PHARMACOLEARN

It's Important to Know!

BP301T — Pharmaceutical Organic Chemistry II

B.Pharm Semester 3 · Unit 3 — Fats and oils

Unit III: Fats and oils

Composition and classification

Fats and oils are mixtures rich in triacylglycerols, which are esters of glycerol and fatty acids. Fats are usually more solid at room temperature, while oils are usually more liquid because of composition and unsaturation. Natural samples may also contain sterols, pigments, phospholipids, moisture and minor unsaponifiable matter.

Fatty acids may be saturated or unsaturated. Double-bond geometry and chain length affect melting behaviour. Cis unsaturation introduces a bend that can reduce close packing. The exact composition of a natural oil varies with source, processing and storage, and should be checked against its monograph for any named sample.

Reactions of fats and oils

Hydrolysis breaks ester bonds and produces glycerol and fatty acids. Alkaline hydrolysis is saponification and forms soap salts. Hydrogenation reduces selected carbon-carbon double bonds. Halogen addition can be used analytically to estimate unsaturation. Oxidation of unsaturated chains can produce peroxides and later aldehydes, ketones and acids, causing rancid odours and flavour changes.

Analytical constants

Common constants include acid value, saponification value, ester value, iodine value, hydroxyl value, acetyl value and peroxide value. Acid value estimates free fatty acids. Saponification value relates to the alkali required to hydrolyse esters. Iodine value estimates unsaturation. Peroxide value measures early oxidation products. Definitions, calculations and official limits are set out in the current pharmacopoeial method.

Unit III: Frequently asked questions

Q: What is saponification?

A: Saponification is alkaline hydrolysis of an ester, producing an alcohol and a carboxylate salt.

Q: What does iodine value indicate?

A: It gives an estimate of the degree of unsaturation in a fat or oil.

Q: Why do oils become rancid?

A: Oxidation or hydrolysis can produce smaller volatile or irritating compounds, especially during exposure to oxygen, heat, light or moisture.

Unit III: Key takeaways

- Triacylglycerols are major constituents of fats and oils.
- Saturation, chain length and double-bond geometry influence physical state.
- Saponification is alkaline ester hydrolysis.
- Iodine value reflects unsaturation and peroxide value reflects early oxidation.
- Analytical limits must be taken from the applicable official method.

Unit III: Practical correlation

Practical correlation: storage of oils. Protection from oxygen, light, heat and moisture can slow deterioration. The appropriate container and antioxidant requirement for a specific product are set out in its monograph.