

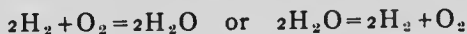
Le Chatelier's Law.

The direction of the reaction which takes place in this and other cases when equilibrium is disturbed, is given in the following Law :

In a system at equilibrium, raising the temperature causes the reaction to take place in the direction that absorbs heat, raising the pressure causes the reaction to take place in the direction that decreases the volume, and increasing the concentration of one of the reagents causes the reaction to take place in the direction that reduces the concentration of that reagent; while the opposite changes produce the opposite effects.

The meaning of the law is best made clear by an example. Imagine a closed vessel containing steam and water at 100° and one atmosphere pressure, and suppose that increase of pressure instead of causing the formation of water caused that of steam—the result of this reaction would be further increase of pressure followed by formation of more steam, and so on, ending in an explosion; all brought about by the first small, perhaps accidental, increase in the temperature; so that Le Chatelier's law may be regarded as a *definition* of equilibrium, distinguishing it on the one hand from explosive reactions, and on the other from what are often called, for the want of a better name "false equilibria".

An example of the latter is afforded by the reaction between hydrogen and oxygen. At ordinary temperatures these gases may be brought together with water without the occurrence of either of the reactions



there is however no "equilibrium," small changes of temperature or pressure not "causing the reaction to take place".

An account of the methods employed in studying and classifying the chemical equilibria may be found in works on the "Phase Rule"; in the present chapter a few examples are given to illustrate some of the chief types.

(i) Reactions analogous to that between ice and water.

Reaction between allotropic forms of the same element. Above 95.5°C rhombic sulphur turns into monoclinic, below that temperature the reverse takes place, at 95.5°C there is equilibrium (See Roscoe and Schorlemmer's Treatise on Chemistry).

"Melting" of washing soda, crystallized sodium sulphate, etc. If a crystal of washing soda be heated to 34°C it "melts" forming a solution mixed with a powder of the monohydrate. The reaction, which is not very accurately¹ represented by the equation

¹ A solution is formed, and not water (H_2O) as stated in the equation; inaccuracies of this nature, however, are usually considered allowable in chemical equations. The same equation can be used to represent the efflorescence of the washing soda (see page 36).