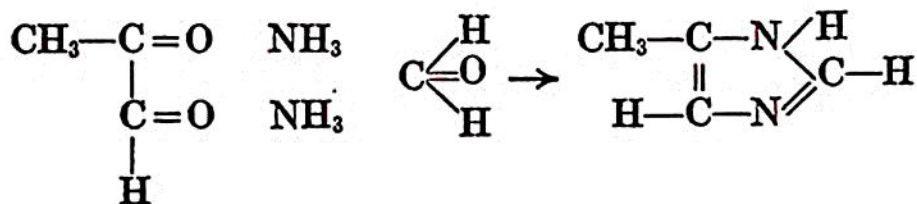


and mannose are produced, and, all told, the constituents of such a solution probably number at least two hundred, all produced from glucose alone, under the influence of a slight excess of hydroxyl ions. Among these substances the greatest diversity of chemical behavior is to be distinguished. Alcohol, aldehyde and ketone, and acid radicals occur in great profusion and variety of combinations; compounds possessing forked chains are present; and double bonds between carbon atoms add to the complexity. Moreover, all these substances themselves possess great chemical activity.

A single case may perhaps illustrate this point. It has been shown by Windaus and Knoop¹ that in such solutions, in the presence of ammonia, one molecule of methyl glyoxal, one of formaldehyde, and two of ammonia unite to form the cyclic compound, methyl imidazol, a substance related to histidine, the latter being an important constituent of the protein molecule:—



¹ Knoop and Windaus, *Berichte*, XXXVI, 1166, 1905. Hofmeister's *Beiträge*, VI, 392, 1905.