



XLII. Relative intensity of the spectral lines of gases

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more or less. Refilling the water-flasks had also a disturbing effect. Taking these facts into consideration, it cannot be wondered at that at this temperature the results were rather inconstant. The tubes gave, when filled with n NaCl solution, at 15° an amount of salt represented by 1.1 cubic centim.

40 AgNO_3 per hour. But usually, when in the ice-chest, the salt diffused from similar solutions required for its titration

1.5–2 cubic centims. $\frac{n}{40}$ AgNO_3 per hour, indicating that the

progress of the diffusion was disturbed. On one occasion, however, for a period of about 14 hours, 6 P.M. to 8 A.M., the diffused amount was equivalent to 0.87 cubic centim. per hour. This rate did not continue during the next day; opening the box to renew the ice and water disturbed it as usual. The experiments at a higher temperature were somewhat more successful. Instead of the ice a Bunsen burner was placed in the box, and a tolerably constant temperature of 25° was obtained. The amount of AgNO_3 solution required now per hour varied between 1.3 and 1.4 cubic centim. Assuming that for the lower temperature the result 0.87 cubic centim. was correct, the amounts diffused from solutions of the same strength at three different temperatures may be thus tabulated:—

At 10° , 0.87 cub. cent. $\frac{n}{40}$ AgNO_3 required per hour.

„ 15° , 1.10 „ „ „ „

„ 25° , 1.35 „ „ „ „

But these results can only be considered approximately correct.

[To be continued.]

XLII. Relative Intensity of the Spectral Lines of Gases.

By J. RAND CAPRON, F.R.A.S.*

IN reference to M. Ch. Fievez's "Researches on the Relative Intensity of the Spectral Lines of Hydrogen and Nitrogen in regard to the Constitution of Nebulae," which appears in your present month's Number, and a copy of which the author has obligingly sent me, it may perhaps be useful to refer to a few experiments detailed in my 'Aurora and their Spectra,' chapter xi. p. 108 *et seq.*

These were made for the purpose of testing how far it was possible or probable that the bright green and red lines in the aurora-spectrum might be the brighter and only visible rays

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of a more complicated spectrum, concealed partly by want of brightness in the aurora itself, and partly by the medium, more or less dense, in which that phenomenon probably occurs. As Geissler's tubes were at the time under examination, they were found convenient for this purpose. Nitrogen-(in the shape of "air") tubes were also used; but I do not find they were specially tested; at least they are not recorded. I have, however, a recollection that the bright double line in the green survived all others. The other results are taken from notes made at the time.

The spectroscope was a direct-vision one, by Browning, giving a dispersion equal to about two white glass prisms of 60° . Collimator and telescope 6 inches long respectively, and carrying 1-inch aperture lenses. Slit about $\frac{1}{300}$ of an inch wide. Source of light Geissler tubes excited by a $\frac{1}{2}$ -inch-spark coil.

Hydrogen tube.—Tube showing ordinary hydrogen-lines, with some others probably due to impurity. At 6 inches from slit, α (solar F) was very bright; the lines β , γ , δ , ϵ , and ζ also seen, but faint. At 12 inches from the slit, F and γ were alone seen; and at 24 inches, F stood by itself alone upon a dark ground.

Carbonic-acid tube.—At 18 inches from the slit the continuous spectrum and fainter lines disappeared, while the four principal lines still shone out, that in the green being the strongest. At 24 inches same lines visible, but faintly.

Coal-gas tube.—At 24 inches whole spectrum quite brilliant, the four principal lines very bright, and preserving their distinctive colours.

Oxygen tube (impure).—At 12 inches distance from the slit the spectrum lost nearly all its light. F hydrogen and three oxygen lines, α , β , and γ , alone remained. At 24 inches no spectrum at all seen.

It was noticed in the foregoing experiments that, on withdrawing the tube from the slit, the colours of the spectrum disappeared in the following consecutive order—red, yellow, violet, and, lastly, green. It thus seems pretty clearly proved that the brighter line or lines of a spectrum may be seen singly as a matter of intensity.

This, however, must be treated as independent of the exaltation or suppression of individual lines of a spectrum by such causes as temperature, pressure, magnetism, &c.

It is easy to conceive that the celestial bodies may be liable to these influences to a very considerable extent, and that modifications of their spectra may thus arise which we do not produce in the laboratory and which are not dependent on the question of intensity alone.

Guildown, April 2, 1880.