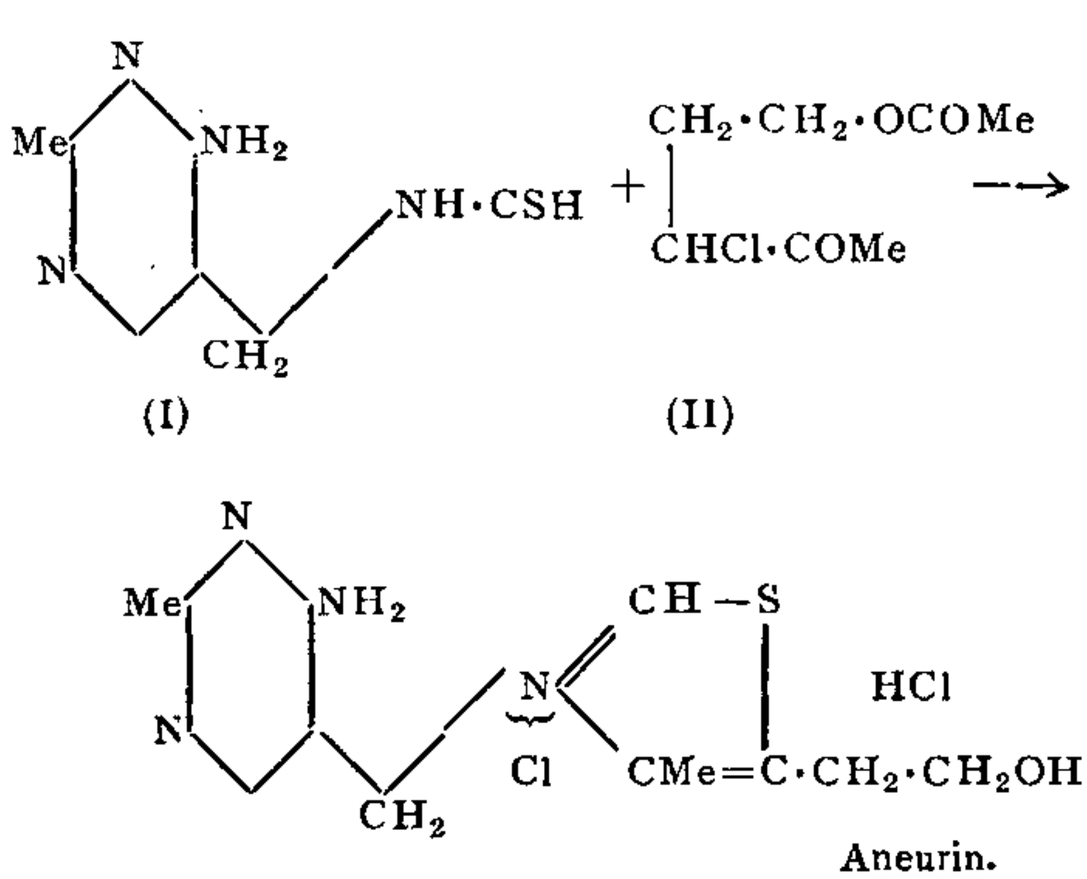
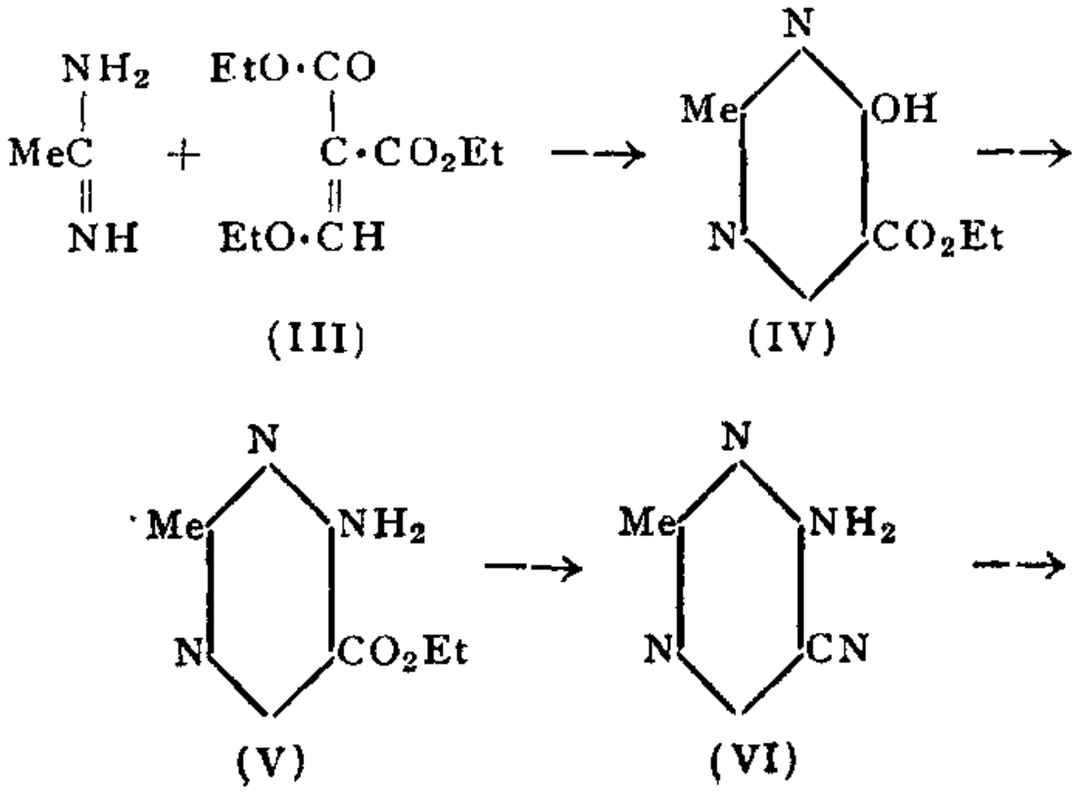
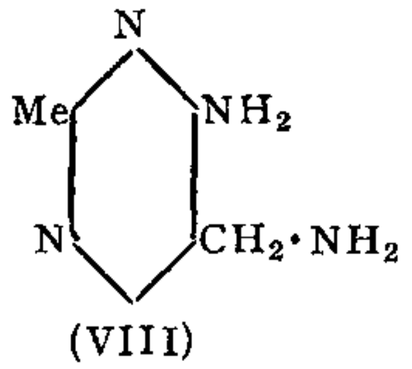
RESEARCH ITEMS.

Synthesis of Aneurin (Vitamin B_1).—Todd and Bergel have recently described (*J. C. S.*, 1937, 364) a synthesis of aneurin; details of previous reported syntheses (*cf.* Williams and Cline, *J. Amer. Chem. Soc.*, 1936, **58,** 1504; Grewe, *Z. physiol. Chem.*, 1936, **242,** 89) have not yet been published. The new synthesis depends on the condensation of 4-amino-5-thioformamidomethyl-2-methylpyrimidine (I) with methyl α-chloro-λ-acetoxypropyl ketone (II). Various alternative routes to (I) are described of which the most reliable is the following. Ethyl ethoxymethylene-malonate (III) condensed readily with acetamidine in presence of sodium ethoxide to give ethyl 4-hydroxy-2-methylpyrimidine-5-carboxylate (IV) which after successive chlorination with phosphoryl chloride and heating with alcoholic ammonia under pressure yielded ethyl 4-amino-2-methylpyrimidine-5-carboxylate (V). After conversion of (V) into the corresponding amide with concentrated aqueous ammonia, the product was dehydrated to give the nitrile 4-amino-5-cyano-2-methylpyrimidine (VI) which on catalytic hydrogenation yielded 4-amino-5-aminomethyl-2-methylpyrimidine (VII) isolated as the hydrochloride. From (VII), (I) was readily obtained on treatment with aqueous potassium dithioformate. (I) and (II) gave aneurin on heating together at 115–120° for a few minutes.



Aneurin.





→ I.

. S. W.

The Search for Element 87.—The first search for element 87 was made by K. T. Bainbridge in 1929. Studying the likely sources by the positive ray method, he failed to detect in them the presence of the element. F. Allison and E. J. Murphy (1930) applying their magneto-optic method reported the discovery of the element in lepidolite and pollucite. Their method however is open to question. In 1931, J. Papish and E. Wainer announced their finding of several of the X-ray lines of element 87, using a concentrate derived from samarskite. Hulubei (1936) examined a pollucite extract by means of the X-ray spectrograph and obtained two lines which he considered as the $L\alpha_{1,2}$ doublet of element 87.

F. R. Hirsh Jr. (*Phys. Rev.*, 1937, **51,** 584) has repeated the experiments of Papish and Wainer and has been able to reproduce the lines. He has shown, however, that the lines are not due to element 87 but are caused by the photographic registration of the surface defects of the calcite crystal employed. (It is of interest to note that the calcite crystal used by Hirsh is the same as was used by Papish and Wainer). On oscillating the crystal to eliminate the defect, the lines disappear completely. Hirsh has further examined the results of Hulubei and has shown that it is more plausible to interpret the lines obtained by the latter as the $L\beta_3$ and $L\beta_1$ lines of mercury (with which his X-ray tube target was contaminated). In view of these considerations Hirsh concludes that the search for element 87 is still open.

K. S. G. D.

Atomic Weight of Oxygen.—Smith and Matheson have reported (*J. Res. National Bureau of Standards*, 1936, **17,** 625–628) the results of their work on the difference in atomic weights of oxygen from air and from water. Accurate determinations of the density of water were made by using the twin quartz pycnometer, employing specimens of water prepared by the union of atmospheric oxygen and of oxygen derived from water respectively, with specimens of hydrogen which had been brought to uniform isotopic composition by the usual process employing ammonia. Samples of water so prepared differed only in respect of the isotopic composition of the oxygen present in them. The observed mean difference in density was 8·6 p.p.m., the water derived from atmospheric oxygen being the heavier. This difference in density corresponds to a

difference in atomic weight of 0·00014 between atmospheric oxygen and oxygen present in water.

K. R. K.

Silica in Portland Cement.—A rapid method for the determination of silica in Portland Cement has been described (Edwin E. Maczkowske, *J. Res. National Bureau of Standards*, 1936, **16**, 549–553). The method consists in mixing the sample of cemert with roughly an equal quantity of ammonium chloride, digesting the mixture with hydrochloric acid for about half an hour and filtering off the silica as usual. This shortened procedure avoids the tedious double evaporation customary in silica determinations. The results obtained by this procedure have been compared with those obtained by the standard method and have been found to be reliable.

K. R. K.

The French Sugar Scale.—The French Sacharimeter Scale yields values for sucrose content which differ by about 0·1 per cent. from the values obtained with the International Scale (Frederick Bates and Francis P. Phelps, *J. Res. National Bureau of Standards*, 1936, **17**, 347–353). This is due to the incorrectness of the normal weight of sugar prescribed by the French Technologists. This paper points out that correct calculation of the data obtained by French investigators leads to a figure for normal weight which is identical with the International Standard, namely, 16·269 g. It is, therefore, recommended that the French Sugar Scale should be rectified by discarding the present normal weight of 16·29 g. and employing instead the International value, *viz.*, 16·269 g.

K. R. K.

Biological Digestion of Garbage with Sewage Sludge.—The underground sewerage system of removal of household wastes developed so far and the methods of purification adopted thereto have concerned themselves mainly with fluid wastes. Quite recently, however, attempts have been made, principally in America, to grind up the solid wastes, *e.g.*, waste-food (garbage) by electric motors and to convey them through the sink and plumbing into the sewers. This improvement, if adopted on the large scale, would ensure a more complete removal of waste material and at the same time serve to enrich the sewage with substances of high manurial value. The slow progress, however, which such an extension of the sewage method to the disposal of garbage has made so far, would draw attention to certain difficulties that lie in the way of its adoption, from the engineering as well as chemical points of view, *e.g.*, questions involving the capacity and ability of plumbing systems and sewers to convey ground garbage suspended in water, the nature of the increased load placed upon sewage treatment plants, the factors controlling the digestion of garbage with sewage, the optimum dosage of garbage which could be successfully manipulated, etc.

In an interesting pamphlet issued by the University of Illinois (*Bulletin* No. 24, Nov. 20, 1936), Dr. Babbitt and co-workers have subjected the chemical factors underlying the biological digestion of garbage with sewage, to a critical examination, conducting their experiments on a semi large scale. They find that garbage could be satisfactorily digested with sewage sludge, provided that it is finely ground and intimately mixed with the sludge and the percentage of sewage solids is kept above 20% (preferably about 40%) of the total volatile solids. The digestion could be carried out in Imhoff tanks, provided the rate of feeding did not exceed 1½ tons of wet garbage per million gallons of sewage. Temperature controlled digestors could be operated successfully at a loading equipment of about 3 c.ft. of digester capacity *per capita*, based on a retention period of 30 days. The rate of gas production was markedly increased by the addition of lime (but not of caustic soda or soda ash), the peak being reached at 3 c.ft. of gas per day per c.ft. of tank capacity.

C. N. A.

Disperse Systems in Gases : Dust, Smoke and Fog.

THE study of disperse systems in gases is of great interest from the theoretical and technical standpoints and has received considerable attention from chemists and physicists. The discussion organised by the Faraday Society in April 1936 has considerably helped workers in this field by placing before them the present position of the several aspects of the subject.

General Properties of Aerosols.

In the introductory paper Whytlaw-Gray (p. 1042)* has briefly dealt with the general properties of disperse systems in gases, pointing out the scope of the subject under discussion.

The Formation of Aerosols.

The work of Stumpf and Jander (p. 1048) dealing with several methods of preparing finely divided and approximately unidisperse smokes in reproducible ways is of special importance for the systematic investigation of the dispersoids. Cawood and Whytlaw-Gray (p. 1059) have studied the effect of pressure on the photochemical production of ferric oxide aerosols. Their experimental results lead to the conclusion that the condensation nuclei are larger at lower pressures than when pressures are high, though as

* References are to the pages in the Monograph (*Trans. Faraday Soc.*, 1936, 1042–1297).