends on the concentration of glucose present in the sample.

The more glucose is present...

Green Orange brick-red



II. Test for Starch (Polysaccharide)

1. Put 2-3 ml of starch solution in a test tube
2. Add 3-4 drops of iodine.
3. Look at the color of the solution.

A bluish black color indicates a positive test for starch.

Note: Table sugar (disaccharide) is a non-reducing sugar and does not react with the iodine or with the Benedict Reagent. Sugar needs to be decomposed into its components glucose and fructose then the glucose test would be positive but the starch test would still be negative.

III. Testing food items

Tests food items for glucose or starch using the above procedure. Make solutions using distilled water with liquid or powders samples. If the material is solid, chop it finely or mush it in a mortar and add distilled water before adding the reagent.

4. Proteins

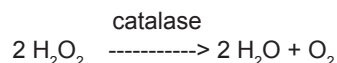
I. Biuret test for proteins:

1. Add 5-10 drops of Biuret's reagent to about 1/2 inch of distilled water in a test tube. The water will be very pale blue in color. This will be your negative control.
2. Add about 1/2 inch of test sample in a test tube. If the test sample is a solid or powder, add water and mush well.
3. Add 5 to 10 drops of Biuret's reagent.

Biuret's reagent will change from blue to violet, or purple, in the presence of protein. The intensity of the colour depends upon the amount of Biuret's reagent used, and the amount of soluble protein present.

II. Enzymes : The Proteins that carry out Chemical Reactions

Hydrogen peroxide (H_2O_2) is a natural but toxic by-product of life. If it were allowed to accumulate in our cells, it would kill them. Fortunately, most living things contain an enzyme called catalase that quickly breaks down H_2O_2 into water and oxygen.



Catalase is a remarkable enzyme – a single catalase enzyme can convert 6 million molecules of H_2O_2 into water and oxygen in a single minute!

Instructions:

1. Fill each labeled test tube approximately 1/3 full with H_2O_2
2. Add a small amount of material to be tested
3. The production of gas (oxygen) is the positive test for catalase being present.

Factors influencing the reaction rate of enzymes

There are a number of factors that determine how fast the break down of the hydrogen peroxide by the catalase enzyme occurs - and therefore how much gas is being released.