1. Write the importance of milk fat on human nutrition and in dairy products

The principal function of the lipids is to serve as source of energy for the infants and young ones. It is also serves as a source of essential fatty acid. The lipids also help in contributing to the flavour and the rheological properties of the dairy products and foods in which they are used. The hydrolysis of milk fat is desirable in certain dairy products such as cheeses while it is detrimental to the flavour of most of the dairy products which is not desirable

2. Write a brief note on the composition of milk fat

The milk fat is present in milk as oil-in-water emulsion in globular form. The bulk of cow milk lipids are triacylglycerols (TGs)which are 97-98 % of the total lipids found in milk. Sterols mostly cholesterol and phospholipids are next in the quantity. Phospholipids represent less than 1% of the total lipid and they are present mainly in the milk fat globule membrane. The major components of fats are the acids. In case of milk fat, the fatty acids account for about 85% and the glycerol for approximately 12.5% of the weight.

3. What is Refractive index of milk fat? What are the factors affecting the refractive index of milk fat?

When a beam of light passes from one medium to another, the light rays bends. The bending or refraction of the light is expressed as its refractive index. The refractometer reading is a constant for any particular medium at a constant temperature. This physical constant for milk fat is is usually

obtained at 40°Cdue to the fact that at that temperature all the fat will be in the liquid form..Butyrorefractometer is used for determining the refractive index of milk fat. This instrument directly gives the refractive index. The refractive index is expressed as butyrorefractometer reading (B.R. Reading). The reading for the milk fat ranges between 1.4527and 1.4566. The refractive index of a fat is influenced by the both the molecular weight and the degree of unsaturation of the component fatty acids.Refractive index increases with increasing saturation and with chain length of fatty acids. 4. Define RM value and Polensky value. How they are important in detecting adulterants in milk fat.

RM value is the number of milliliters of 0.1N sodium hydroxide or aqueous alkali solution required to neutralize the steam volatile water soluble fatty acids distilled from 5g of fat under specified conditions. This value for milk fat is quite significant since it primarily measures the butyric acid and caproic acid content in the given fat. When compared to other fats this value for milk fat is high. This helps in the identification of milk fat from other fats.

Polensky number is the number of milliliters of 0.1N sodium hydroxide or aqueous alkali solution required to neutralize the steam volatile water insoluble fatty acids distilled from 5g of fat. The Caprylic and capric acid although steam volatile, are insoluble in water. Since most of the steam volatile fatty acids in milk fat are water soluble this value helps in identifying the presence of coconut oil content which contains higher proportion of these acids.

5. Write a short note on the structure of fat globule membrane.

Milk fat is predominantly present as spherical droplets which range in diameter from less than 0.2 to 15 μ m. The free fat which is made up of triglycerides is covered by a membrane called fat globule membrane. It gives a protection to the free fat. The fat globule membrane helps in stabilizing the emulsion of fat in the milk and preserving the individual identities of the fat globules. The fat globule membrane also helps in protecting the free fat from the lipase enzyme. Thus prevents the rancidity in milk.

6. Give a broad classification of milk lipids

Cow milk is composed of triacylglycerol formed by the esterification of the hydroxyl groups of glycerol with the fatty acids. The major components of fats are the fatty acids. The fatty acids account for about 85% and the glycerol for approximately 12.5% of the weight. Nearly 80% of the total fatty acids are distributed among the five fatty acids namely the oleic, palmitic, butryic, stearic and myristic acids. The fatty acids are usually grouped on the basis of saturation such as saturated, monounsaturated and polyunsaturated fatty acids. Milk fat contain a high level of butyric acid ($C_{4:0}$) and other short chain fatty acids. Unsaturated fatty acids may occur in *cis* or*trans* isomers. Bovine milks contain low level

of *trans* fatty acids in comparison with chemically hydrogenated vegetable oils.

7. What is iodine number? What is its importance with reference to milk fat?

Iodine number is the number grams of iodine absorbed by 100 g of fat under specified conditions. This value is a measure for the unsaturated linkages present in a fat. Absorption of either iodine bromide (IBr) or iodine chloride (ICl) is used for measuring this value. One molecule of halogen compound absorbed by each unsaturated linkage and the absorption is expressed as equivalent number of iodine absorbed by 100g fat. The iodine number for milk fat ranges between 26 - 35. The softness of fat is directly related to the iodine number. The iodine value for milk fat is generally low in comparison to most other oils and fats. Hence addition of any vegetable fat or oil increases the Iodine number due to increased unsaturated fatty acid linkages and thus helps in detection of adulterants in ghee (i.e. milk fat).

8. Define peroxide value. How it helps in assessing the quality of ghee or milk fat?

The peroxide value is defined as the amount of peroxide oxygen per 1 kilogram of fat or oil. expressed Generally this is as millimoles per kilogram fat.Peroxide value (PV) is one of the most widely used tests for oxidative rancidity. It is a measure of the concentration of peroxides and hydroperoxides formed in the initial stages of lipid oxidation. Milliequivalents of peroxide per kg of fat are measured by titration with iodide ion. The determination of peroxide value is frequently used as a means of determining whether the quality of the oil or fat is spoiled due to oxidative rancidity. In general the oils and fats are spoiled by the chemical deterioration, and more particularly by the oxidation of fat.

9. How short chain fatty acids are important?

Short chain fatty acids have strong and characteristic flavours which are released by the action of lipase enzyme in milk and milk products. They impart strong flavours which are undesirable in milk and butter while they contribute to the characteristic desirable flavour in cheeses. Hence the chemical reaction of milk fat i.e. hydrolysis and auto-oxidation plays an important role in spoilage of fat rich dairy products.