FAQs

1. **Give a broad classification of proteins.**
   Milk proteins can broadly be classified into casein and whey proteins. They are first separated by bringing the pH of milk to isoelectric point of 4.6 where the casein gets precipitated and separated by filtration. The whey proteins which are presented in the whey can be further obtained by using saturated magnesium sulphate. The main components of whey proteins are lactoglobulins and lactoalbumins which are commonly called as immunoglobulins.

2. **What is the importance of whey proteins?**
   Whey proteins constitute about 20% of the total protein of cow and buffalo milk. Sometimes this fraction of protein is also referred and serum proteins or non-casein nitrogen. It has two well defined groups of proteins called lactoglobulin and lactoalbumin. Lactoglobulin fraction consists mainly of immunoglobulins especially IgG_1 with lesser amounts of IgG_2, IgA and IgM. The lactoalbumin fractions contain three main proteins β- lactoblobulin, α-lactoglobulin and blood serum albumin. These proteins are known to provide immunity to the human beings. The whey proteins are very high in colostrum, feeding of which give immunity to the newborn for wide range of diseases.

3. **Write the differences between casein and whey proteins**
   whey proteins do not precipitate from the solution when the pH of the milk adjusted to pH 4.6. Chymosin and some other proteinases results in coagulation of casein while whey proteins do not undergo such alterations.
   Casein is low in Sulphur content (0.8%) while the whey proteins are rich source of Sulphur (about 1.7%). Casein is synthesized in mammary glands and is found nowhere in nature. Some of the whey proteins such as β-Lactoglobulin and α-Lactoglobulin are also synthesized in mammary gland while others such as bovine serum albumin and immunoglobulins are derived from the blood.

4. **What do you mean by amphoteric nature of casein?**
   An amphoteric compound is a molecule or ion that can react both as an acid as well as a base. The amphoteric property of proteins is due to presence of free carboxylic and free amino groups at the end of proteins molecule. All amino acid is contain atleast two ionizable groups, the α

amino groups and α-carboxylic group which are responsible for the acid – base behavior. Because of the amphoteric nature, the proteins act sometimes as acids and sometimes as bases depending upon the pH of their medium.

5. **Write the procedure for production of lactic acid casein**
   For the manufacture of lactic acid casein, the pasteurized skim milk (72^0C for 15 s) is cooled to setting temperature (around 30^0C) and inoculated with lactic acid-producing bacteria at the rate of 0.1- 0.2% of milk taken. The milk is incubated, without agitation for a period of 14-16 h. During this period, the pH of milk is reduced to about 4.6, causing coagulation of the casein. The coagulum is then broken and cooked *i.e.* heated to a temperature of 50-55^0C. After a brief period of residence in a cooking under acidic conditions, the casein gets precipitated. After cooking, the whey is drained and the curd particles are washed thoroughly with water, pressed to remove excess water. Finally, minced and dried in hot air oven or using fluidized bed drier. The dried casein is then milled to get particles of desired particle size.

6. **What is the significance of lipase in dairy industry?**
   Lipase enzyme catalyses the hydrolysis of milk fat, causing hydrolytic rancidity in milk and fat rich milk products. The effect of lipolysis is the production of rancid flavour. Lipolysis may also produce varieties of other effects. One of the most noticeable is the lowering of surface tension. The liberated fatty acids, especially their salts, mono and diglycerides are responsible for depressing the surface tension of milk. The lipolysis plays a positive role in ripening of cheese. The fatty acids particularly the low chain fatty acids released during ripening of cheese are responsible for the development of desirable cheesy flavour in the ripened varieties of cheeses. In addition to the fatty acids, the esters and other compounds of fatty acids collectives contributes to the cheese flavour.

7. **What is the importance of alkaline phosphatase in milk processing?**
   Milk alkaline phosphatase is used as the method of preference for determining whether the milk has been pasteurized adequately. Inactivation of alkaline phosphatase by pasteurization is an index of destruction of *Mycobacterium tuberculosis.* The inactivation of phosphatase enzyme by easy and simple chemical methods can be determined. This enzyme gets inactivated at temperature slightly above the temperature recommended for pasteurization i.e. 72^0C for 16 seconds. The presence of this enzyme in

pasteurized milk indicated that the milk is not adequately heated to attain pasteurization.

8. Write the uses of proteinases enzyme in food industry

Milk contains two main proteinases, alkaline milk proteinase and acid milk proteinase, and several other proteinases. Plasmin is the most important among indigenous proteinases. Plasmin accompanies the casein micelles on the rennet coagulation of milk and is concentrated in cheese wherein plasmin contributes to the primary proteolysis of casein in cheeses.

The exogenous proteinases are of great importance in cheese making. The use of rennet is the principal application in proteinases in food processing. Protein hydrolysates which are obtained by partial hydrolysis of proteins are used as food flavorings in soups and gravies and in dietetic foods. The functional properties of milk proteins may be improved by limited proteolysis under controlled conditions by using proteinases. Acid soluble caseins are suitable for beverages and other foods can be produced by partial hydrolysis of caseins. Controlled proteolysis improves the meltability of cheeses but excess proteolysis causes bitterness in the product. Limited hydrolysis of whey proteins reduces its emulsifying capacity but increases its specific foam volume. The heat stable proteinases enzymes produced by psychrotrophic bacteria causes age gelation defect in the ultra high temperature (UHT) treated milk during storage. The heat stable proteinases gels the milk proteins and milk will have gel like structure which is not accepted by the consumers.

9. How rennet casein is prepared?

The pasteurized skim milk (72^0C for 16 seconds) is cooled to a setting temperature of about 30^0C, and microbial rennet is added at the rate of 1.5 to 2.0grams for every 100 litres of skim milk. The rennet added milk is kept undisturbed till a firm gel is formed. The renneting process completes in40 min. The clotted milk is then cut into one square inch cubes using wire knives and cooked *i.e.* heated to a temperature of 50-55^0C. After a brief period of residence in a cooking, the curd cubes shrinks due to expulsion of whey from the cubes. After cooking, the whey is drained and the curd particles are washed thoroughly with water, pressed to remove excess water. Finally, minced and dried in hot air oven or using fluidized bed drier. The dried casein is then milled to get particles of desired particle size. The rennet

casein is generally prepared from good quality fresh skim milk and hence they are used in food and pharmaceuticals

10. What are the applications of casein?

Casein is generally not consumed as a food on its own. Casein products are used mainly as ingredients in foods for modifying the physical properties of that food or to provide nutritional supplementation. The edible applications of casein products are in Bakery Cheese products, as coffee whiteners and creamers, Confectionery, Infant foods, Instant breakfast and beverages, Nutritional food bars Pasta, Soups and gravies Pharmaceuticals Sports drinks, Whipped toppings, etc. it can also be used in the form of hydrolysed caseins as protein supplements

It also find its use in non food products such as adhesive for wood, foil laminates and paper, Coatings for paper and cardboardLeather tanning, Paints, Synthetic fibres and Textile sizing