WJEC Wales Biology A Level

SP 1.1: Food tests

Practical notes

Introduction

Qualitative tests can be used to identify the presence of a substance in food. You need to be able to use chemical tests for five biological molecules:

- Reducing sugars
- Non-reducing sugars
- Proteins
- Starch
- Lipids (fats and oils)

Equipment

- Test solution
- Benedict's reagent
- 0.5 mol dm^{-3} hydrochloric acid
- Dilute sodium hydroxide solution
- Biuret reagent
- Iodine-KI reagent
- Ethanol
- Distilled water
- 5 boiling tubes
- 2 test tubes
- 3 dropping pipettes
- 4× 5 cm^3 syringes
- Water bath

Risk assessment

Hazard	Risk	Precaution	Emergency
Benedict's reagent	Irritation to eyes	Avoid contact with eyes; wear safety goggles	Flood eye(s) with tap water; seek medical assistance
Hydrochloric acid	Irritation to skin	Wear gloves when handling HCl	Remove contaminated clothing; run the affected area under cold water; seek medical assistance
	Irritation to eyes	Wear safety goggles	Flood eye(s) with tap water; seek medical assistance

Biuret reagent	Irritation to eyes	Wear safety goggles	Flood eye(s) with tap water; seek medical assistance
	Corrosive	Wear gloves when handling reagent	Remove contaminated clothing; run the affected area under cold water; seek medical assistance
Iodine-KI reagent	Irritation to eyes	Wear safety goggles	Flood eye(s) with tap water; seek medical assistance
	Irritation to skin	Wear gloves when handling solution	Remove contaminated clothing; run the affected area under cold water; seek medical assistance
Boiling water	Scalding	Handle boiling water with care; use tongs to transfer boiling tubes; wear safety goggles	Run burn under cold water; seek medical assistance
Ethanol	Highly flammable	Make sure that there are no naked flames in the room	Put out small fires with a damp cloth; evacuate the building

Method

Testing for reducing sugars

1. Add $2cm^3$ of test solution and **Benedict's reagent** to a boiling tube.
2. Heat in a boiling water bath (80°C or higher) for five minutes
3. Remove boiling tube and observe the **colour** of the **precipitate** formed.

Testing for non-reducing sugars

Test the solution for the presence of **reducing sugars**. If no colour change is observed…

1. Add two drops of **hydrochloric acid** to $2cm^3$ of test solution. *HCl hydrolyses the non-reducing sugar's glycosidic bonds, releasing reducing sugars into solution.*
2. Heat the boiling tube in a water bath (80°C or higher) for two minutes.
3. Allow to cool.

4. Add two drops of **dilute sodium hydroxide solution** to the boiling tube. *This neutralises the excess HCl.*
5. Re-test the resulting solution with **Benedict's reagent.**
6. Record the **colour** of the **precipitate** formed.

Testing for proteins

1. Add 2 cm^3 of test solution and **Biuret reagent** to a boiling tube.
2. Shake gently to mix.
3. Record observations.

Testing for starch

1. Add 2 cm^3 of test solution to a test tube.
2. Add two drops of **iodine-KI reagent** and gently mix.
3. Record observations.

Testing for lipids

1. Add 2 cm^3 of test solution to a test tube.
2. Add 5 cm^3 of **ethanol** and shake. Allow the mixture to settle.
3. Take a boiling tube and fill it half full with distilled water.
4. Pour the mixture into the boiling tube.
5. Record observations.

Results

Biological molecule	**Positive test**
Reducing sugars	Colour change from **green** to **yellow** to **orange** to **brown** to **brick red** depending on the quantity of reducing sugar present
Non-reducing sugars	Colour change from **green** to **yellow** to **orange** to **brown** to **brick red** depending on the quantity of non-reducing sugar present
Protein	Colour change from **pale blue** to **purple**
Starch	Colour change from **yellow-brown** to **blue-black** (amylose) or **red-purple** (amylopectin)
Lipids	**White**, **cloudy** emulsion forms