

Cooling Effect of Evaporation

Introduction:

Evaporation is the removal of water molecules from the surface of a liquid. If alcohol is splashed on the back of the hand, it produces a cooling effect. When a liquid evaporates, this involves a change of state from liquid to gas. This change requires heat energy called latent heat/ hidden heat.

As plants transpire, water is evaporated from the leaves. Evaporation has a cooling effect in this situation as well. Plants are cooled during transpiration.

Evaporation is used by the body to regulate its temperature. When the temperature of the body rises, we begin to perspire more. Sweat glands in the skin will produce more sweat.

This sweat evaporates and the result is a cooling effect on the skin. The rate at which the evaporation takes place depends on the rate of air over the skin and this is why we fan ourselves to speed up the process. The rate at which evaporation takes place also depends on how much water vapour is already present in the air. If the air already has quite a lot of water vapour in it then sweat cannot evaporate quickly and we feel sticky.

The skin uses another method to aid in temperature control. There are blood capillaries below the skin. When we become too hot, these capillaries dilate or become larger. There is increased flow of blood and the extra heat is radiated away. When the surroundings are cold, the blood vessels contract, to prevent heat loss. In these circumstances the subcutaneous fat serves as insulation and is sometimes burnt to provide heat. Hairs may also become erect to trap air as further insulation.

In circumstances where the temperature is high, our metabolic rate falls so that less heat is generated by our body. In cold temperatures extra heat is produced by an increase of the metabolic rate, mainly of the liver and muscles. This sometimes causes rhythmical involuntary contractions of the skeletal muscles (shivering).