

ON THE ABSORPTION OF γ RAYS OF RADIUM BY LIQUIDS.¹

BY S. J. ALLEN.

THESE experiments were made in exactly the same manner as those for solids, described in this same issue. The liquid was placed in a cylindrical glass cell, and the cell situated at a distance of about 5 cm. from the radium. The radium was covered with 7 mm. of lead.

Before a reading was taken enough liquid was poured into the cell to cover the glass bottom and thus ensure a level surface to measure the thickness from. The thickness was measured both directly and by means of a calibrated pipette.

Two series of tests were made: (1) When the bottom of the electroscope was covered with a very thin layer of paper. (2) When the bottom was covered with 7 mm. of lead. The results of these two tests are shown in the following table. Both pure liquids and saturated aqueous solutions of the salts were tested.

TABLE I.

Cell Placed 5 cm. from Ra.				Electroscope Covered with 7 mm. Lead.			
Substance.	Thick- ness in mm.	λ	$\lambda \times 100$ Density	Substance.	Thick- ness in mm.	λ	$\lambda \times 100$ Density
Water	0-20.4	.0462	4.62	Water	0-18.4	.0465	4.65
Ethyl alcohol	0-20.0	.0352	4.40	Amyl alcohol	0-18.3	.0355	4.37
Amyl bromide	0-20.0	.0544	4.50	Amyl bromide	0-18.3	.0497	4.11
Carbon tetra bromide	0-14.8	.1144	3.73	Iod benzene	0- 6.5	.074	4.05
Iod benzene	0-20.0	.0783	4.28	Chloroform	0-18.4	.0603	4.06
Ether	0-20.0	.0326	4.46	Sulphuric acid . . .	0-18.4	.0757	4.11
Ethyl iodide	0-12.0	.0860	4.52	Lead nitrate	0-18.4	.0652	4.82
Methyl iodide	0- 8.0	.0907	4.12	Lead nitrate	0-32.7	.0636	4.68
Brom benzene	0-20.0	.0607	4.04	Potassium iodide . .	0-18.4	.0658	4.17
Ethelene bromide . .	0-18.0	.0870	3.95	Potassium iodide . .	0-26.5	.0653	4.21
Meta brom anilene . .	0-20.0	.0731	4.56	Copper chloride . . .	0-18.4	.0609	4.22
Propyl bromide	0- 9.0	.0617	4.54	Copper chloride . . .	0-32.7	.0612	4.25
Iso amyl bromide . . .	0-19.0	.0685	4.10	Cadmium iodide . . .	0-18.4	.0549	4.28
Lead nitrate	0-20.0	.0754	5.57	Bismuth tri chl. . .	0-18.4	.0465	4.33
Potassium iodide . . .	0-20.0	.0760	4.81				
Copper chloride	0-20.0	.0594	4.12				

From an examination of this table it can be seen that the results for liquids are very similar to those for solids. For those liquids not containing

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atoms of high atomic weight λ /density is nearly constant, but for the liquids of high atomic weight this ratio is much larger. The value for lead nitrate is practically the same as for solid lead. Excluding lead nitrate and water the ratio λ /density in the (2) case is 4.18.

A NEW FORMULA FOR THE VAPOR TENSION OF WATER BETWEEN
0° AND 200° C.¹

BY K. E. GUTHE AND A. G. WORTHING.

THE pressure of saturated water vapor has recently been very accurately determined for the interval from 50° to 200° C. by Holborn and Henning,² and for the interval from 0° to 50° C. by Scheel and Heuse.³ Thiesen's empirical formula

$$(t + 273) \log \frac{p}{760} = 5.409(t - 100) - 0.508 \times 10^{-8}(365 - t)^4 - 265^4 \quad (1)$$

represents very closely the results between 0° and 100°, but leads to increasing differences at higher temperatures, reaching the large value of 0°.35 C. at 200°. Holborn and Baumann⁴ propose the following formula for the interval between 100° and 200°:

$$(t + 273) \log \frac{p}{760} = 5.3867(t - 100) - 0.5262 \times 10^{-8}(365 - t)^4 - 265^4. \quad (2)$$

This gives a very good agreement between observed and calculated values for the range of temperature in question, but the equation does not fit as well as Thiesen's formula for the lower temperatures. Nernst⁵ proposes a still more complicated equation, which, though very interesting from a theoretical point of view, can hardly be considered as of value for rapid calculation.

We have found the following simple formula to be very convenient and of great accuracy

$$\log p = 7.39992 - \frac{\log^{-1} 3.949046}{\theta^{1.2808}}, \quad (3)$$

where p is the pressure of the saturated vapor and θ the absolute temperature ($= 273°.1 + t$). This equation has not only the great advantage of simplicity

¹Abstract of a paper presented at the Chicago meeting of the Physical Society, November 26, 1910.

²Holborn and Henning, *Ann. Phys.*, 26, 833, 1908.

³Scheel and Heuse, *Ann. Phys.*, 31, 715, 1910.

⁴Holborn and Baumann, *Ann. Phys.*, 31, 945, 1910.

⁵Nernst, *Verh. d. d. Phys. Ges.*, 12, 565, 1910.