

Avogadro's Hypothesis.—*Equal volumes of all gases, under similar conditions of temperature and pressure, contain equal numbers of molecules.* That is, when temperature and pressure are alike, there is the same amount of crowding in all gases. If one litre of hydrogen at a certain temperature and pressure, contains x molecules, then one litre of oxygen, or of air, or of any other gas, at the same temperature and pressure, contains x molecules.

This is often spoken of as Avogadro's law, but it is not a law at all; it is not a condensed statement of facts that we know; it is a guess, an imaginary picture, as to what we suppose. Further, although still spoken of as a hypothesis, it has long graduated to the rank of a theory.

Although it is impossible to find out the actual weights of molecules by experiment, we can determine their relative weights by making use of Avogadro's hypothesis. A litre of hydrogen weighs 0.09 gr., and a litre of oxygen weighs 1.43 gr., i.e., x molecules of oxygen weigh 16 times as much as x molecules of hydrogen. Therefore, each molecule of oxygen must weigh sixteen times as much as each molecule of hydrogen. Hydrogen being the lightest substance known, was chosen as the standard, and, for a reason that will appear later, its molecule was said to weigh 2; then the molecule of oxygen must weigh $16 \times 2 = 32$. (Some of the numbers used here will not appear quite correct; this is because we do not calculate out to many places of decimals. Thus, the weight of a litre of hydrogen is really 0.089947 gr., and not 0.09 as we have used it.)

If 1 litre of hydrogen weighs 0.09 gr. and 1 litre of oxygen weighs 1.43 gr., then 22.4 litres of each will weigh 2 gr. and 32 gr., respectively. But, as we have just seen, these numbers represent the molecular weights of hydrogen and oxygen; and what is true of them in this respect is true of all gases. Therefore we may say that *the weight in grams of 22.4 litres of any gas, under standard conditions, is numerically equivalent to its molecular weight.*