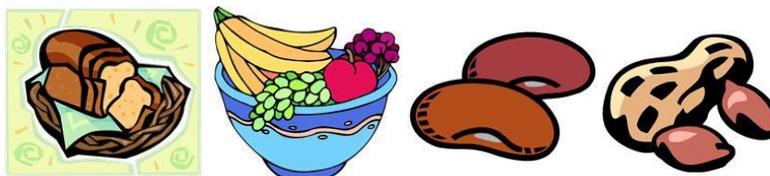


Chemistry of Baking

carbohydrate: a molecule composed mainly of carbon, hydrogen, and oxygen; these molecules can be linked together in small groups or large groups. Food sources like whole grains, fruits, legumes (beans) and nuts are dietary sources of carbohydrates.



sugar molecule: the basic building block of simple sugars, complex sugars, starches, and other carbohydrates. The single sugar unit is a ring of carbons, which can have between 3 and 7 carbons in a ring, with a 6 carbon ring being the most common. Sugar names usually end with “ose”, like glucose, fructose, etc.

simple sugar: a single sugar molecule – commonly called a monosaccharide (mono means “one”). These simple sugar molecules contain a carbon ring, with 3 to 7 carbons. Examples: glucose (or dextrose), levulose, and fructose

glucose: the most common simple sugar, a six sided ring with a total of 6 carbons.

invert sugar: a mixture of equal amounts of two simple sugars; for example, a mixture of dextrose and levulose.

complex sugar: double sugar or disaccharide (di means “two”). Two sugar molecules that are connected together. Examples: maltose, sucrose, lactose

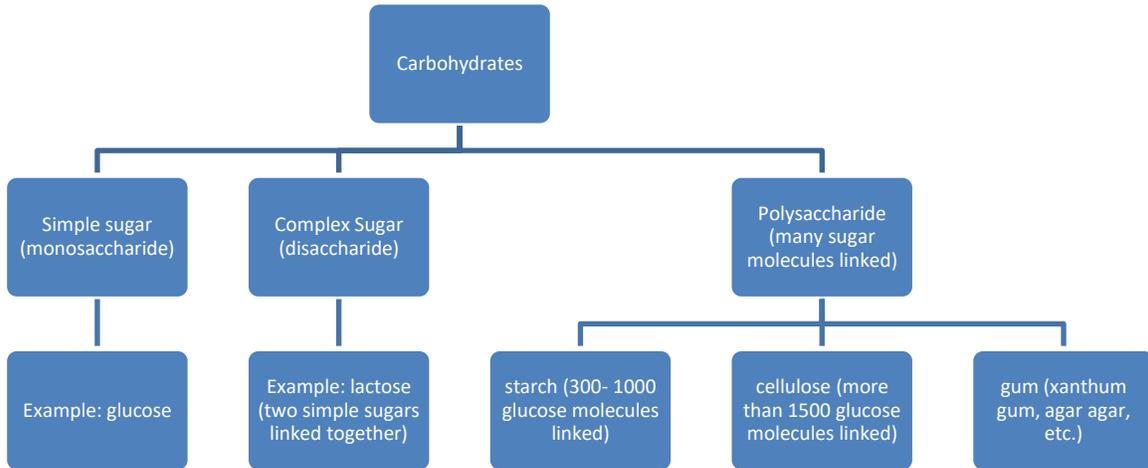
sucrose: the chemical name for sugars made from sugarcane or beets (table sugar). It is a type of complex sugar.



starch: multiple sugars linked together. When starch comes into contact with water, it absorbs water and grows larger in size.

pentosan: A type of carbohydrate made of long chains of rings containing five carbons (pentoses). Pentosans are a type of gum present in wheat flour. “Gum” refers to a chemical that comes from a plant that stabilizes, thickens, or causes gelling of a liquid.

Another word for carbohydrates is saccharides. The diagram below shows how many of the above words are related.

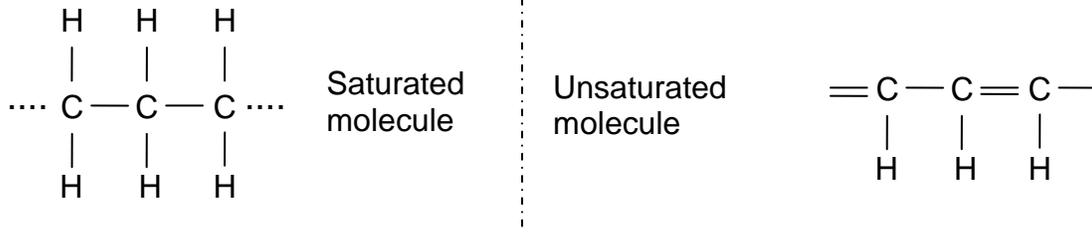


emulsion: when two compounds or substances that would normally stay separate (like oil and vinegar) are combined into a single mixture with no separations. If you add mustard to oil and vinegar and shake it, it becomes a single solution. Mustard in this case is the emulsifier; it causes emulsion.

fats: molecules made up of three fatty acid chains attached to a glycerine molecule. The chains are long, made up of carbon and hydrogen atoms linked together. At the end they have a carbon and two oxygen atoms which are the “acid” part of the molecule. Fats can be a solid or a liquid, depending on their molecular structure (saturated versus unsaturated).

saturated: when carbons connect to each other in a chain with single bonds and fill up all the rest of the spaces that are open for bonding with hydrogen atoms, a molecule is called saturated. (saturated means “full of”) This word can be used to describe types of fats. Saturated fats are solids at room temperature.

Examples of saturated fats: coconut oil, butter



unsaturated: when carbons connected to each other in a chain have more than one bond between them; this means fewer hydrogen atoms can be attached and it is called unsaturated. (unsaturated means “not full of”) This word can be used to describe types of fats. Unsaturated fats are liquids at room temperature, usually called oils. Examples of unsaturated fats: canola oil, sunflower oil.

hydrogenation: this changes unsaturated molecules into saturated molecules by



taking away the extra bonds between carbons and opening up space for hydrogen atoms to bond to the carbon atoms. This process can make a fat softer, more mouldable, and have a lower or higher melting point. This also makes fats last longer since a saturated fat is more stable than an unsaturated fat. Examples of hydrogenated fats: shortening, margarine

gluten: when the two proteins from flour (glutenin and gliadin) combine with water, they form an elastic material which can be easily stretched and pushed together. When bread rises, the gluten gives bread structure while allowing it to expand and stay together.

enzyme: a protein that speeds up a reaction. Any molecule that makes a reaction go faster, and is there at the beginning and end of a reaction is called a catalyst. Enzymes are a type of catalyst. They target certain reactions. This means that an enzyme that helps one reaction go faster would not help all reactions go faster. Usually, enzymes break down big molecules into smaller molecules. Molecule names that end with the suffix "ase" are enzymes.

amylase: the enzyme that speeds up the breakdown of starch into simple sugars. Found naturally in flour and in higher concentrations in malt barley.

diastase: another word for amylase, more commonly used by bakers.

leavening: the process of making or adding in gases to a baked product to increase the size of the product and give it shape and texture.

fermentation: the process where enzymes change sugars into carbon dioxide gas and alcohol.

yeast: a plant that provides the enzymes to break down complex sugars into simple sugars, or simple sugars into carbon dioxide and alcohol. The carbon dioxide provides the leavening action that makes baked goods rise.



glucose

chemical leavener: a chemical that releases gases (like carbon dioxide) when it reacts and makes baked goods rise. Examples: baking soda, baking powder, baking ammonia.

gelatin: a protein taken from animal tissues that dissolves in water. It is used to thicken or solidify liquids.

pectin: a type of gum that is naturally present in fruits. Used to thicken or gel fruit preserves, jams, and jellies.

