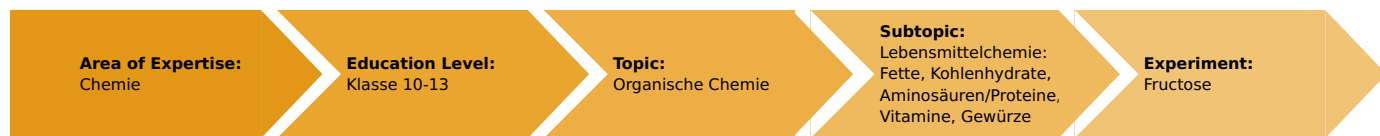


Fructose (Item No.: P7187000)

Curricular Relevance



Difficulty



Intermediate

Preparation Time



10 Minutes

Execution Time



20 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

carbohydrates, fructose

Task and equipment

Information for teachers

Additional Information

Fructose occurs naturally in many fruits but also in honey. Fructose is therefore referred to as fruit sugar. Sucrose (table sugar) is composed of one molecule of glucose and one molecule of fructose.

Learning objectives

- The reactive group of fructose is a keto-group, whereas that of glucose is an aldehyd-group.
- Fructose can be detected by means of the Seliwanow reaction.
- The monosaccharide fructose is contained in sweet fruits and honey.

Notes on the method

By the preparation of a check list for sucrose, the differing properties of mono- and di-saccharides can be illustrated. The use of formulas is dependent on the state of knowledge of the students. the learning objectives can also be achieved by using simplified symbols.

Fundamentals and remarks

Fructose is the sugar with the greatest sweetening power. It is won from sucrose by inversion and the removal of glucose. Fructose is metabolized quickly and independently of insulin, and has hardly any influence on the blood level. Fructose is therefore used to produce diabetic foods.

As fructose is difficult to crystallize and is hygroscopic, it is handled as a syrup.

Hints on going deeper

- Carry out the detection and orange sugars in ketoses and aldoses on fruits, honey and sweets.
- Differentiation of different sugars in aldoses and ketoses.

Notes on the set-up and procedure

Preparation:

The experiment can also be carried out with solutions containing fruit sugar, such as fruit juices, honey or invert sugar solutions.

Notes on the students experiment:

A good differentiation between fructose and glucose is only possible when a small amount of resorcinol is added. Should the water in the hot water bath not be hot enough, it must be re-heated.



Hazard and Precautionary statements

Resorcinol

H302:	Harmful if swallowed.
H315:	Causes skin irritation.
H319:	Causes serious eye irritation.
H400:	Very toxic to aquatic life.
P273:	Avoid release to the environment.
P302 + P352:	IF ON SKIN: Wash with soap and water.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing.

Hydrochloric acid:

H290:	May be corrosive to metals.
H314:	Causes severe skin burns and eye damage.
H335:	May cause respiratory irritation.
P234:	Keep only in original container.
P260:	Do not breathe dust/fume/gas/mist/vapours/spray.
P303 + P361 + P353:	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing.
P309 + P311:	IF exposed or you feel unwell: Call a POISON CENTER or doctor/physician.

Hazards

- Hydrochloric acid irritates the respiratory organs, eyes and skin.
- Resorcinol is harmful to health when swallowed or on contacting skin.
- Do not allow the chemicals to make skin-contact.
- Wear protective gloves and protective glasses.

Waste disposal

Pour the solutions to drain.

Fructose (Item No.: P7187000)

Task and equipment

Task

How do fructose and glucose differ?

Detect fructose with the Seliwanow reaction!



Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
3	Ring with boss head, i. d. = 10 cm	37701-01	1
4	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
5	Glass beaker DURAN®, short, 400 ml	36014-00	1
6	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
7	Test tube, 180x18 mm,100pcs	37658-10	(2)
8	Test tube holder, up to d 22mm	38823-00	1
9	Test tube brush w. wool tip,d25mm	38762-00	1
10	Wash bottle, 250 ml, plastic	33930-00	1
11	Pipette with rubber bulb	64701-00	1
12	Spoon, special steel	33398-00	1
13	Labor pencil, waterproof	38711-00	1
14	Protecting glasses, clear glass	39316-00	1
15	Rubber gloves, size S (7)	39325-00	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	D-fructose -laevulose- 25 g	30128-04	1
	Resorcin,recryst. 50 g	30209-05	1
	D(+)-glucose 1000 g	30237-70	1
	Water, distilled 5 l	31246-81	1
	Hydrochloric acid 25% 1000 ml	31822-70	1
	Boiling beads, 200 g	36937-20	1

Set-up and procedure

Set-up

Hazards

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Setup

Number two test tubes from 1 to 2 and stand them next to each other in the test tube rack (Fig. 1).



Fig. 1

Assemble the stand as shown in figures 2 to 6. Fasten the support ring to the support rod and place the wire gauze on it. Adjust the height of the support ring so that the flame of the burner just reaches the wire gauze.



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6

Half-fill a 400 ml beaker with water and add a few boiling stones (Fig. 7). Heat it to boiling, then put it aside. Extinguish the bunsen burner flame!



Fig. 7

Procedure

Put a spatula tip of fructose in test tube 1, and the same amount of glucose in test tube 2. Fill both test tubes up to a height of 4 cm with distilled water (Fig. 8) and dissolve the sugars.



Fig. 8

Add a crystal of resorcinol and a few drops of hydrochloric acid to each test tube (Fig. 9).



Fig. 9

Place the test tubes in the beaker containing hot water.

Waste disposal

Pour the solutions to drain.

Report: Fructose

Result - Observations

Note your observations.

- a) Test tube 1: Fructose
- b) Test tube 2: Glucose

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Evaluation - Question 1

Draw conclusions from your observations.

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Evaluation - Question 2

Fill in the check lists for fructose and glucose and draw their structural formulas.

Name (chemical)	Fructose	Glucose
Name (trivial)	1	1
Reactive groups	1	1
Empirical formula	1	1
Component of	1	1

Evaluation - Question 3

Sketch the structural formulas of fructose and glucose.

Evaluation - Question 4

Name foods which contain fructose!

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Evaluation - Question 5

Complete the following statements:

1. Fructose has as group the-group. It is classed as a
2. Fructose reacts very rapidly with on the addition of acid to a
3. With glucose, a is first formed, which requires some time to