

### Question #72346, Chemistry / Physical Chemistry

A container with volume 71.9 ml contains water vapor at a pressure of 10.4 atm and a temperature of 465°C. How many grams of the gas are in the container?

**Answer:**

Ideal gas law:

$$PV = nRT$$
$$PV = \frac{mRT}{M}$$
$$m = \frac{PVM}{RT}$$

For water vapor:

$$P = 10.4 \text{ atm}$$
$$T = 465^\circ\text{C} = 738.15 \text{ K}$$
$$V = 71.9 \text{ mL} = 0.0719 \text{ L}$$
$$R = 0.082 \frac{\text{L} \times \text{atm}}{\text{K} \times \text{mol}}$$
$$M = 18.015 \frac{\text{g}}{\text{mol}}$$
$$m = \frac{10.4 \text{ atm} \times 0.0719 \text{ L} \times 18.015 \frac{\text{g}}{\text{mol}}}{0.082 \frac{\text{L} \times \text{atm}}{\text{K} \times \text{mol}} \times 738.15 \text{ K}} = \mathbf{0.223 \text{ g}}$$