

LATEX PRACTICE

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(1)

$$m_{O_2} = 0.105 \text{ kg}$$

$$m_p = 75.0 \text{ kg}$$

$$r = 0.0550 \text{ m}$$

$$T_{O_2} = 200.0 \text{ }^{\circ}\text{C} = 473.0 \text{ K}$$

$$\text{O}_2 = 32.0 \text{ AMU}$$

$$1 \text{ AMU} = 1.66 \times 10^{-27} \text{ kg}$$

$$1 \text{ mol} = 6.022 \times 10^{23} \text{ particles}$$

$$k_B = 1.38 \times 10^{-23} \frac{J}{K}$$

a. Moles of O₂

$$\frac{0.105 \text{ kg}}{32.0 \times (1.66 \times 10^{-27} \text{ kg})} = 1.977 \times 10^{24} \text{ particles}$$

$$1.977 \times 10^{24} \text{ particles} \times \frac{1 \text{ mol}}{6.022 \times 10^{23} \text{ particles}} = 3.282 \text{ mol}$$

b. Find pressure

$$P = \frac{F}{A} = \frac{mg}{\pi r^2} = \frac{(75.0 \text{ kg})(9.80 \frac{\text{m}}{\text{s}^2})}{\pi(0.0550 \text{ m})^2} = 77341 \text{ Pa}$$

$$P_{\text{final}} = (77341 + 1.013 \times 10^5) \text{ Pa}$$

$$P_{\text{final}} = 178641 \text{ Pa}$$

c. Find volume

$$PV = nRT; V = \frac{nRT}{P}$$

$$V = \frac{3.282 \text{ mol} \times 8.314 \frac{\text{J}}{\text{K mol}} \times 473.0 \text{ K}}{178641 \text{ Pa}} = 0.07225 \text{ m}^3$$

d. Find height

$$V = \pi r^2 h; h = \frac{V}{\pi r^2}$$

$$h = \frac{0.07225 \text{ m}^3}{\pi(0.0550 \text{ m})^2} = 7.603 \text{ m}$$

e. Find K_{avg}

$$K_{\text{avg}} = \frac{3}{2} k_B T = \frac{3}{2} \times 1.38 \times 10^{-23} \frac{J}{K} \times 473.0 \text{ K}$$

$$K_{\text{avg}} = 9.791 \times 10^{-21} \text{ J}$$

f. Find v_{RMS}

$$v_{\text{RMS}} = \sqrt{\frac{3k_B T}{m}} = \sqrt{\frac{3 \times 1.38 \times 10^{-23} \frac{J}{K} \times 473.0 \text{ K}}{32.0 \times 1.66 \times 10^{-27} \text{ kg}}}$$

$$v_{\text{RMS}} = 607.2 \frac{\text{m}}{\text{s}}$$