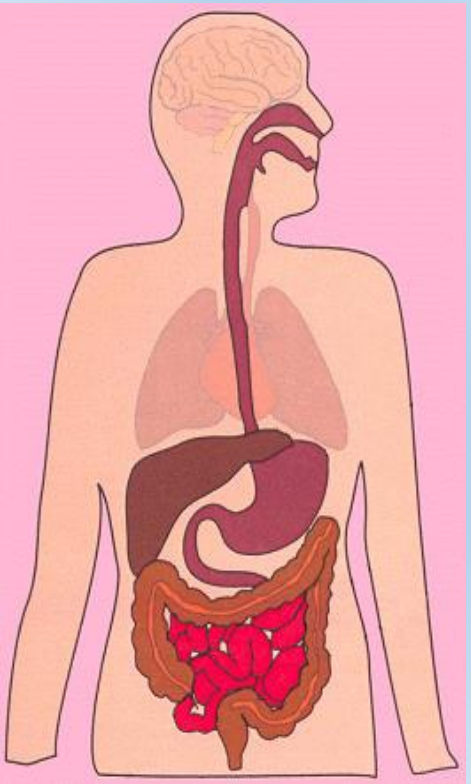
Biology Grade 9

CHAPTER 1: FROM FOOD TO NUTRIENTS: DIGESTION



Activity 1: Our Food

INSTRUCTOR: SUHAIB AUDI

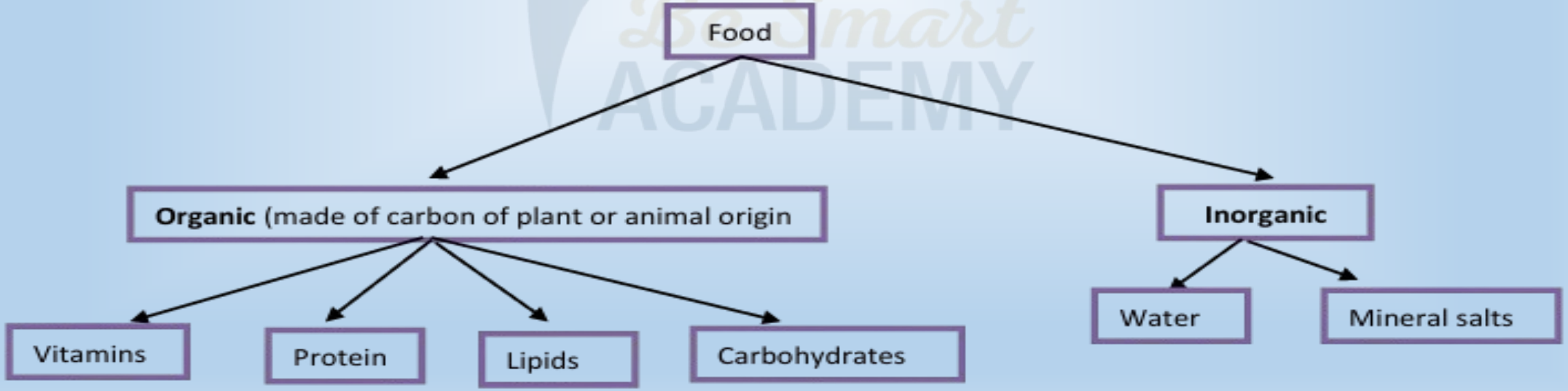
Activity 1: Our Food

Introduction

After digestion, the food transforms into nutrients which gives us the energy we need. The food we consume is often considered as a mixture of different organic and inorganic matter (complex food):

Inorganic food: water and minerals. (They are already simple and don't need any digestion).

Organic food: carbohydrates, proteins, lipids and vitamins. (They need breaking down/ digestion).



Our Food

is formed of

Organic Substances

include

Carbohydrates

like

- Rice
- Potato
- Pasta

include

- Starch
- Sugars

can be

- Reducing
  - Glucose, Maltose, Lactose, Fructose
- Non-reducing
  - Sucrose

Lipids

like

- Butter
- Oil
- Ghee

Proteins

like

- Meat
- Egg
- Fish

divided into

- Proteins
- Amino acids
- peptides

Vitamins

Inorganic Substances

include

Water

Mineral Salts

like

- Calcium
- Magnesium
- Potassium
- Chlorine
- Iron

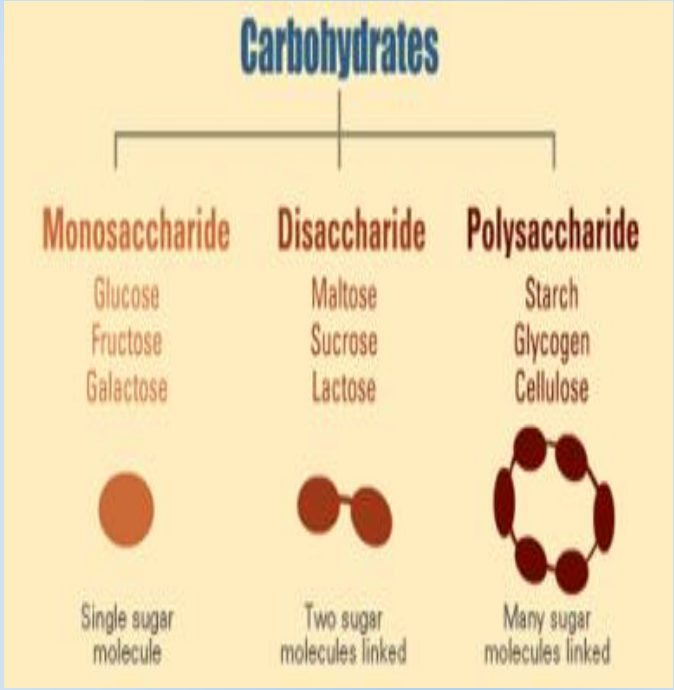
❖ Carbohydrates:

They are energetic foods that include 3 classes:

1- Monosaccharides: are simple sugars. Examples: glucose, fructose, & galactose.

2- Disaccharides: consists of 2 monosaccharides joined together. Example:

- Lactose: made of glucose+ galactose.
- Maltose: made of 2 glucose molecules.
- Sucrose: made of glucose + fructose.



3- Polysaccharides: consist of long chains of monosaccharides.

Example:

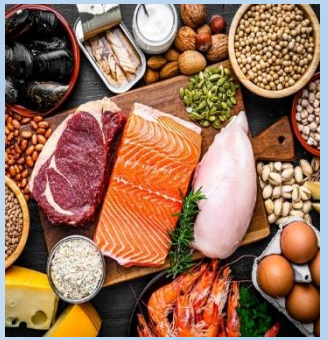
- Starch: made up of repeated glucose molecules.
- Cellulose: made up of long chains of glucose; it forms the plant's cell wall. In humans, it's not digested due to the absence of specific enzymes.

***Mono** means: 1*

***Di** means: 2*

***Poly** means: many (3 or more)*

❖ **Proteins:** are the building blocks of the body. They are made of long chains of peptides joined by a peptide bond.

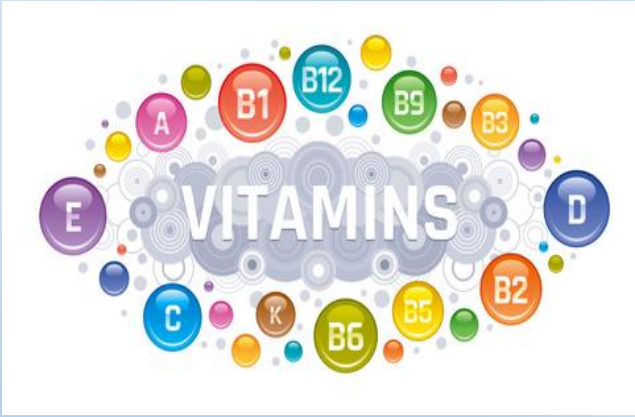


1- Polypeptides: made of many amino acids joined together by peptide bonds.

2- Amino acids: are the simplest unit of proteins.

❖ **Lipids:** are made up of 1 glycerol molecule and 3 fatty acid molecules.

❖ **Vitamins:** are necessary for the different functions of the body: “A” for vision, “D” for bones, “C” for immune system …



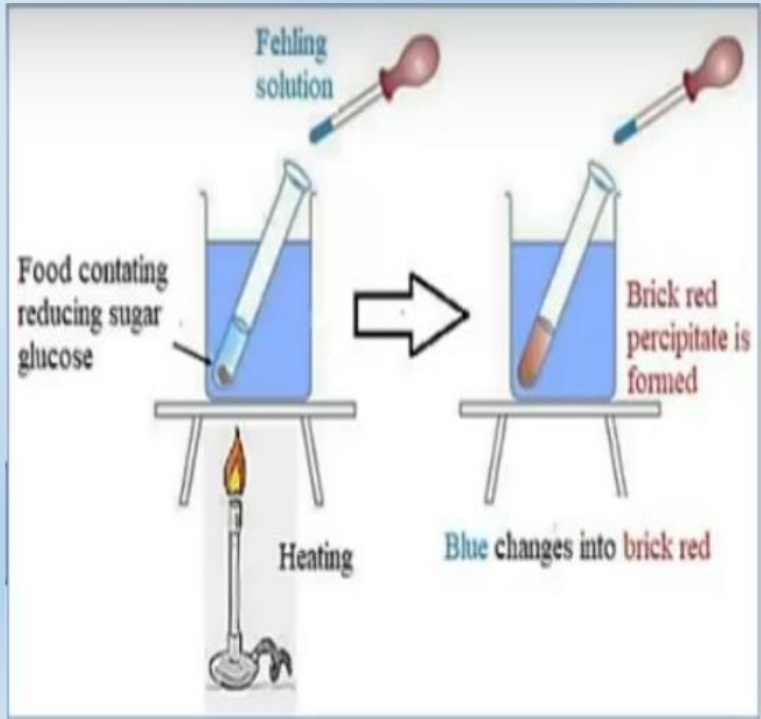
❖ Chemical Tests used for the identification of Carbohydrates (starch and reducing sugar):

1. Iodine test: is a test used to identify the presence of starch.

❑ Notes:

- The iodine solution has a **brown orange color**.
- If a **dark blue** color appears after adding iodine to the food, this indicates the presence of starch in this food.
- **Starch + Iodine solution (Brown orange color) → Dark blue color**

2. Fehling test : is a test used to identify the presence of reducing sugars (simple sugars).



❑ Notes:

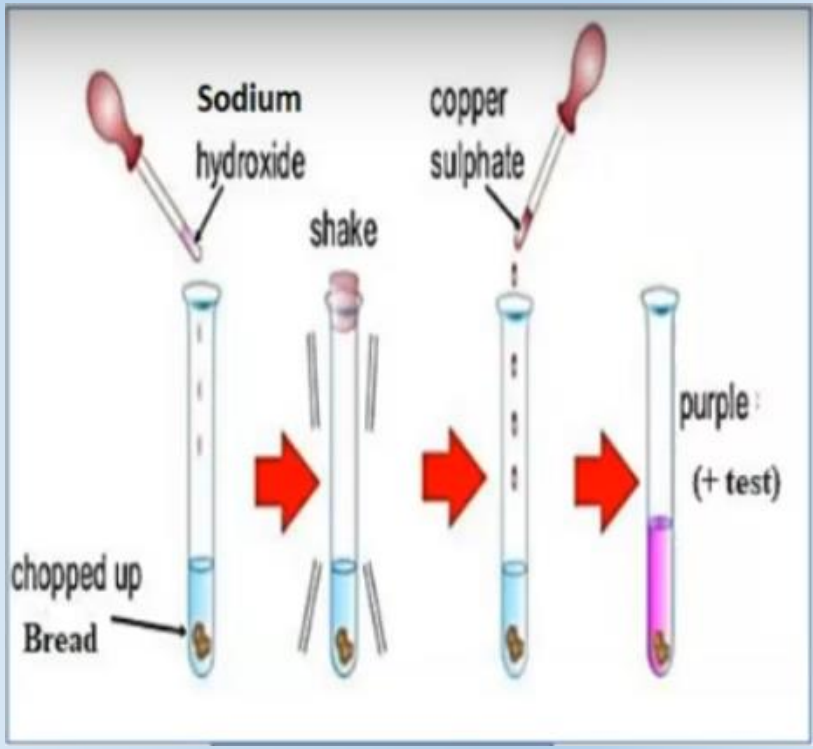
- The Fehling test is performed **with heating.**
- Fehling solution has a **blue color** , if a **brick red precipitate** appears then the food contains reducing sugars.
- **Reducing sugar + Fehling solution (blue color) → Brick-red precipitate.**

❖ Chemical Tests used for the identification of Proteins

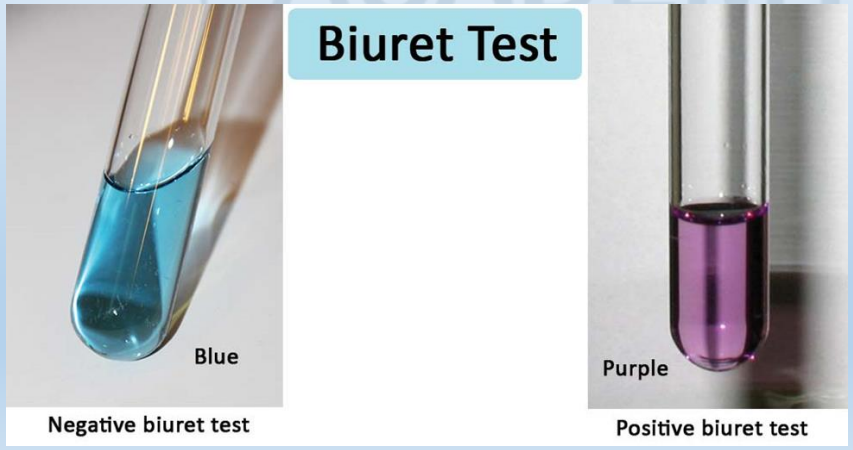
Biuret test: is a test used to identify the presence of proteins.

Notes:

- The Biuret solution formed of (copper sulfate(**blue**)and sodium hydroxide).
- If a **Violet color** appears after adding Biuret solution to the food, **this indicates the presence of proteins in this food.**

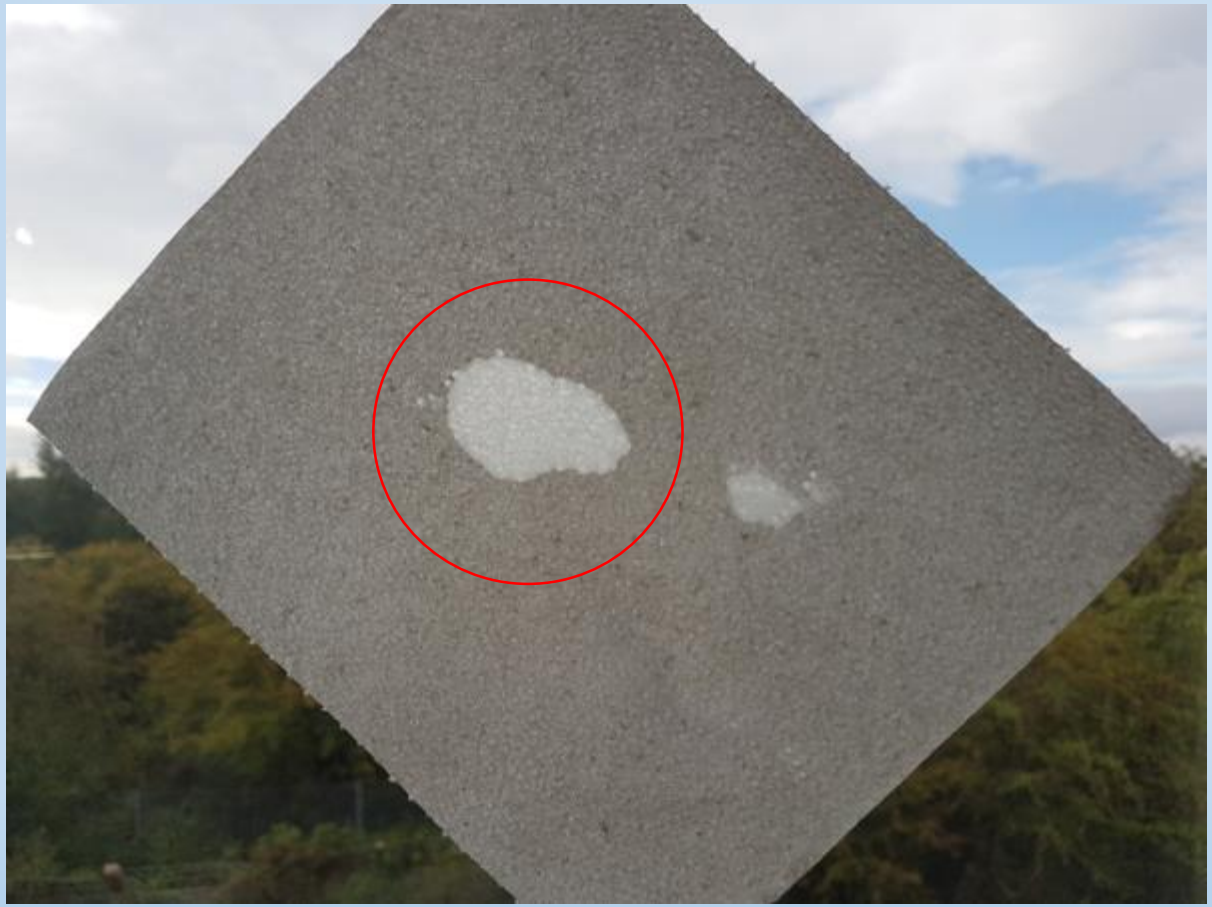


- **Proteins + Biuret solution (blue color) → Violet color**
- The Biuret test is performed without heating.



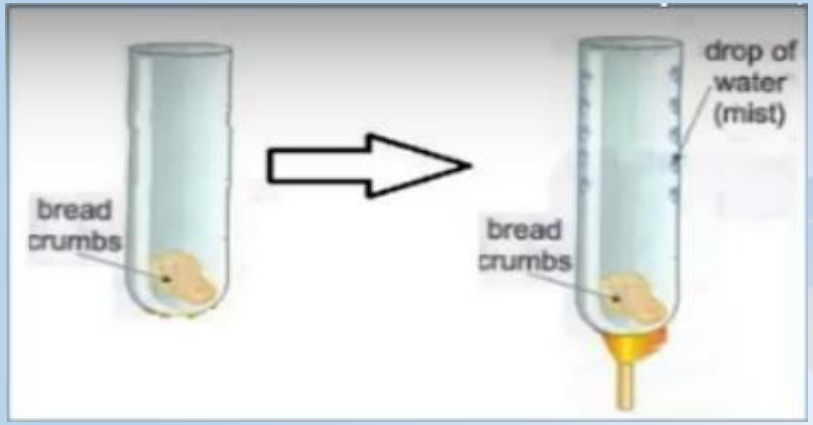
❖ Chemical Tests used for the identification of lipids:

Put or rub the food on piece of paper, presence of **translucent spot** **indicates the presence of lipids in the food.**



❖ Tests to identify inorganic constituents:

1. Test of water

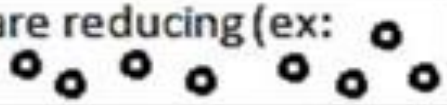
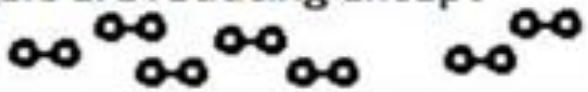
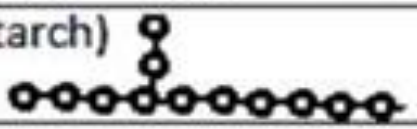
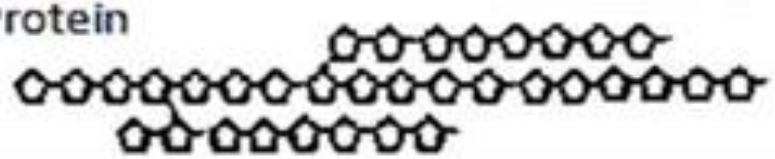
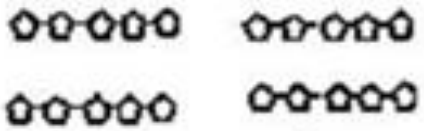


Heating slice of bread in a tube. → Drops of water appeared at the wall of the tube.

2. Test of mineral salts

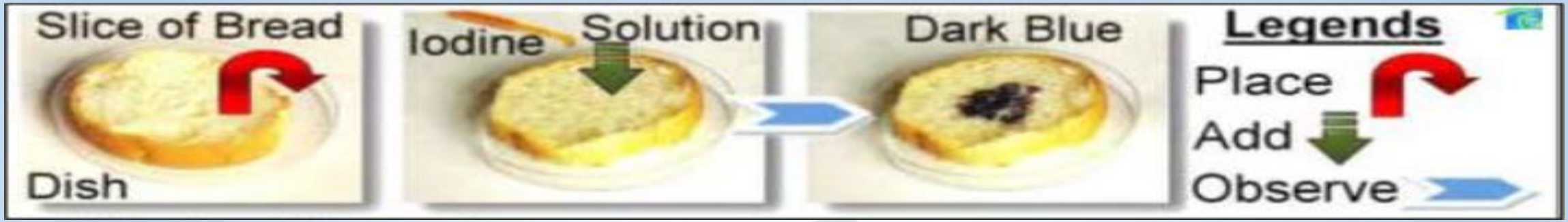
Adding distilled water +bread + **silver nitrate.** → White precipitate of silver chloride obtained after shaking

Summary

kinds of organic foods	classification	Name of the test and its original color	Color of the positive test
Carbohydrates	Simple sugars, all are reducing (ex: glucose, fructose) 	Fehling test / blue	Brick red precipitate under heat
	Double sugars are reducing except sucrose 	Fehling test / blue Except sucrose	Brick red precipitate under heat except sucrose.
	Complex sugars (starch) 	Iodine test / brown orange	Dark blue
Proteins	Protein 	Biuret test (copper sulfate then sodium hydroxide) / blue	Violet
	Peptides 	Biuret test (copper sulfate then sodium hydroxide) / blue	Violet
	Amino acids 	No test	
Lipids	Made up of fatty acids and glycerol 	Paper	Translucent spot

Application:

- Bread is the most basic food in the world that is mainly consumed at every meal. In our research in identifying some of its organic constituents, we conduct the following experiment:



1. Indicate the objective of this experiment.

To identify some of the organic constituents of bread.

2. Describe the given experiment.

A slice of bread was **placed** on a culture dish then iodine solution was **added**. At the end, dark blue color was **observed.**

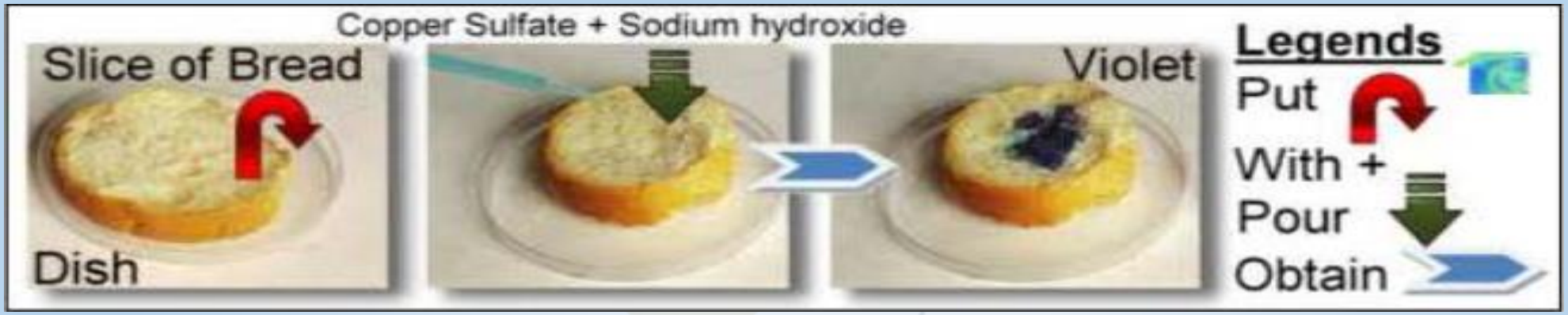
3. Analyze the given experiment.

Dark blue color was observed on a slice of bread **after** adding iodine solution to it.

4. Derive a conclusion.

We conclude that bread contains starch.

- Many scientists suppose that bread contains proteins. In order to verify this hypothesis, we conduct biuret test by adding CuSO4 and NaOH.



4. Pick out the studied hypothesis.

Hypothesis: Bread contains proteins.

5. Describe the given experiment.

A slice of bread was **put** in a culture dish. Then, copper sulfate with sodium hydroxide were **poured** on it. Finally, a violet color was **obtained.**

6. Deduce the organic constituent of the bread.

Since violet color was observed at the slice of bread after pouring on it, copper sulfate with sodium hydroxide, we deduce that bread contains proteins.

❖ Tests to identify inorganic constituents:

7. Indicate the significance of each of the following experiments.

Exp	Variable	Result	Indicate the...(Significance)....
1	Heating slice of bread in a tube.	Drop of water appeared at the tube.	..... **Presence of water** .....
2	Adding distilled water +bread + silver nitrate.	White precipitate of silver chloride obtained after shaking.	..... **Presence of mineral salts.** .....

8. "Bread is a complex food". Justify this statement.

Since bread contains more than one type of food such as starch, protein, water and mineral salts. Thus bread is a complex food.