The first column contains measured wave-lengths of the Pickering series in the star, the second the computed values, the third contains the measured wave-lengths of the Balmer series in the star, and the fourth the residuals, star–laboratory, using Curtis's wave-lengths. In view of the closeness of the agreement between the observed and computed values, there can be no doubt as to the existence of the helium components of the Balmer series, and hence no doubt that the Pickering series is due to enhanced helium.

Using these preliminary wave-lengths, corrected to vacuum, the value of the constant N_{He} in Bohr's formula, $n = N_{He}\left(\frac{1}{4^2} - \frac{1}{m^2}\right)$, for the Pickering series has been computed for all lines except those with footnotes. The weighted mean, using in addition the measured wave-length 4685·76, comes out $N_{He}=438\ 890\cdot3$, with a total range of 16·8. From the well-known formula :

$$\frac{m_0}{M} = \frac{N_{He} - N_H}{N_H - \frac{1}{4}N_{He}},$$

arising from the correction to Böhr's simple theory on account of the motion of the nucleus, the mass of the electron m_0 in terms of the mass M of the hydrogen atom comes out $\frac{1}{1851\cdot6}$. The revised values of the wave-lengths which will result from additional plates and re-measures should give a value of the electron mass of a high degree of accuracy.

In a recent paper (Proc. Roy. Soc., A, vol. 99, p. 135, 1921) Saha has predicted that at about the stage Ob in stellar spectra the Balmer series disappears and is replaced by the Pickering lines 6560, 4859, 4339, 4100. Reference to his tables shows that the enhanced Mg line 4481 should disappear at a still higher temperature than the Balmer series. In the star 9 Sagittæ the line 4481 has almost disappeared. In fact it has only been glimpsed on one of several plates. However, at Hγ there are lines at 4340·4 (Hγ) and 4338·8. Further, Hγ is about six times as intense as the Pickering component. This non-verification of Saha's prediction is scarcely surprising when it is recalled that the nebulæ, which are probably more advanced than O type stars, show the Balmer series (Lick Observatory Publications, vol. 13).

<div align="right">H. H. PLASKETT.</div>

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Victoria, B.C., September 17.

Radiation and Chemical Action.

IN the *Philosophical Magazine* for November, 1920, Prof. Lindemann has shown that if Prof. W. C. McC. Lewis's hypothesis is true, *i.e.* that the velocity of a chemical reaction is proportional to the intensity in the system of the radiation of a wave-length which is characteristic of the reaction, then in the case of the inversion of cane-sugar by dilute acid, exposure to the radiation of the sun should increase the reaction velocity 5×10^{13} times.

Recently Prof. Lewis has suggested that any such effect would not be true for the conditions under which such a reaction is usually carried out, because the activating rays lie in the region of 1μ, and at this wave-length water, the solvent, would absorb the radiation almost totally in the first thin layer, so that the bulk of the liquid would remain unaffected.

In order to test the radiation hypothesis, paying heed to Prof. Lewis's suggestion, the following simple experiment has been carried out. A solution con-

taining 100 gr. of cane-sugar and 3·65 gr. of hydrogen chloride per litre was made up and divided into two portions. One was left to stand indoors at room-temperature (14·7° C.), while the other was forced upwards through four fine jets made from 3 mm. diameter glass tubing drawn out to the narrowest of capillaries; this treatment took place on the roof in full sunshine. The liquid from the jets formed fine columns about 8 cm. high, which then broke up into clouds of small drops, the drops rising a further 40 cm. They were allowed to fall, and collected in a large dish; the temperature of the resulting liquid had risen to 19·1° C.

Now for the cane-sugar at the concentrations used the period required for half to be inverted is at 20° C. from Lewis's measurement of the velocity constant, $1\cdot6 \times 10^5$ seconds, or approximately 47 hours. On Lewis's hypothesis, illumination by the sun should reduce this to 3×10^{-9} seconds; hence it was reasonable to expect some indication of a more rapid change in the exposed portion if the hypothesis were true. Two polarimeter tubes were filled, one with the exposed portion, the other with the unexposed. The rotations measured were :—Unexposed solution, 13·06°; exposed solution (measured 2 min. later), 12·82°. In other words, illumination by the sun had had no appreciable effect on the reaction velocity.

The size of the drops in which the one portion had been exposed was measured later by catching drops of the same solution formed under the same conditions on black velvet and measuring them under a microscope. They were of pretty constant size, the average diameter being 0·015 cm. It is thus difficult to imagine that the absence of any effect was due to absorption by the solvent. Further, from Stokes's formula the size gives an average time of fall 0·68 second, so that the time of exposure is ridiculously ample. For even if the radiation density at 1μ had been reduced inside each drop, by absorption, to 10^{-8} of its value, which is unlikely, then a rough calculation, assuming the truth of the hypothesis, shows, that an exposure for this time should result in a difference in polarimeter reading for the two solutions of about 13°, instead of the observed 0·24°.

It is, of course, realised that this simple experiment has no bearing upon M. Perrin's version of the radiation hypothesis, in which the reactants are supposed to absorb several quanta of considerably longer wave-length than $1-2\mu$. But this also can be tested directly by experiments, which it is proposed to carry out here as soon as possible.

<div align="right">T. W. J. TAYLOR.</div>

Brasenose College, Oxford, October 2.

Qualities of Valency.

IN his article in *Science* of July 22 (see NATURE, September 15, p. 101), and in his address to Sections A and B of the British Association at Edinburgh, Dr. Irving Langmuir asks us to believe that the sodium and chlorine atoms in sodium chloride are never united by a chemical *bond*, *i.e.* that the salt is ionised in its synthesis and remains ionised under all conditions. This appears to be a denial of the existence of NaCl molecules, yet such molecules exist in the state of vapour at *cir.* 2000° C. Are we, then, to suppose that sodium and chlorine ions are held together at this temperature by electrostatic attraction only? Difficult to reconcile with this idea, if it is applied to salts in general, are the phenomena of aqueous solutions of some salts—mercuric salts, for example—which are attributed to imperfect ionisation and the increase of specific conductivity of imperfect