



Sugars are a rich **source of energy**. That is why they are among the most important nutrients for human beings. Sugars are produced in green plants via **photosynthesis** which requires *carbon dioxide* (from the air) and *water* (from the soil).

### Classification :

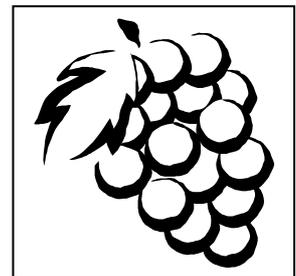
simple sugars ( <i>monosaccharides</i> )	,double sugars' ( <i>disaccharides</i> )	complex sugars ( <i>polysaccharides</i> )
glucose (grape sugar/dextrose), fructose (fruit sugar)	saccharose (beet sugar), maltose (malt sugar)	starch, cellulose

**glucose:** occurs *in grapes*, in *sweet fruit* and in *honey*. Blood contains about 0.1% of glucose; the disorder interfering with sugar balance in blood is known as diabetes.

In foodstuff glucose is often used as *syrup* (sweets, creamy chocolate 'Nougat', candied fruit)

*Ascorbic acid (vitamin C)* is made from glucose.

In medicine, *infusions* of glucose solution are used for artificial feeding and states of exhaustion.



**fructose:** very similar to glucose; occurs in *very sweet fruit* and in *honey*.

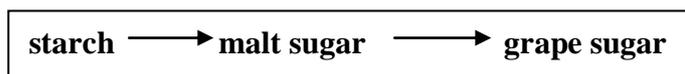
**saccharose:** commonly known as *crystal sugar* or *cube sugar*; is produced from *sugar beet*.

**maltose:** is formed during the *breakdown of starch*; important for the production of *beer*; compare *malt sugar*!

**starch:** many glucose molecules form one *giant molecule* of starch. Starch occurs in *grain*, *rice*, *potatoes*, *flour*, *bread*.

**cellulose:** composed of many glucose molecules; Cellulose is an important skeletal substance in plants (cotton, vegetables) and roughage (fibre) in nutrition.

### Breakdown (decomposition) of starch



cellulose / cotton wool  
fructose    saccharose  
starch / flour    maltose  
glucose

## Experiments

**E 1: Taste the types of sugars** handed out and write the names down in a sequence (from the least sweet to the sweetest sugar).

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Heat some *glucose*, *saccharose*, *starch* and *sweetener* on a magnesia trough. What does it smell like? \_\_\_\_\_

**E 2: Testing for simple sugars by heating with *Fehling's solution*:**

Mix equal amounts of the two reagents *Fehling's solutions I* and *II* and add some *glucose*. Heat solution at 80° C (water bath) for about three minutes. Repeat the procedure with *starch* and *sweetener*.

**observation:**

test 1 (glucose) \_\_\_\_\_

test 2 (saccharose/ sweetener) \_\_\_\_\_

test 3 (starch) \_\_\_\_\_

**E 3: 'silver mirror reaction'**

In a dry test tube put some silver nitrate ( $\text{AgNO}_3$ ) and add a few drops of ammonia. Then pour some glucose solution into the same test tube. **Do not shake!**

Pass the test tube through the flame of the burner. **AVOID heating to the BOIL!**

**observation:**

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**E 4: Testing for starch with a solution of iodine: 'iodine colour reaction'**

Put some drops of iodine solution on foods containing starch (flour, bread, rice, potatoes).

**observation:**

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What's the difference in the way that a *raw potato* and a *cooked potato* react to the test above? Try to explain that difference!

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**E 5: Enzymatic splitting of starch by saliva:**

Chew a piece of roll as long as possible. Take some of the mush, add *Fehling's solution I* and *II* and heat carefully!

**observation:**

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