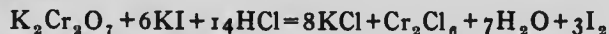


to make 1 litre; sulphuric acid 3cc, water to 1 litre; crystallized ferrous sulphate 7 g, water to 500cc; iron alum 10 g, water to 100cc; starch $\frac{1}{2}$ g mixed with a little cold water and poured into 500cc of boiling water, cool before use.



The rate is increased when the concentration of bichromate, iodide, or acid is increased; ferrous sulphate acts as a positive catalyser, ferric alum by itself has very little effect, but much reduces the acceleration caused by the ferrous salt.

DELAYED REACTIONS

The great effect of temperature on the rates of reactions has already been illustrated; as a general rule every rise of 10°C about doubles the rate— 100° would thus multiply it by 1000. This accounts for the fact that many substances which combine vigorously at a red heat appear to be without action on each other at ordinary temperatures; thus the catalytic action of platinum on mixtures of hydrogen and oxygen may be regarded as acceleration of a reaction already taking place, and the spontaneous combustion of coal heaps may be traced to the heat given off by slow oxidation, which raises the temperature of the interior of the heap and increases the rate of the reaction, until finally the whole mass is red hot.

There are however some cases of "delayed" or "retarded" reactions to which this explanation is not applicable; supersaturated solutions for instance have been kept for years without the deposition of crystals; and as the first speck of the solid salt is enough to bring about a quick reaction, it is not possible to assume that crystallization is going on "very slowly" all the while.

The rate at which the crystallization proceeds may be studied if the solution while still hot be sucked up into a narrow glass tube, which is then closed at both ends by small caps made from an inch of rubber tube and a scrap of glass rod. After cooling, one of the caps may be removed and a crystal of the salt introduced. If tube and caps be wet just before filling, and if the outside be washed off as soon as possible after putting on the caps, there is very little danger of premature crystallization.

THE ACTION OF LIGHT

The action of light in accelerating the reduction of silver salts by organic matter (gelatine), or the reduction of ferric salts by ferricyanides (blue print) is familiar to all; the warning that accompanies each film "to be developed not later than . . ." is a reminder that the reaction takes place even in the dark, and that light only hurries it up. The decomposition of chlorine water in the light is also a familiar experiment;