

A. Fatty Acids - Reactions:

1. Definition:

- Fatty acids are long-chain carboxylic acids found in fats and oils.
- Saturated fatty acids have no double bonds, while unsaturated fatty acids have one or more double bonds.

2. Reactions of Fatty Acids:

- **Esterification:** Fatty acids react with alcohols to form esters and water.
- **Hydrolysis:** Fatty acids can be hydrolyzed to form carboxylic acids and glycerol.
- **Saponification:** Fatty acids react with alkalis (e.g., NaOH) to form soap and glycerol.
- **Hydrogenation:** Unsaturated fatty acids can be hydrogenated to form saturated fatty acids.

B. Processes Involving Oils:

1. Hydrolysis:

- Breaking down fats and oils into fatty acids and glycerol in the presence of water and an enzyme (lipase).

2. Hydrogenation:

- Addition of hydrogen to unsaturated fats or oils, converting them to saturated fats.
- Often used to produce solid fats from liquid oils, like in the production of margarine.

3. Saponification:

- Reaction of fats or oils with an alkali (e.g., sodium hydroxide) to form soap and glycerol.
- Used in soap-making processes.

4. Rancidity:

- The oxidation of fats and oils leading to the development of unpleasant odors and flavors.
- Can be prevented by antioxidants or by storing fats in airtight containers.

5. Drying Oils:

- Oils that polymerize to form a solid film when exposed to air.
- Used in the production of paints and varnishes.

C. Analytical Constants:

1. Acid Value:

- Measures the amount of free fatty acids in a fat or oil.
- Determined by titration with a base.

2. Saponification Value:

- Measures the average molecular weight of all fatty acids present.
- Determined by the amount of alkali required to saponify a fat or oil.

3. Ester Value:

- Measures the average molecular weight of esters in a fat or oil.
- Calculated from the saponification value and acid value.

4. Iodine Value:

- Indicates the degree of unsaturation in a fat or oil.
- Measures the amount of iodine absorbed by the fat.

5. Acetyl Value:

- Measures the amount of acetyl groups in a fat or oil.
- Calculated from the amount of acetic acid produced in a reaction.

6. Reichert Meissl (RM) Value:

- Measures the amount of volatile fatty acids in a fat.
- Determined by saponifying the fat and distilling off the volatile acids.

These analytical constants provide valuable information about the composition and quality of fats and oils. They are crucial in the food and industrial sectors for quality control and product development.