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The Chemistry of Cooking

Cooking is actually just a bunch of chemical reactions. These reactions change the food as ingredients mix. Changes happen when chemical bonds are broken and new bonds form. A **chemical bond**¹ holds **atoms**² together to make **molecules**³. This bond usually happens when atoms share or transfer **electrons**⁴. For example, a water molecule is made up of two hydrogen atoms and one oxygen atom.

The oxygen shares one electron with each hydrogen, forming a single bond with each of them.

Did You Know?

Our ancient ancestors, *Homo erectus*, may have used fire to tenderize meat 1.8 million years ago.



Marinades help tenderize and flavor meat while keeping it from drying out.

Marinades

One of the reasons we cook meat, besides to kill any dangerous germs, is to make it softer so we can chew it. To do this, the **collagen proteins**⁵ in its **connective tissues**⁶ (which makes it tough and difficult to chew) must be broken down. Heat can do this. Collagen begins to dissolve at around 71°C. But it can take days to **tenderize**⁷ the meat enough. It will dry out in that time. Marinades help here. One way to

keep meat from drying out while making it tender and flavorful is to marinate it.

Ecobottle Sample



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¹ **Chemical bond:** a bond that holds atoms together to make molecules.

² **Atoms:** the smallest form of a chemical element (such as hydrogen, oxygen, or carbon).

³ **Molecules:** groups of atoms bonded together.

⁴ **Electrons:** tiny particles that are part of atoms and have a negative charge.

⁵ **Collagen proteins:** proteins that hold tissues together.

⁶ **Connective tissues:** tissues that help the body and organs keep their shape.

⁷ **Tenderize:** soften.

Another type of marination is **enzymatic marination**⁸. **Enzymes**⁹ found in some roots, leaves, and fruits **denature**¹⁰, or break down, protein bonds in meat. If you over marinate with enzymes, however, you can end up without any food. If given enough time, enzymes can fully break down meat.

Baking bread

Wheat flour has proteins called gliadin and glutenin. When put in water, they bond to form a web of protein called **gluten**¹¹. Gluten holds the bread together. Bread will make gluten when you knead it or autolyze it. **Kneading**¹² denatures the gliadin and glutenin bonds, so they can form new bonds as gluten. The more you knead,



Kneading helps form gluten to hold bread together.

the more bonds will form. You can feel this as the dough gets firmer and less sticky. To **autolyze**¹³ dough, let it rest for a while. Enzymes do the denaturing that allows gluten bonds to form. This reaction is completed with baking. At about 140° Fahrenheit, heat causes the proteins to solidify, producing the form that gives the bread its shape.

Ecobottle Sample



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Popcorn

Popcorn pops because of water vapor. About 13.5% of a popcorn kernel is water. Its hull is sealed around the corn within. When popcorn is heated, the water inside boils and turns into steam. The steam expands, creating high pressure within the sealed hull. At 180°C, the pressure has risen to almost 1000 kilopascals (kPa). Standard atmospheric pressure, which we feel all the time, is around 100 kPa. The hull can't withstand such high pressure and the kernel explodes.

⁸ **Enzymatic marination:** marinating with enzymes.

⁹ **Enzymes:** substances that make chemical reactions go faster.

¹⁰ **Denature:** break down.

¹¹ **Gluten:** a web of protein that holds bread together.

¹² **Kneading:** repeatedly working dough by folding it over and pushing it down on a hard surface

¹³ **Autolyze:** to allow enzymes to denature protein bonds

Reading Comprehension Questions

1. What is a
2. What does marinating do to meat?
3. What are
4. What are
5. What does
6. Why does popcorn pop?

Extension Questions

7. The breads we
8. Animals eat their meat raw but raw meats can make humans very sick. Why do animals not need to cook their food while humans do?

Ecobottle Sample



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References

- Chattman, L. (2011) *Bread making: A home course: Crafting the perfect loaf, from crust to crumb*. North Adams, MA: Storey Publishing.
- Dictionary.com. (2016b). Bond. Retrieved 17 June 2016 from: <http://www.dictionary.com/browse/bond>.
- Durham, S. (2010). USDA Scientists Produce Palatable Gluten-Free Bread. *Journal of Cereal Science - News*. Retrieved 27 July 2017 from <https://www.journals.elsevier.com/journal-of-cereal-science/news/usda-scientists-produce-palatable-gluten-free-bread>.
- Fawcett, D.W. (2007). Connective tissues. *Science*. Retrieved 29 August 2017 from <https://www.britannica.com/science/connective-tissue>.
- Field, S.Q. (2012). *Culinary reactions: The everyday chemistry of cooking*. Chicago, IL: Chicago Review Press, Incorporated.
- Hu, C. (2015). Science of Marinades. *Science & Food*. Retrieved 27 July 2017 from <https://scienceandfooducla.wordpress.com/2015/03/31/science-of-marinades/>.
- McIntosh, J. (2017). Collagen: What is it and what are its uses? *Medical News Today*. Retrieved 29 August 2017 from <http://www.medicalnewstoday.com/articles/262881.php>.
- Oldfield, M. and Mitchinson, J. (2011). QI: Quite interesting facts about cooking. *The Telegraph*. Retrieved 29 August 2017 from <http://www.telegraph.co.uk/men/the-filter/qi/8330504/QI-Quite-interesting-facts-about-cooking.html>.
- Science Foundation Ireland. (2011). What's the chemistry of cooking? Retrieved 15 June 2016 from: <http://www.science.ie/features/archived-feature-articles/chemistry-of-cooking.html>.
- The Editors of Encyclopædia Britannica. (2006). Electron. *Science*. Retrieved 29 August 2017 from <https://www.britannica.com/science/electron>.
- The Editors of Encyclopædia Britannica. (2007). Fermentation. *Science*. Retrieved 29 August 2017 from <https://www.britannica.com/science/fermentation>.
- The Editors of Encyclopædia Britannica. (2008). Enzyme. *Science*. Retrieved 29 August 2017 from <https://www.britannica.com/science/enzyme>.
- The Editors of Encyclopædia Britannica. (2014). Pascal. *Encyclopædia Britannica*. Retrieved 27 July 2017 from <https://www.britannica.com/science/pascal-unit-of-energy-measurement#ref187919>.
- The Royal Society of Chemistry. (n.d.) Kitchen Chemistry. *Learn Chemistry*. Retrieved 27 July 2017 from <http://www.rsc.org/learn-chemistry/resource/res00000817/chemical-changes-during-cooking?cmpid=CMP00000918>.
- Washington University in St. Louis. (2005). Redox reactions. Retrieved 8 June 2016 from: <http://www.chemistry.wustl.edu/~coursedev/Online%20tutorials/Redox.htm>.
- Trefil, J., McGrayne, S.B., Bertsch, G.F. (1999). Atom. *Science*. Retrieved 29 August 2017 from <https://www.britannica.com/science/atom>.
- Weston, N. (2013). What is Gluten Free Flour? *Baking Bites*. Retrieved 27 July 2017 from <http://bakingbites.com/2013/01/what-is-gluten-free-flour/>.