PHYSICS TEACHING NOTES

THE PRODUCTION OF LIQUID OXYGEN AS A LECTURE TABLE DEMONSTRATION

A one-liter florence flask (round bottom) is prepared with a stem about 3 cm. in diameter and 20 cm. long. At the lower end is fused a small Dewar flask of about 4 cc. capacity. The liter flask with its stem is evacuated and filled to a pressure of 2.5 atmospheres with tank oxygen and sealed off. To produce *liquid* oxygen it is only necessary to submerge the stem with its small Dewar flask in liquid air. Almost immediately the gaseous oxygen will begin to condense in the cooled stem and trickle down into the small Dewar flask. After about one minute the stem is removed from the liquid air and it will be noticed that 2 or 3 cc. of liquid oxygen will have collected in the Dewar flask. The cold parts will soon be covered with frost. This may be removed by dipping the Dewar in a beaker of water for a few moments. The liquid oxygen is now visible and may be studied at leisure. It will last for a half hour or more.

The following simple calculation may be made: Volume of bulb and stem = 1150 cc. This volume was filled with O until the manometer read 96 cm. Hence total pressure = 96 + 74 = 170 cm. Therefore, the equivalent volume = 1150 × 2.3 atmospheres = 2600 cc. The manometer reading fell to 30 cm. when the stem cooled to the temperature of liquid air, i. e., to —180° C. Hence the volume liquefied

$$= 2600 \times \frac{140}{170} = 2100 \text{ cc.}$$

Now the density of liquid oxygen = .92, and that of the gas oxygen = .00142. Therefore, the volume of oxygen at N. P. T. required to produce 1 cc. of liquid is .92/.00142 = 643 cc. Hence the volume of liquid oxygen that the apparatus should yield when the stem is cooled to the temperature of liquid air is

$$\frac{2100}{643} = 3.3 \text{ cc.}$$

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A NEW LECTURE TABLE DEMONSTRATION TO SHOW THAT CATHODE RAYS LEAVE THE CATHODE NORMALLY

Ample proof is at hand experimentally and otherwise that cathode rays (electrons in motion) in a discharge tube leave the surface normally, and additional proof seems unnecessary.

The following experiment is so simple and striking, yet on close observation is just what one would expect, that I venture a brief description of it. The apparatus may be blown by anyone handy with glass.