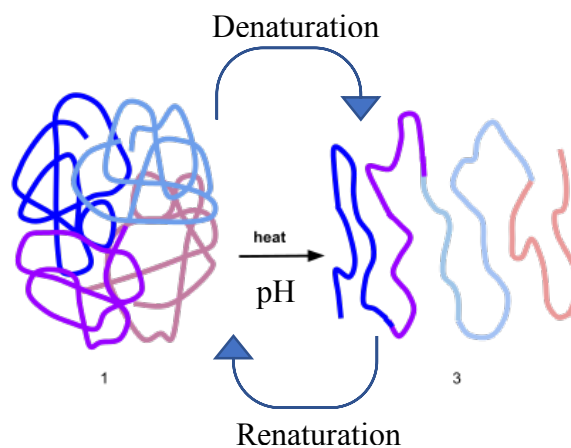


## Protein denaturation

Denaturation of the protein occurs when some external stress applied, such as overheating, very acidic or alkaline conditions. Under such a way, the protein will no longer have its 3-dimensional structure and will not be able to do its cellular functions. The denaturation affected the quaternary and tertiary structure of the protein, but sometimes even the secondary structure is affected by the following harsh conditions:

1. Heat: It affects the weak interactions (such as hydrogen and van der Waals bonds) within the structure and causes a gradual misfolding of the protein into its secondary or primary structure, see Figure 1. The protein in the egg (albumin) is coagulated during cooking due to denaturation process.



2. pH: Proteins can also be misfolded by extreme pH, where the net charge on the protein will be changed, which causes an electrostatic repulsion and the disruption of some hydrogen bonding and S-S bonding, see Figure 1.
3. organic solvents such as alcohol or acetone, or by detergents. Each of these denaturing agents are disrupting the hydrophobic interactions that stabilizes the core of globular proteins and causes precipitation of the protein. Some protein could retain its structure and function by removing the denaturation agent and the process is called “renaturation”, Figure 1.

## Plasma proteins

Plasma is present in the blood and constitutes the liquid part of the blood. It is made up of 90% water which is required for hydration of body tissues. 7% of plasma is composed of proteins and looks like a pale-yellow liquid. The total concentration of plasma protein in blood is 7-7.5 g/dl.

There are three main groups of plasma protein:

1. **Albumin:** It comprises of 60% of overall plasma protein and hence albumins are the highly abundant plasma proteins. These are produced by the liver and helps in transportation of different components in blood, along with drugs.

2. **Fibrinogen:** These comprise of merely 4% of overall plasma proteins. This plasma protein is created by liver and its only function is to make clots and stop bleeding.

3. **Globulin:** These comprise of 36% of overall plasma protein and include enzymes, gamma globulin and antibodies. Globulins are fractionized into alpha, beta and gamma which are all in the liver. Plasma globulins are categorized into four types based on its properties:

**$\alpha$ 1-Globulins:** This fraction includes several conjugated proteins with carbohydrates and lipids.

**$\alpha$ 2-Globulins:** This fraction also contains conjugated proteins such as  $\alpha$ 2-glycoproteins and prothrombin. The normal serum value is 0.67 g/dl.

**$\beta$ -Globulins:** This fraction contains different  $\beta$ -lipoproteins which are very rich in lipid content. The normal serum value is 0.91 g/dl.

**$\gamma$ -Globulins:** These are also called as Immunoglobulins and possess antibody activity. They are classified as IgG, IgA and IgM.