

## LIPIDS

All lipids are .....in water: that's the one property they have in common. That is why they are soluble in .....

### Types of lipids:

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### Biological functions of lipids:

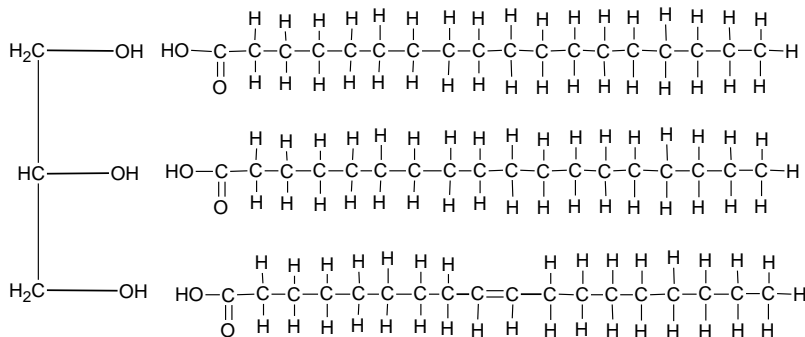
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## FATS AND OILS

= esters of .....and fatty acids

- palmitic acid
- stearic acid
- oleic acid

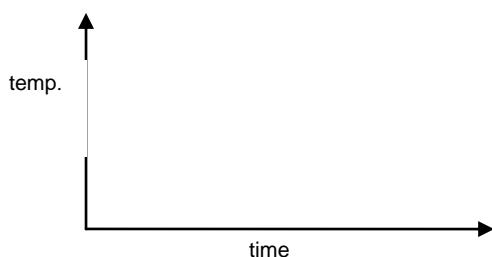
Since there are three fatty acids attached to glycerol, these lipids are known as **triglycerides**.



**FATS:** triacylglycerides of **saturated** fatty acids only

- animal origin-e.g. ....(pork), .....(beef), or .....

- they do not have sharp m.p. because they are mixtures!



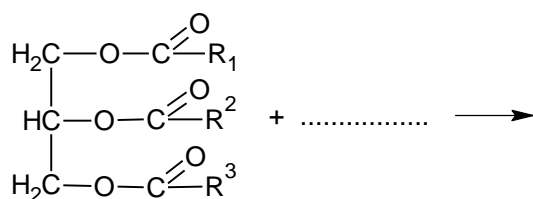
**OILS:** triacylglycerides of both **saturated** and **unsaturated** fatty acids - double bond *decreases/increases* the m.p.

- plant oils + .....!!!!

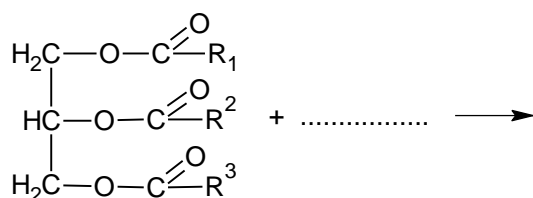
## Reactions of FATS and OILS

### 1. HYDROLYSIS

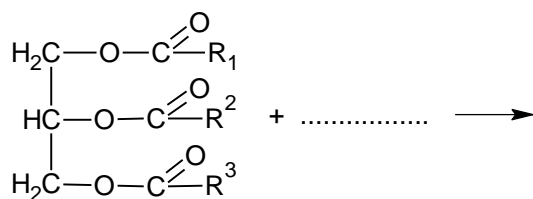
#### a. acidic



#### b. alkaline - SAPONIFICATION



#### c. spontaneous - HYDROLYTIC RANCIDITY



### 2. OXIDATION

= it is a slow process that can be accelerated by the presence of light, transition metals (catalysts) and free radicals - products are aldehydes, ketones and volatile acids that have a disgusting smell - OXIDATIVE RANCIDITY.

1. What is the function of antioxidants added to food as food preservatives?

### 3. HYDROGENATION OF OILS

The m.p. of an unsaturated oil (carrying a double bond) can be raised by hydrogenation of the liquid oil to form a solid MARGARINE

### WAXES

= esters of fatty acids with an alcohol with high relative molecular mass e.g. hexadecan-1-ol or octadecan-1-ol

#### PLANT WAXES

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#### ANIMAL WAXES

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- spermaceti wax

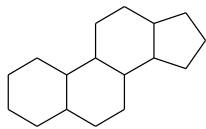
The sperm whale received its name from an organ inside its head—the *spermaceti* organ— contains high quality lipid. Sperm whales are very difficult to study because they spend most of their time in open water, away from coastlines. Sperm whales can dive deeper than 1000 meters in pursuit of giant squid, their primary prey.

### STEROID AND TERPENES

Do NOT contain any fatty acid residues - still classified as lipids.

#### STEROIDS

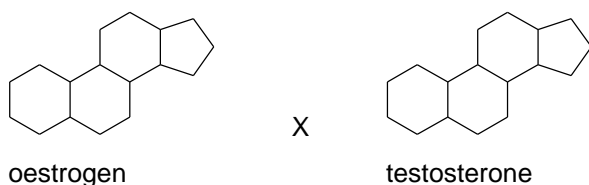
are terpenoid lipids characterized by a carbon skeleton with four fused rings: STERANE



Steroids vary by the functional groups attached to these rings. Hundreds of distinct steroids are found in plants, animals, and fungi.

- Insect steroids - e.g. ecdysterone which controls the ECDYSIS = ..... and ..... of arthropods.
- Vertebrate steroids
  - a. Cholesterol, which is an important component of cell membranes. It is synthesised in liver and is used for synthesis of other substances e.g. sex hormones; vitamin (.....) and bile acids. It is also the principal constituent of the plaques implicated in atherosclerosis!!!

- b. Sex hormones that produce sex differences or support reproduction. They include androgens, estrogens, and progestagens.



- c. Corticosteroids include glucocorticoids and mineralocorticoids. Glucocorticoids regulate many aspects of metabolism and immune function, whereas mineralocorticoids help maintain blood volume and control renal excretion of electrolytes.

- d. Anabolic androgenic steroids are a class of steroids that interact with androgen receptors to increase muscle and bone synthesis.



The picture taken from <http://www.justthinktwice.com/hot/steroids.cfm>

## TERPENES

Substances of plant origin responsible for the scent and flavour of plant essential oils.

They contain 2 or more ISOPRENE UNITS.

Isoprene = .....

### Occurrence:

- Essential oils - volatile substances with pleasant smell - AROMATHERAPY
- Resins - solid, sticky substances insoluble in water made by oxidation of essential oils
- Balms - mixtures of essential oils and resins



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Classified according to the number of isoprene units

**1. MONOTERPENES** - ..... isoprene units

Limonen

Menthol

Camphor

Geraniol

**2. DITERPENES** - ..... isoprene units

Phytol

**3. TETRATERPENES** - ..... isoprene units

they occur in the form of plant dyes - .....

Carotenes (C,H only):  $\beta$ - carotene

Lycopene

Xanthophyls (C,H,O): Lutein

Zeaxanthin

**4. POLYTERPENES** - ..... isoprene units

Natural rubber = ..... isomer

Gutta-percha = ..... isomer