

# Differences Between Salt & Sugar Crystal Shapes

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When you accidentally spill some salt in your sugar, it can be difficult to tell which is which. On the molecular level, however, there are multiple differences between salt and sugar crystals. The crystals that these two molecules can form are actually quite beautiful when experimented upon and have been used to teach the concept of molecular shape in science classes.



## Shape

- The shape of salt crystals is a six-sided cube similar to a dice. Sugar crystals on the other hand resemble a hexagonal prism. The edges of sugar crystals are often more sharp. The shape of sugar crystals can be estimated from looking at a piece of rock candy, which consists of many sugar crystals grown and bonded together. Occasionally, salt and sugar will look similar under a microscope, but this is typically because of broken or bonded crystals.

## Reason

- Salt takes on a cube-like shape because of the way that its molecules are bonded together. The ionic bonds of salt are very specific requiring one metal and one non-metal and this causes the molecule to be arranged in a regular and repeating crystal. Similarly, the shape of a molecule of sugar is similar to a hexagon, but since it is not as particular about its bonding, this leads to sharper edges and a less regular shape.

## Other Differences

- The color of salt and sugar crystals is also slightly different though they both look similar when viewed without a microscope. Sugar crystals tend to be sparkling and clear. Salt crystals are duller and have a sort of frosted or white color. The taste difference between the two crystals is the most easily discernible trait that sets the two crystals apart.

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# The Differences Between Salt & Sugar

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While sugar and salt may look similar, they are quite different. Various sugars are naturally occurring, but the term "sugar" usually refers to sucrose, which is a disaccharide made of glucose and fructose. Similarly, there are many different kinds of salt, but the word "salt" usually refers to table salt, which is a lattice structure of sodium and chloride ions held together by hydrogen bonds.

## Chemical Composition

- The chemical formula of sucrose is  $C_{12}H_{22}O_{11}$ , meaning that each molecule of sucrose has 12 carbon atoms, 22 hydrogen atoms and 11 oxygen atoms. The atoms come from one monomer of glucose plus one monomer of fructose. These two monosaccharides are connected by a glycosidic bond. The chemical formula for table salt, otherwise known as sodium chloride, is  $NaCl$ . Knowing that sodium chloride is a salt as opposed to a molecule like sucrose, this chemical formula tells us that table salt is a lattice structure composed of sodium cations and chloride anions arranged in a 1:1 ratio. Sodium chloride is held together by hydrogen bonds as opposed to molecular bonds.

## Sources

- The main sources of sucrose are sugar cane and sugar beet. Other sources include sugar maples and sorghum. The primary sources of table salt are brine and naturally occurring rock salt, which is also known as halite. The United States is the largest producer of sodium chloride.

## Uses

- Both sucrose and salt are used for human consumption. We are hardwired to like the taste of sweet and salty foods because our bodies need sugars and salts to survive. Like most carbohydrates, sucrose contains a lot of energy stored in its molecular bonds. Our bodies are able to break down sucrose and release this energy. When we eat salt, it naturally dissolves into sodium and chloride. Sodium chloride can also be useful in industry, as many industrial products require chlorine.

## Health Effects

- While our bodies certainly need sugar and salt, too much of a good thing can be unhealthy. Consuming too much sugar can lead to tooth decay because the bacteria that live on the surfaces of our teeth metabolize sugar in such a way as to produce an acidic by-product. This acid breaks down the enamel in our teeth. Because sucrose contains so much energy, over-consumption of it can lead to weight gain. Over-consumption of salt can lead to high blood pressure, fluid retention and certain metabolic disturbances.