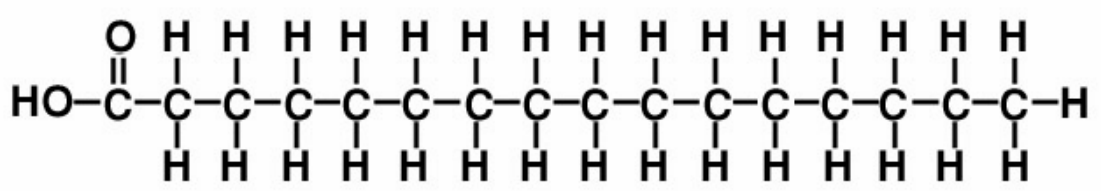
Lipids

a chemically diverse class of organic molecules that are grouped together because they are all largely **nonpolar**. Because they are nonpolar they are soluble in organic solvents like chloroform, benzene, acetone, paint thinner, etc. and insoluble in water

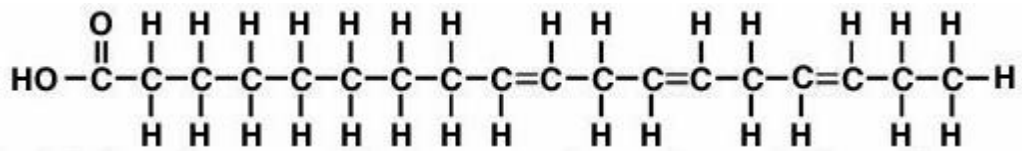
The major classes of lipids are **fatty acids**, **neutral fats**, **phospholipids**, **steroids** (or sterols).

Lipids have many functions including **energy storage**, cell membrane **structure**, **vitamins** (biochemical helpers) and **hormones** (substances produced in one part of the body that have effects on other parts of the body).

Fatty acids are long-chain carbon molecules with many carbon hydrogen bonds and a carboxyl group (COOH) on one end. The carboxyl group can ionize, releasing an H+.
They come in two varieties **saturated** and **unsaturated**.
Saturated fatty acids have no C=C bonds - all carbons in the chain are bonded to as many hydrogens as possible.



Unsaturated fatty acids have some C=C bonds in the chain - the carbon chain is not completely saturated with hydrogens.



Fatty acids are a component of two other classes of lipids - **neutral fats** and **phospholipids**.

Neutral fats are molecules composed of glycerol (a sugar alcohol) and 1, 2, or 3 fatty acids.

Neutral fats are called **saturated fats** if their fatty acid chains are saturated. They are called **unsaturated fats** if one or more chains are unsaturated fatty acids. They are called polyunsaturated if they have many C=C bonds in their fatty acids chains.

Fats are energy-yielding foods. When digested they release about twice as much energy as carbohydrates or proteins

100 g of fat yields 900 kcal (3800 kjoules)

100 g of carbohydrate yields 400 kcal

100 g of protein yields 400 kcal

On average a person will have about 15% body fat. As time passes their percentage can increase to 25% or even 40% in the very fat (obese) person .Women tend to have a greater percentage of body fat than men. The "typical" man's body may have the following proportions.

Chemically fats are made up of carbon, hydrogen and oxygen but not in the same proportion as they are in carbohydrates (CH_2O). In fats there is more carbon and hydrogen and relatively less oxygen.

Fats are essential to our health and are familiar to everybody because we eat them at most meals in one form or another. Fats are *lipids,* that is they belong to a wide group of chemicals that include waxes and cholesterol. Fats are also described as *triglycerides,* because they are made up from three molecules of *glycerol* combined with three *fatty acids.*

Saturated fatty acids	Unsaturated fatty acids
Solid at room temperature	Liquid at room temperature
Palmitic acid and stearic acid	Oleic acid and linoleic acid
Animal fats and coconut oil; contain high percentage of saturated fatty acids	Liquid vegetable oils and fish oils; contain unsaturated fatty acids

Cholesterol

Is a lipid rather than a fat. It should , be mentioned here because this waxy substance is blamed for the blocking up of blood vessels.*(atherosclerosis)* as we get older. This "hardening of the arteries" is found to be more common in those people who have higher levels of cholesterol in their blood plasma.

Cholesterol is a normal component of the blood. It is present in all body cells (especially nervous tissue) and is needed for the manufacture of sex hormones and adrenal hormones. In a healthy individual the levels of cholesterol in the blood are regulated by excretion in the bile and faeces. A blood cholesterol level of **200 mg/dl** is considered acceptable by many medical authorities, but this level is much exceeded in some less healthy persons who are in danger of heart disorders.

The uses of fats

Fats and fat-containing foods have a wide range of uses in the human body. Their functions may be outlined as follows:

l. Fats produce energy when digested (9 kcal for each 1 g).

2. Fats build up, our insulating fat store just beneath the skin.

3. Fats carry the fat-soluble vitamins A,D,E and K.

4. Fats slow up digestion and the secretion of hydrochloric acid in the stomach.

5. Fats stay in the stomach longer and give a feeling of satisfaction (i.e. they are foods with a high *satiety value).* The feeling of hunger is prevented by fatty foads.

6. Fats give a flavour to foods.

7. Lipids like cholesterol are needed to produce same hormones. Other lipids are needed in the production .of enzymes and to make up part of the cell membrane.

Fats that are not used immediately are stored in adipose tissue as body fat.