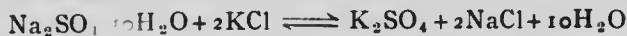


is in equilibrium at 34° .

Reaction between two double salts. If a few grammes of crystallized cupric chloride, $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$, be ground with about its own volume of potassium chloride, and the mixture heated in a test tube by immersing in boiling water, the brown cupric potassium chloride $\text{CuCl}_2 \cdot \text{KCl}$ is formed, and on cooling again disappears. The equilibrium temperature of the reaction

$\text{CuCl}_2 \cdot 2\text{KCl} \cdot 2\text{H}_2\text{O}$ (blue) $\rightleftharpoons \text{KCl} + 2\text{H}_2\text{O} + \text{CuCl}_2 \cdot \text{KCl}$ (brown) is 92°C . To ensure the reverse reaction, it is well to stir the mixture on cooling, so that the three substances on the right may be brought into contact.

A case of double decomposition. If potassium chloride and crystallized sodium sulphate be ground together in a mortar, the mass becomes moist, and crystals of potassium sulphate and sodium chloride are deposited. The reaction, which may be represented by the equation



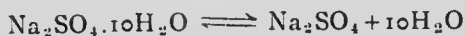
is in equilibrium at 3.5 degrees C ; if cooled below that temperature the original substances are formed again and the mass solidifies.

(ii) Reactions analogous to that between water and steam.

These examples differ from the preceding only because a gas takes part in the reaction, which is consequently accompanied by a great change of volume. In both cases the reactions are in equilibrium at one temperature only for each pressure; but change of pressure has much more effect on the temperature of equilibrium here than in the others. *Sublimation.* If a little iodine be placed between a pair of watch-glasses, and the under glass be heated, the iodine gives off vapour which condenses on the upper (cool) glass. Sublimation of solids is thus analogous to distillation of liquids.

Solid iodine $\rightleftharpoons$ Iodine vapour

Efflorescence. When crystals of washing soda, hydrated sodium sulphate, etc., are left in an open vessel in a dry room, they fall to a powder of the anhydrous salt; and if this powder be placed under a bell-jar with a dish of water beside it, it cakes together and the hydrate is formed again.



Decomposition of carbonates by heating. $\text{CaCO}_3 \rightleftharpoons \text{CaO} + \text{CO}_2$

In a lime kiln the reaction takes place in one direction, and at ordinary temperatures in the other. Sodium bicarbonate behaves in much the same manner. (Heat some in a test-tube).

