CARBOHYDRATES



There are 3 categories of Carbohydrates

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Functional Properties of Starch

Gelatinisation

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Starch is a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and found in grains such as rice, wheat and vegetables such as cassava and potatoes.

Gelatinisation is defined as: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

This process takes place regardless of the type of **\_\_\_\_\_\_\_\_**. The physical qualities of the gel produced, however, are determined by the ratio of **\_\_\_\_\_\_\_\_\_\_\_\_\_** to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and the method used to prepare the food.

What are the three most common ingredients used to thicken liquids in a domestic kitchen?

Which starch is used in the hospitality industry to thicken liquids and why?

**Factors that affect gelatinisation of starch**

The functional properties of carbohydrates are affected by changes in temperature, pH, agitation and the presence of other ingredients

**Temperature**

Gelatinisation requires **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. Starch is not soluble in cold water therefore cannot **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. To absorb liquid the outside of the starch granule needs to be softened by heating it to **\_\_\_\_\_\_\_\_**C, this allows it to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. At 86-90C the swollen starch granules burst and the amylose and amylopectin they contain are released, capturing the liquid and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

What will happen if the mixture is not boiled for 1 minute before serving?

How should the sauce look if it is successfully gelatinised?

When a gelatinised mixture cools, it forms a more rigid **\_\_\_\_\_**. Some cold gels such as custard made from custard powder, rupture and ‘weep’ liquid when **\_\_\_\_\_** or **\_\_\_\_\_\_\_\_**.What happens when gels are reheated? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

What is a roux?

**Agitation**

Agitation is essential for the creation of a smooth, gelatinised sauce. Gelatinisation takes place within a specific temperature range in the presence of liquids. What happens if only some of the starch granules are exposed to the liquid? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

How can you prevent lumps forming in a sauce thickened with starch?

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Starch is **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in cold water

**The impact of other ingredients and pH**

The gelatinisation process can be affected by several additives, particularly sugar and acid.

**\_\_\_\_\_\_\_\_\_** competes with **\_\_\_\_\_\_\_\_** for water, so not as much water is available for the starch to absorb. Sugar **\_\_\_\_\_\_\_\_\_** the temperature at which the starch granules start gelatinising, making the mixture more liquid and less likely to remain **\_\_\_\_\_\_\_\_**.

What affect does acid have on starch mixtures?

What are the important features of a roux?

What effect does sugar have on a starch mixture?

Dextrinisation

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Dextrinisation is defined as:

One of the most common examples is:

The polysaccharide starch can undergo a partial chemical breakdown into shorter glucose chains called **\_\_\_\_\_\_\_\_\_\_\_\_\_**.

Dextrins are the halfway point in the complete breakdown of a starch molecule into the monosaccharide glucose. Complete the table below to show this process

|  |  |  |  |
| --- | --- | --- | --- |
| Starch |  |  | Glucose |
|  |  | (disaccharide) |  |

List the differences between dextrins and starch:

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Dextrinisation can be caused by:

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Dextrinisation is the reason for:

* Gravies being brown
* Bread turning brown when toasted
* Toasted commercial breakfast cereals being brown and sweeter than raw cereals
* The brown crust forming on baked starchy vegetables such as potatoes and carrots



Functional Property of Pectin

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Pectin is a polysaccharide found in the liquid extract of many fleshy fruits, it is responsible for:

Fruits high in pectin include:

What must be present for pectin to gel? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

When making jams the pectin dissolves in water and the sugar and boiling process reduces the liquid and a gel results on cooling.

Functional Properties of Sucrose

Crystallisation

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Crystallisation is a functional property of sugar related to its ability to \_\_\_\_\_\_\_\_\_\_\_ and reform crystals. Sucrose which is derived from cane sugar is easily dissolved in water. Where is this property used? **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

How does this process occur?

The four factors that affect the crystallisation process can be summarised as follows:

* **Temperature**: The **\_\_\_\_\_\_\_\_\_**the temperature is, the **\_\_\_\_\_\_\_\_\_\_** the number of crystals that will form, hence the greater solidity of the final product
* **Acidity**: Disaccharides are formed when two monosaccharide’s chemically join to create a new sugar molecule. Acid such as **\_\_\_\_\_\_\_\_\_\_\_\_** splits the bond joining the disaccharide, creating separate monosaccharide’s which crystallise less readily than disaccharides and so inhibit the development of large crystals in a solution, this gives the confectionary a **\_\_\_\_\_\_\_\_\_\_\_** texture
* **Agitation**: Stirring sugar solutions **\_\_\_\_\_\_\_\_\_\_\_\_\_** crystals to develop. If a solution is stirred while hot, crystallisation starts too soon, giving the product a \_\_\_\_\_\_\_\_\_\_\_ texture. It is essential that a sugar is stirred into a liquid and fully dissolved before the mixture boils. Stirring after boiling point is reached **\_\_\_\_\_\_\_\_\_\_** crystals to form
* **Presence of other ingredients** such as **\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_**.

Caramelisation

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Sucrose melts at**\_\_\_\_\_\_\_**. Above that temperature, acids form and the molten sugar turns a light **\_\_\_\_\_\_\_\_**, or caramelises which adds flavour to foods. If the heat is not removed, the liquid sugar becomes darker and darker until it is black. This process happens without water as it has been evaporated during the cooking process.

Summary