

Answer on Question #63206, Chemistry / General Chemistry

Chapter 11 (11.96)

The vapor pressure of a volatile liquid can be determined by slowly bubbling a known volume of gas through it at a known temperature and pressure. In an experiment, 4.95 L of N₂ gas is passed through 7.7059 g of liquid benzene, C₆H₆, at 28.0 °C and atmospheric pressure. The liquid remaining after the experiment weighs 5.9203 g.

Assuming that the gas becomes saturated with benzene vapor and that the total gas volume and temperature remain constant, what is the vapor pressure of the benzene in torr?

Solution:

$$7.7059 \text{ g} - 5.9203 \text{ g} = 1.7856 \text{ g}$$

$$\text{Molar mass of benzene} = 78.11 \text{ g/mol}$$

$$n = 1.7856 \text{ g} / 78.11 \text{ g/mol} = 0.023 \text{ mol}$$

$$T = 273 + 28 = 301 \text{ K}$$

$$PV = nRT.$$

We get

$$P = nRT/V$$

$$P = (0.023 \text{ mol} \times 8.3 \text{ J/molK} \times 301 \text{ K}) / 0.00495 \text{ m}^3 = 11608.3 \text{ Pa} = 87.07 \text{ Torr}$$

Answer: 87.07 Torr

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