

Under these circumstances the pressure, called osmotic pressure by van't Hoff, may be very great.

According to the theories of van't Hoff and Arrhenius this pressure is, in the case of dilute solutions, proportional to the total number of particles (molecules plus ions) which are present in solution. In its magnitude and the laws governing its variation such pressure corresponds exactly to gaseous pressure. In fact the theory of solution consists primarily in the extension of the laws of Boyle and Gay-Lussac, of the hypothesis of Avogadro, and of the manifold theoretical developments which have been based upon them, to solutions. The great force of osmotic pressure always comes into action when solutions are in contact with permeable or semipermeable membranes. It must therefore always be reckoned with in physiology. The biological importance of the constancy of the osmotic pressure of sea water is strikingly exemplified by the precision with which every higher vertebrate preserves constant the osmotic pressure of its own body fluids, all at about seven or eight atmospheres.

It may readily be shown that the osmotic pressure of a solution is proportional to the depression of its freezing point, and accord-