Melting points of unsaturated fatty acids are much lower than those of saturated fatty acids with the same number of carbon atoms. Compare palmitic and palmitoleic acids.

The m.p. of unsaturated fatty acids are much lower because the *cis* configuration produces a bend in the structure which decreases the number of possible van der Waals interactions between molecules.

Note that the m.p. decreases as the number of double bonds increases for fatty acids with the same number of carbon atoms. Compare oleic, linoleic and linolenic acids.

Triacylglycerols (triglycerides) are triesters of fatty acids and glycerol as shown in Fig 11.6.

Triacylglycerols may contain a mixture of saturated and unsaturated fatty acids of different chain length.

Triacylglycerols are uncharged (neutral) and nonpolar molecules.

Triacylglycerols are solids or liquids at room temperature depending on their m.p..

The m.p. depends on the kind of fatty acids present in the molecule.

Triacylglycerols composed primarily of saturated fatty acids are solids at room temperature. Butter and lard are examples.

Triacylglycerols composed primarily of unsaturated fatty acids are liquids at room temperature. Vegetable oils are examples.

Partial hydrogenation of vegetable oils results in the addition of H_2 to some of the double bonds that yields triacylglycerols that are solids at room temperature. Marjarine and shortnings are examples.

Catalytic hydrogenation also converts some of the remaining *cis* double bonds to the *trans* configuration that is the source of *trans* fatty acids in the diet.

Triacylglycerols function as energy stores for organisms. Fat tissue contains large amounts of triacylglycerols.

Triacylglycerols are well suited for this function because they are insoluble in water and can be stored in an unhydrated and thus concentrated form.

Triacylglycerols also yield more energy per carbon when oxidized by O_2 to CO_2 and H_2O than proteins or carbohydrates because triacylglycerols have a more reduced form of carbon.

Compare the H and O content per carbon of trispalmitoylglycerol to sucrose

trispalmitoylglycerol $C_{51}H_{98}O_6$

sucrose $C_{12}H_{22}O_{11}$

Consider the structure, properties and function of glycerophospholipids and sphingolipids that are major components of membranes.

The general structure of glycerolphospholipids is shown in Table 11.2.

These lipids are composed of glycerol, fatty acids, phosphate and an alcohol bonded to each other by ester linkages.

There are carboxylic acid ester linkages between the two fatty acids and C_1 and C_2 of glycerol and inorganic acid ester and diester linkages between phosphoric acid, glycerol and a variety of alcohols.

Table 11.2 indicates the various alcohols found in a diester linkage to the phosphate group.

The most common alcohols are choline, ethanolamine and serine.

One example of a glycerolphospholipid is phosphatidylcholine