

### Resonance Spectrum of Hydrogen.

WHILE we were attempting to photograph the spectrum of arsenic by the Paschen hollow cathode discharge in helium, plates were obtained which revealed with remarkable intensity the Lyman series of hydrogen extending down to the 15th member. The most interesting feature of the series, however, is the peculiar distribution of intensity among its members. Instead of the intensity diminishing steadily to the very last member, it diminishes rather slowly to the 10th member; there is a definite increase in intensity of the 11th and then an abrupt fall, so that the remaining members are only just observable.

Further experiments under varying conditions of pressure of helium and arsenic in the discharge have definitely indicated that the phenomenon must be interpreted as a case of resonance occurring only in the presence of arsenic. With a high pressure of arsenic and a low pressure of helium, the 10th and the 11th members of the Lyman series appear with considerable intensity (the 11th being stronger), while the others show a rapid diminution in intensity, the 8th and 9th being very faint.

It is considered that the energy of excitation of this resonance spectrum is to be sought for in a transfer, by collisions of the second kind, from the excited arsenic atoms. Further investigations are in progress to determine the exact value, from series data, of the first ionisation potential of arsenic, a knowledge of which throws considerable light on the correct interpretation of the phenomenon.

A full report of the results will be published as soon as they are ready.

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### Contraction Constants of Enzyme-Substrate Reactions.

CHANGES of volume accompanying enzyme hydrolysis have been utilised by Sreenivasaya and Sastry<sup>1</sup> to follow the kinetics of enzyme action by means of the dilatometer. The procedure employed in the above investigation does not bring into consideration the substantial volume change occurring in the initial stages of the reaction, and therefore gives no idea of the total contraction resulting from the complete hydrolysis of the substrates. The total contraction given by an enzyme-substrate system depends only on the absolute amount of the substrate in the reaction mixture, and is proportional to it.

The contraction of a few systems has now been investigated by a specially designed dilatometer; the contraction per gram-molecule of the substrate has been calculated, and found to be a constant for each enzyme-substrate system. For urea-urease the constant is 24, while sucrose-invertase has a constant of 6. These constants are of considerable value in the dilatometric estimation of substrates in physiological liquids and plant saps. Constants for other enzyme-substrate systems are being determined.

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<sup>1</sup> *Biochem. Jour.*, 23, 975; 1929.

### The Treatment of 'Gapes' in Chickens.

OUTBREAKS of 'gapes' among chickens usually lead to a very high mortality. The disease is due to the presence of the nematode worm *Syngamus trachealis* Lieb. in the windpipe. Treatment with turpentine in olive oil, applied with a feather, is often successful in skilful hands, but I have only saved one pullet thus. A severe outbreak occurred among my chickens in March 1930, and I treated a number with carbon tetrachloride dissolved in medicinal paraffin, probably about a two per cent solution. Fewer died than I expected, but being otherwise occupied, no records were kept.

In January this year four chickens were hatched out, and all developed gapes when about a month old. Two died, and I started to treat the remaining two cockerels by giving, on three successive nights, about 2 c.c. of carbon tetrachloride solution, administered by means of a pipette with teat. Though one appeared to be very ill at the start, both recovered. Successive outbreaks were similarly treated, fourteen birds in all, with only one death up to about the end of May. The birds were usually a month or six weeks old when attacked. Late in May, however, gapes appeared in two broods, of eight and six, when about a fortnight old. The treatment failed completely, and thirteen died, even though the amount of carbon tetrachloride was increased up to probably about five per cent. One pullet, however, never contracted gapes, though she must have been as heavily infected as the others. This bird is still alive, and might form the starting point of an immune race.

Though unsuccessful among chickens a fortnight old, the treatment has undoubtedly been successful among older birds, and appears to be worth the attention of those engaged in work on poultry. My own trials were rather rough and ready, a cure rather than a definite research being the object. The breeds were Light Sussex and White Wyandotte, including crosses.

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### A Spark Method of Measuring High Resistance.

A CONDENSER of capacity  $cap$  charged through a resistance  $r$  megohm by a battery of  $e$  volts, has at any instant a charge  $q = ec(1 - e^{-t/r})$ . After a time,  $t$  sec., the charge is approximately equal to  $2/3 ec$ . The attainment of this stage in the charging process may be determined by inserting a spark gap in parallel with the condenser, of which the sparking potential is  $2/3 e$ , the spark passing when  $t = cr$ .

This suggests a method of measuring resistances of a high order (or capacities of a low order), and some preliminary experiments have been made with standard megohms and xylol alcohol resistances of the order of  $10^8$  ohm. The spark gap consisted of two platinum wires about 1 mm. apart fused into a highly evacuated glass tube, the sparking potential being about 410 volts. The values obtained for the resistances in this manner were about 10-15 per cent too great, but consistent results were obtained in all cases. The large results (that is, large values of  $t$ ) obtained are probably due to leakage through the condenser insulation or across the glass of the spark tube. The elimination of these defects is under investigation, and it is hoped shortly to publish elsewhere the results of further work.

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