Body Fluids and Fluid Compartments

Introduction of fluids:-

In general the chemical reactions of life take place in aqueous solutions where the dissolved substances in a solution are called solutes. In the human body, solutes vary in different parts of the body, but may include proteins including those that transport lipids, carbohydrates, and, very importantly, electrolytes. For instance, sodium ions (Na^+) and chloride ions (Cl^-) are often referred to as electrolytes.

In the body, water moves through semi-permeable membranes of cells and from one compartment of the body to another by a process called Osmosis.

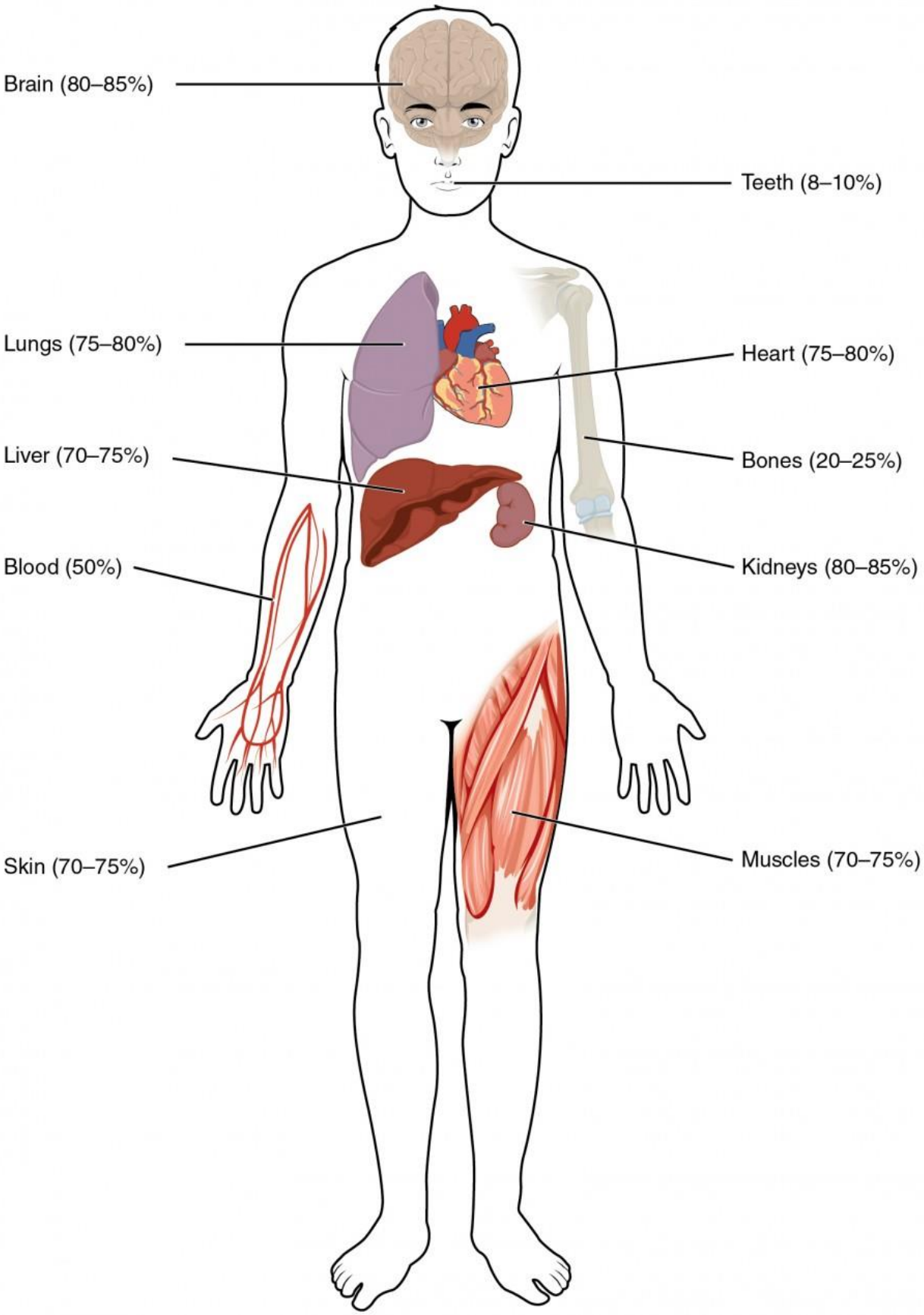
Osmosis*:* - is the diffusion of water from regions of higher concentration to regions of lower concentration, along an osmotic gradient across a semi-permeable membrane.

As a result, water will move into and out of cells and tissues, depending on the relative concentrations of the water and solutes found there. An appropriate balance of solutes inside and outside of cells must be maintained to ensure normal function.

Body Water Content:-

body water is the water content of an body that is contained in the tissues, the blood, the bones and elsewhere. human beings are mostly water, ranging from about 75 percent of body mass in ***infants*** to about 50–60 percent in ***adult*** men and women, to as low as 45 percent in ***old age***. The percent of body water changes with development, because the proportions of the body given over to each organ and to muscles, fat, bone, and other tissues change from infancy to adulthood.

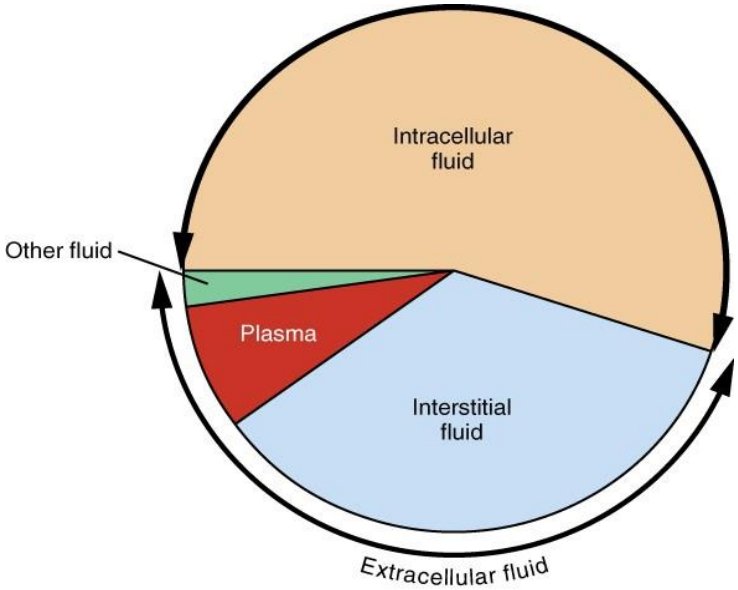
The brain and kidneys have the highest proportions of water, as well as the rest of body organs all contain the water percentage as cleared in below



Water Content of the Body

Fluid Compartments:-

Fluid compartment is a location that is largely separate from another compartment by some form of a physical barrier .The two main fluid compartments are the intracellular and extracellular compartments which include the fluid component of the blood (called plasma) and the interstitial fluid (IF) that surrounds all cells not in the blood.



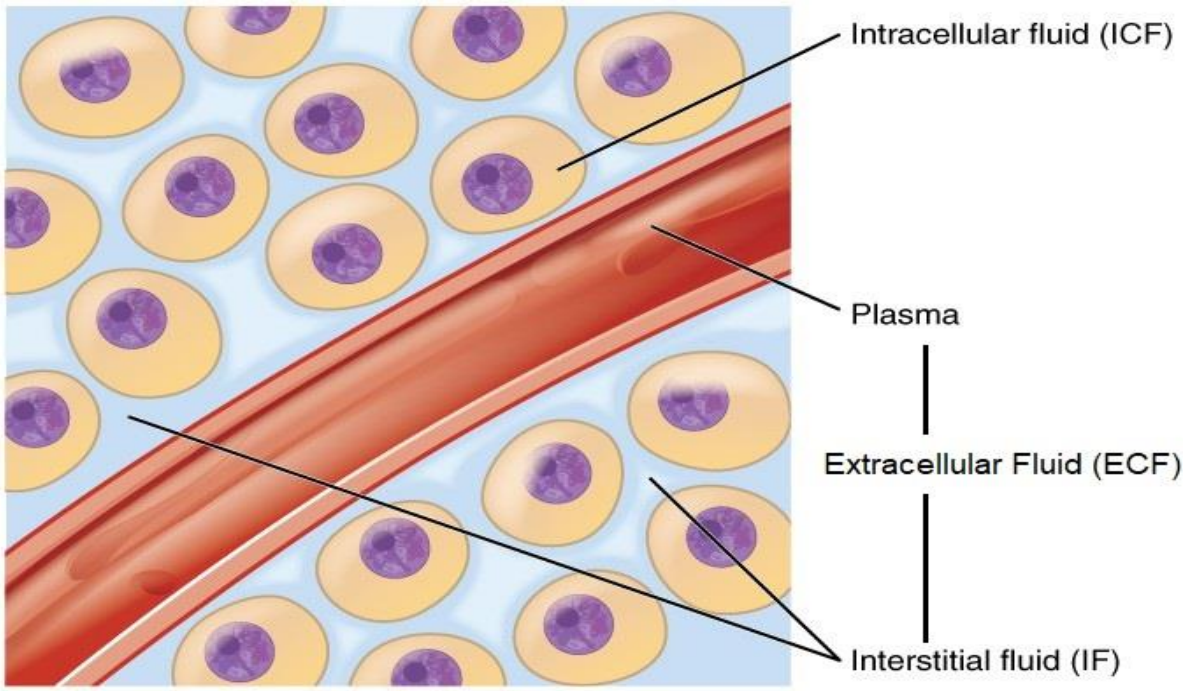
Fluid Compartments

- **Intracellular Fluid (ICF)**

The compartment in which the system that includes all fluid enclosed in cells by their plasma membranes. The ICF lies within cells and is the principal component of the cytosol/cytoplasm. *Cytosol* is a fluid present in the cell membrane composed of soluble ions, water, water-soluble proteins and molecules while *Cytoplasm* is a cell component present inside the cell membrane composed of enzymes, water, lipids, carbohydrates, nucleic acids and inorganic ions. The ICF makes up about 60 percent of the total water in the human body, the ICF accounts for about 25 liters. This fluid volume tends to be very stable, because the amount of water in living cells is closely regulated. If the amount of water inside a cell falls to a value that is too low, the cytosol becomes too concentrated with solutes to carry on normal cellular activities; if too much water enters a cell, the cell may burst and be destroyed.

- **Extracellular Fluid (ECF)**

The body fluid outside the cells called as Extracellular fluid ,it has two primary constituents: the fluid component of the blood (called plasma) and the interstitial fluid (IF) that surrounds all cells not in the blood. Approximately 20 percent of the ECF is found in plasma. Plasma travels through the body in blood vessels and transports a range of materials, including blood cells, proteins (including clotting factors and antibodies), electrolytes, nutrients, gases, and wastes.



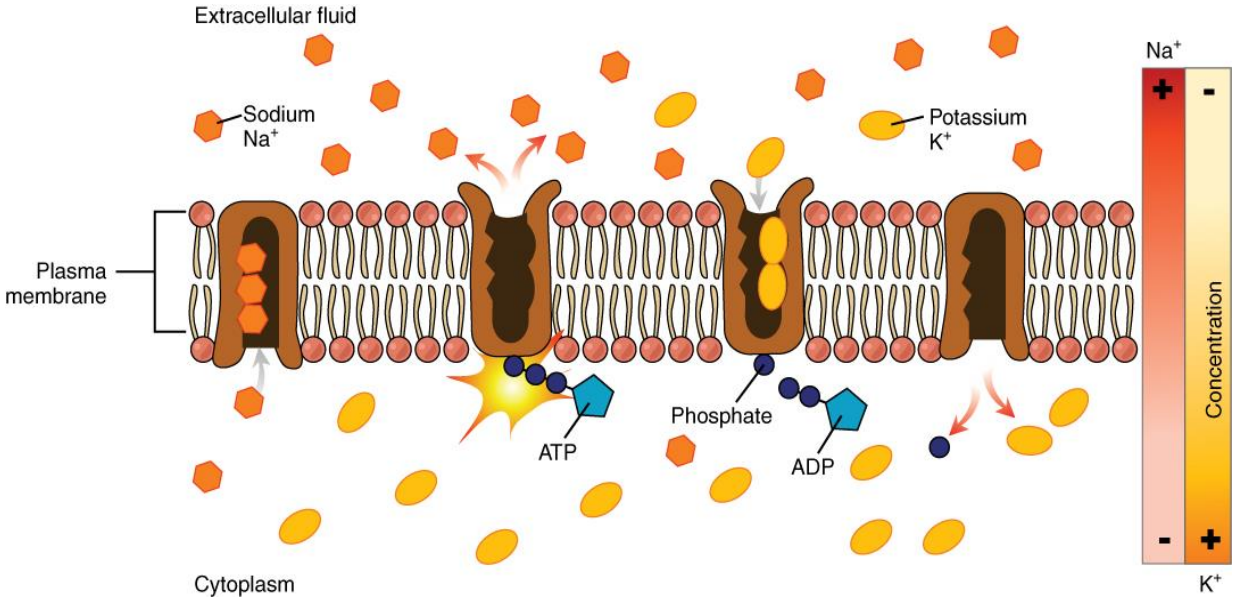
Composition of Body Fluids

The compositions of the two components of the ECF—plasma and IF—are more similar to each other than either is to the ICF.

The ECF with its both types of plasma and IF consist of the high concentrations of Sodium(Na^+), Chloride(Cl^-) but a relatively lower concentration of Bicarbonate(HCO_3^-) and protein. In contrast, the ICF has elevated amounts of Potassium(K^+), Phosphate(PO_4^{-3}), Magnesium(Mg^{+2}), and protein. Overall, the ICF contains high concentrations of Potassium and Phosphate, whereas both plasma and the IF contain high concentrations of Sodium and Chloride.

Most body fluids are neutral in charge. Thus, cations, or positively charged ions, and anions, or negatively charged ions, are balanced in fluids. Sodium

(Na^+) ions and Chloride (Cl^-) ions are concentrated in the ECF of the body, Whereas Potassium (K^+) and Phosphate(PO_4^{-3}) ions are concentrated inside cells. Although sodium and potassium can "leak" through "pores" into and out of cells, respectively, the high levels of potassium and low levels of sodium in the ICF are maintained by Sodium-Potassium Pumps in the cell membranes. These pumps use the energy supplied by ATP to pump sodium out of the cell and potassium into the cell.



Composition of Body Fluids