

Difference Between Glycerol and Fatty Acids

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Key Difference - Glycerol vs Fatty Acids

Fats are stored in the body as triacylglycerols in adipose tissue. Triacylglycerols are a good source of energy as it yields a higher amount of energy in comparison to carbohydrate sources. But due to its insolubility, it is not readily used by the body. Triacylglycerols are composed of fatty acids and glycerol joined by an ester bond. Fatty acids are long hydrocarbon chains with a carboxyl group (COOH) at the alpha end of the fatty acid chain. Glycerol is a polyol having three hydroxyl groups (OH groups) and is termed as a trihydroxy sugar alcohol. The **key difference** of fatty acids and glycerol is the chemical composition of the two compounds. **Fatty acids have a terminal carboxyl group whereas glycerol fall under the category of alcohol having three OH groups.**

What is Glycerol?

Glycerol which is also termed as glycerin or glycerine is a non - toxic chemical compound. It is a polyol which is an alcohol composed of three hydroxyl groups. The formula of glycerol is C₃H₈O₃. Glycerol is a sweet tasting, clear, colorless hygroscopic liquid which is viscous in nature. The density of glycerol is 1.261 g/ml. Its boiling point is 290 degrees Celsius, and its melting point is 17.8 degrees Celsius. Glycerol is denser than water and has a higher boiling point and a melting point than water.

Glycerol is a polar molecule. It is highly soluble and miscible in water due to the presence of the OH groups. These OH groups are also responsible for imparting the hygroscopic property to water. Thus glycerol readily takes up water and retains it. Therefore when storing glycerol special airtight containers should be used.

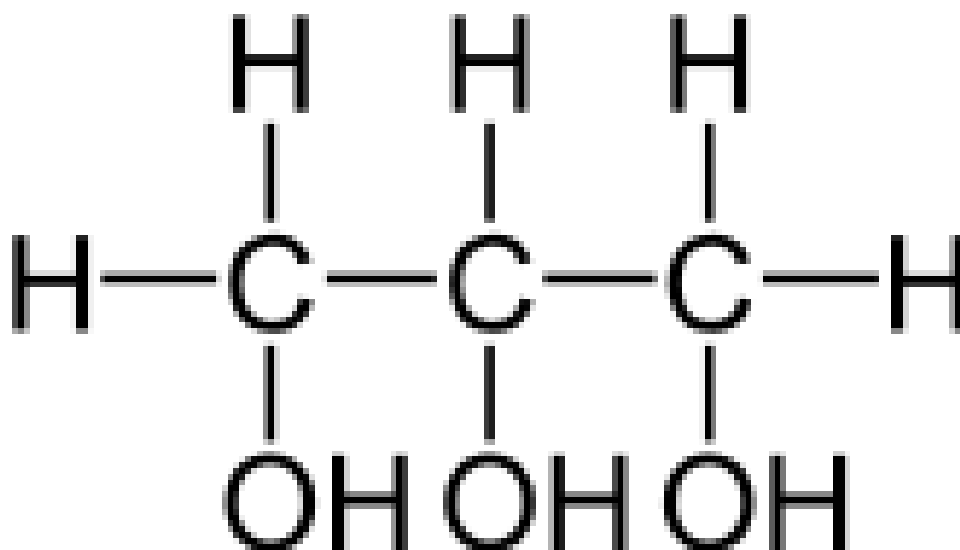


Figure 01: Glycerol

The body satisfies its requirement of glycerol from lipid breakdown which is catalyzed by lipases. Glycerol in the body is stored in the liver and adipose tissue where it is reused to form triacylglycerols when needed. In addition, glycerol is also used to elevate the blood plasma osmolality. By elevating the osmolality, more water is extracted from the tissues into the interstitial fluid. Glycerol or glycerin also acts as an agent to prevent water reabsorption in the kidneys via the proximal convoluted tubules. This leads to a lower blood volume and a higher excretory volume of water and sodium.

Glycerol is also used commercially in the food industry as a food emulsifier and a flavoring agent. Glycerol is used in personal care products such as toothpaste, shower gel, perfumes and other accessory ointments and creams. It is also used to manufacture pharmaceuticals.

What is Fatty Acids?

Fatty acids are long chains of hydrocarbons and have a carboxyl terminal. They are nonpolar molecules and thus insoluble in water but soluble in organic solvents. Fatty acids are often straight chain compounds and may have either an odd number or an even number of carbon atoms. Odd-numbered fatty acids are found mostly in bacteria and lower plants or animals. Based on the number of carbon atoms its synthesis and breakdown in an organism differs slightly. The number of carbon atoms in a fatty acid chain ranges from 2 to 80. But common fatty acids contain about 12 to 24 carbon atoms. Based upon the number of carbon atoms and the length of the chains there are three types of fatty acid chains.

- Short-chain fatty acids - 2 to 6 carbons
- Medium - chain fatty acids - 8 to 10 carbons they are called and 12 up to 24 they are called
- Long-chain fatty acids – 12 to 24

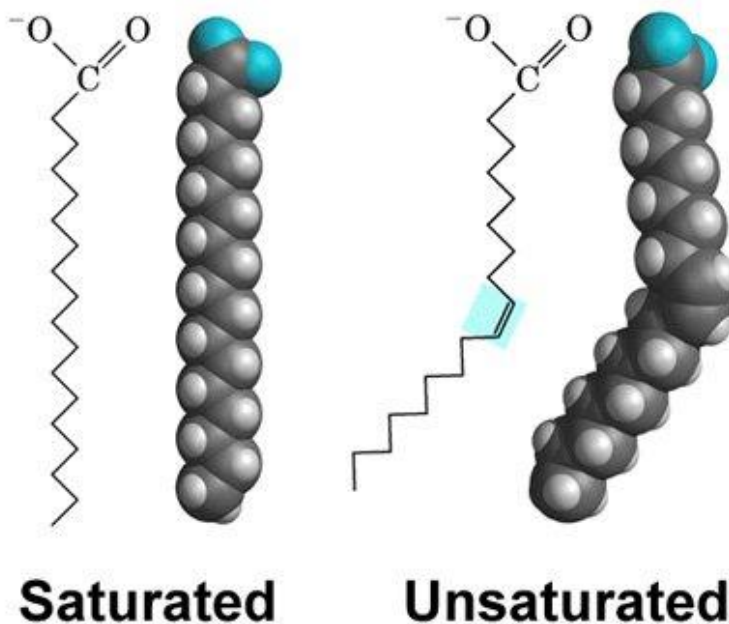


Figure 02: Saturated and Unsaturated Fatty Acids

According to the presence and absence of double bonds, fatty acids can be categorized as saturated and unsaturated fatty acids. Saturated fatty acids do not constitute of any double bonds. Unsaturated fatty acids may contain either one double bond – Monounsaturated fatty acids or more than one double bond – Polyunsaturated fatty acids. Polyunsaturated fatty acids are also termed as essential fatty acids as they play an important beneficial role and should be consumed via food. Polyunsaturated fatty acids are long chain fatty acids and thus cannot be synthesized in the body (omega 3 and omega 6 fatty acids)

What are the Similarities Between Glycerol and Fatty Acids?

- Both are composed of Carbon, Hydrogen, and Oxygen.
- Both compounds participate in esterification reactions to produce triacylglycerols.
- Both compounds play a functional and structural role in fat metabolism

What is the Difference Between Glycerol and Fatty Acids?

Glycerol vs Fatty Acids	
Glycerol is a polyol having three hydroxyl groups (OH groups) and is termed as a trihydroxy sugar alcohol.	Fatty acids are long hydrocarbon chains with a carboxyl group (COOH) at the terminal of the fatty acid chain.
Classification	
None	Can be classified according to the chain length and the degree of saturation and unsaturation
Solubility in water	
Glycerol is soluble in water.	Fatty acids are insoluble in water.
Polarity	
Glycerol is a polar molecule.	Fatty acid is a nonpolar molecule.
Number of carbons	
Three carbon atoms are present in glycerol.	Carbon number may vary from 2- 80 in fatty acids.

Summary - Glycerol vs Fatty Acids

Fatty acids and glycerol are important compounds which are studied extensively due to the fact that they are the precursors of triacylglycerols and other functional lipid compounds. The difference between fatty acids and glycerol is that fatty acids are nonpolar linear hydrocarbon chains whereas glycerol is polar and composed of a fixed 3 carbons each joined by a hydroxyl group. Both undergo esterification to produce fatty acylglycerols which has a major functional role in the physiology of organisms. Individually both components have its properties and applications.

Reference:

1. "Fatty acids ." Fatty acid structure. [Available here](#)
2. "Glycerol." National Center for Biotechnology Information. PubChem Compound Database, U.S. National Library of Medicine. [Available here](#)

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APA: Difference Between Glycerol and Fatty Acids. (2017, October 16). Retrieved (date), from <http://www.differencebetween.com/difference-between-glycerol-and-vs-fatty-acids/>

MLA: "Difference Between Glycerol and Fatty Acids." Difference Between.Com. 16 October 2017. Web.

Chicago: "Difference Between Glycerol and Fatty Acids." Difference Between.Com. <http://www.differencebetween.com/difference-between-glycerol-and-vs-fatty-acids/> accessed (accessed [date]).



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