Baking bread may seem like a very simple process. It’s a combination of only four different ingredients: flour, water, yeast, and salt. However, there’s a lot of science in how these four ingredients interact, and how varying them varies the bread’s characteristics.

**THE CHEMISTRY OF BREAD-MAKING**

**FLOUR, WATER & SALT**
- **PROTEINS**: Specifically glutenin and gliadin
- **STARCH & SUGAR**: Composed of many sugar molecules stuck together
- **ENZYMES**: Flour contains starch, long chains of connected sugar molecules. Amylase converts starch to maltose; maltase in yeast converts this to glucose. Along with other sugars, this can be used by the yeast for fermentation, and is also involved in the flavour-forming browning reactions that help to form the bread’s crust.

**STARCH & SUGAR**
- **STARCH**: Viscoelastic network that traps gas
- **GLUCOSE**: Used by yeast for fermentation.

**YEAST & FERMENTATION**
- **YEAST**: Yeast are single-celled fungi that help convert sugars in the bread mix into carbon dioxide. The bubbles of carbon dioxide formed cause the bread to rise; kneading makes their size more uniform. Sour dough breads contain both bacteria and wild yeasts. The lactic acid produced by bacteria can sometimes give a sour taste.

**OTHER INGREDIENTS**
- **FATS**: Weaken the gluten network, giving a softer bread. Also stabilise gas bubbles, increasing loaf volume.
- **SALT**: Adds flavour to bread, slows dough fermentation, strengthens gluten structure, makes dough more elastic.
- **NaHCO₃ (Baking Soda)**: Sodium bicarbonate. Combined with moisture and acidity, produces carbon dioxide, which can help bread rise. Can cause bitterness.
- **NaHCO₃ + CREAM OF TARTAR**: Also sodium bicarbonate, but with cream of tartar (potassium bitartrate), an acid ingredient that activates the bicarbonate.
- **ASCORBIC ACID**: More commonly known as vitamin C, it helps to strengthen the dough’s gluten network.
- **XANTHAN GUM**: Used in the production of gluten-free breads.

**THE ROLE OF SALT**
- **ADDS FLAVOUR TO BREAD**
- **SLOWS DOUGH FERMENTATION**
- **STRENGTHENS GLUTEN STRUCTURE**
- **MAKES DOUGH MORE ELASTIC**