Testing for Chemicals in Cells

Background Information

The major groups of chemicals found in plant and animal tissues are proteins, carbohydrates, nucleic acids, lipids, minerals, vitamins and water. Many of these can be identified by simple laboratory tests involving colour changes. In this investigation, samples of most of these chemicals will be testes to identify a distinguishing test. The tests can be then used to identify the chemicals in samples of plant and animal tissues, mainly foods.

Part A: Identifying tests for chemicals

Materials

- dilute sodium hydroxide (NaOH)
- dilute copper sulfate ($CuSO_4$) in dropping bottles
- Iodine solution
- Tes tape
- Benedict's solution
- 1% Silver nitrate solution
- plain brown paper
- Sudan III solution in dropping bottles
- toluidine blue
- test tubes
- Bunsen burner and matches
- distilled water
- white tile
- protein solution (albumin in water)
- 1% glucose solution
- 5% starch suspension
- 2% sodium chloride solution
- pipid, e.g olive oil
- a wet mount of a thin section of a plant stem
- microscope
- celery
- scaples, forcepts, probes

Chemical to be used	Reagent	Method	Result: test substance	Result: control
Protein (albumin)	Biuret test reagents (NaOH, $CuSO_4$)	To 3ml of albumin in a test tube add 1ml of NaOH and then 1-2 drops of SO_4 – shake	Purple – positive	
Glucose	Benedict's solution	To 3ml of glucose add 1ml of Benedict's solution and heat with a Bunsen	Orange, red – positive	
Starch	Iodine solution	Place a few drops of starch suspension on a tile. Add a few drops of iodine solution.	Blue, black – positive	
Lipid	Sudan II stain	Place 5 drops of oil into a test tube containing 5ml of water. Shake and then add 2 drops of Sudan II, shake and then allow to stand	Red – positive	
Sodium chloride	Silver nitrate solution	To 3ml of sodium chloride add a few drops of silver nitrate solution (careful silver nitrate can stain clothes and skin)	White – positive	
Lignin	Toluidine blue	Add toluidine blue to a wet mount of a plant stem	Green, blue – positive	

Part B: Using the tests to identify the chemicals in foods

Materials

- food samples, such as bread, milk, apple, muesli, meat, fish, potato, banana
- vegetable knife
- mortar and pestle

Method

1. Use the tests from Part A to identify the chemicals in the food samples provided. Some food samples will need to be crushed in a mortar and pestle and some will need to be cut into small pieces and then crushed. It may also be necessary to add a small amount of distilled water to the drier foods when they are crushed. Add a few drops of toluidine blue to test for lignin
2. Observe each result and make conclusions about the chemicals present in each food. Set up a control for comparison if the result is difficult to detect. Record the results in a table.

Results

Food	Protein	Glucose	Starch	Lipid	Sodium chloride	Lignin