Aim: To test food samples for the presence of glucose (reducing sugar), starch, protein and lipid.

Background Theory

- Food molecules include carbohydrates (starch, glucose), proteins and lipids.
- Each macromolecule can be identified using a specific chemical test.
- A positive result is a specific colour change. A negative result keeps the reagent colour.

Equipment

- Test tubes and test tube rack
- Water bath at 80°C
- Benedict's solution (blue)
- Biuret reagent (NaOH + copper sulfate solution)
- Iodine solution (orange-brown)
- Ethanol (industrial)
- Distilled water
- Food samples to test (e.g. glucose solution, starch solution, egg white, cooking oil)

The Four Tests

Test	Method	Positive result	Negative result
Reducing sugar (glucose)	Add 2 cm^3 of food sample + 2 cm^3 Benedict's solution. Heat in water bath at 80°C for 5 minutes.	**Brick red/orange precipitate**	Solution stays blue
Starch	Add 2 drops of iodine solution to the food sample on a white tile.	**Blue-black colour**	Remains orange-brown
Protein	Add 2 cm^3 food sample + 2 cm^3 dilute NaOH. Add 2 drops copper sulfate solution. Mix gently.	**Purple/violet colour**	Remains blue
Lipid	Add 2 cm^3 food sample to 2 cm^3 ethanol. Shake to dissolve. Pour into 2 cm^3 distilled water.	**Milky white emulsion forms**	Solution remains clear

Results Table

Food sample	Benedict's result	Iodine result	Biuret result	Ethanol result

Analysis

- For each food sample, identify which molecules are present based on your results.
- Explain each positive result using the appropriate test name and colour change.

★ Explain why heating is required for Benedict's test — the copper ions need energy to react with the reducing sugar.

★ Describe why a food might test positive for both starch and reducing sugar (starch is being broken down by amylase in saliva during the test).

Exam Tip: Learn the EXACT positive colour for each test. Benedict's = brick red (not just "red"). Iodine = blue-black (not "black"). Biuret = purple/violet (not "blue"). Wrong colour = wrong mark.

Common Mistake: The biuret test reagents must be added in the right order — NaOH first, then copper sulfate. Adding them the wrong way round gives an incorrect result.