

Teacher notes

Of the three food tests described here, only the Benedict's Test requires the use of test tubes: both Iodine and Biuret tests can be carried out on plastic grids (e-copies supplied); these can be printed onto paper, then laminated.*The grids can easily be wiped clean and reused, and time and mess are both reduced considerably.

Moreover, it is not necessary to use Bunsens for the Benedict's Test – a water bath with boiling water from an electric kettle works very well and lessens the potential for accidents. If the result of the Benedict's test is a white colour, the solution should be replaced with a fresh batch – it doesn't take long to check beforehand.

Part One is aimed at allowing the students to discover which test identifies which food substance; for this reason, the tests are called 'Iodine Test', 'Biuret Test', and 'Benedict's Test', rather than 'Starch Test', 'Protein Test', and 'Glucose Test'.

A point for discussion is the range of colours displayed in the Benedict's Test: from blue to green to brown to red; students can be led to the conclusion that the final colour indicates the concentration of glucose in the sample.

Part Two is where the three tests are applied to a selection of foods, using grid #2. Students are asked to indicate not only the **presence** of each of the three chemicals in each foodstuff, but also the **amount** of each, by allocating up to three ticks in each box of the results table. Observant students will notice that the cooked potato goes black immediately upon addition of iodine, whereas with the raw potato, the black takes longer to appear – cooking bursts the cell walls of the potato and releases the starch. The aim of comparing ripe with unripe bananas is to illustrate that the ripening process converts/digests starch to glucose.

** or printed directly onto transparent OHP sheets. Grid #1 printed on A4; Grid #2 printed on A3.*

Materials required (approx. amounts only)

- Iodine solution (1 small bottle)
- Benedict's solution (100mL)
- Biuret reagents: NaOH solution (1%) & CuSO₄ solution (100mL of each)
- Solutions of sucrose, glucose, starch, and protein (approx.1%; 100mL of each)
- Disposable pipettes/droppers
- 1 apple
- 1 ripe banana and 1 green banana
- 1 slice white bread
- 10g butter
- 10g cheese
- The white of one egg
- 10g white flour
- 10g honey
- 10g mincemeat
- 20mL milk
- 1 orange
- 10g pasta

- 1 raw potato
- 1 cooked potato (microwave)
- 10g white rice
- 30 x test/boiling tubes
- 6 x 250mL beakers
- 1 electric kettle
- Permanent marker pens

Food testing: Teacher's copy:

Part 1: investigating simple tests for 3 common food substances.

It's easy to tell which foods and drinks contain **sugars** (*they taste sweet*) and **fats/oils** leave *greasy stains* on your clothes, but how do you know which foods contain **starch** or **protein**?

1. Benedict's Test

Method:

1. Label five test tubes as follows: 'Protein', 'Sucrose', 'Glucose', 'Starch', and 'Water'.
2. Squirt about 1mL of each solution into its labelled test tube.
3. Squirt about 1mL of **Benedict's** solution into each tube and swirl to mix.
4. Half-fill a beaker with boiling water (from the kettle) and place the 5 tubes in the beaker.
5. **Leave** until one of the mixtures changes colour. You may need to add more boiling water if there is no colour change after a few minutes.
6. Record the **colours** of the 5 mixtures in the Results table below.

Results:

Protein blue	Sucrose blue	Glucose red	Starch blue	Water blue
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2. Iodine Test

Method:

1. Squirt 3 drops of each solution into its named square on plastic grid #1.
2. Squirt one drop of **iodine** solution into each square.
3. Record the **colours** of the 5 mixtures in the Results table below.

Results:

Protein yellow	Sucrose yellow	Glucose yellow	Starch black	Water yellow
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3. Biuret test

Method:

1. Squirt 3 drops of each solution into its named square on plastic grid #1.
2. Squirt two drops of **sodium hydroxide** solution into each square.
3. Squirt one drop of **copper sulfate** solution into each square.
4. **Leave** for a few minutes until one of the tubes changes colour.
5. Record the **colours** of the 5 mixtures in the Results table below.

Results:

Protein purple	Sucrose blue	Glucose blue	Starch blue	Water blue
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Summary:

Iodine results	Biuret results	Benedict's results	Proves presence of
yellow	purple	blue	protein
yellow	blue	red	glucose
black	blue	blue	starch

Part 2: using the 3 simple food tests on some common foodstuffs

Method:

1. Divide each food sample into **3 portions**.
2. Place **2 portions** of each food on **plastic grid #2**: carry out the **iodine test** on the first portion, and the **Biuret test** on the second portion.
3. Place the third portions in **separate test tubes**; and carry out the **Benedict's Test** on each.
4. Record your results by placing up to 3 ticks or 1 cross in each box in the table below.

Food substance tested	Does the food go black with iodine?	Does the food go purple with Biuret?	Does the food go red with Benedict's?

apple		X	
banana (ripe)	X	X	
banana (green)		X	X
bread			X
butter	X	X	X
cheese	X		X
eggwhite	X		X
flour			X
honey	X	X	
meat	X		X
milk	X		X
orange		X	
pasta		X	X
potato (raw)		X	X
potato (cooked)		X	X
rice		X	X

Summary/Conclusions:

Foods rich in starch	Foods rich in protein	Foods rich in glucose
banana (green) bread flour pasta potato rice	cheese eggwhite meat	apple banana (ripe) honey orange