R = 0.0821 or 62.4 (×760)

PV = nRT

STP = 1 ATM (760 mm Hg) 0°C (273 K)

1. Determine the number of moles present in a red balloon that has a volume of 1.5L at STP $PV = nRT$

$\frac{PV}{RT} = n \qquad \frac{1 \cdot 1.5}{.0821 \cdot 273} = .0669 mol$

2. What is the temperature of a sample of air that has a pressure of 1.5 atm, moles = .05 and a volume of 1.1 L.

$PV = nRT$

$\frac{PV}{nR} = T \qquad \frac{1.5 \cdot 1.1L}{0.05mol \cdot .0821} = 401.9$

3. If a balloon has a temperature of 298K and a volume of 1.98L, what is the pressure if the balloon contains 1 mole of gas?

$PV = nRT$

$P = \frac{nRT}{V} \qquad \frac{1 mol \cdot 0.0821 \cdot 298}{1.98L} = 12.3 atm$

4. A balloon filled with He has a volume of 250mL at STP is what is the mass of the He in the balloon?

$PV = nRT \qquad n = \frac{PV}{RT} \qquad \frac{1 atm \cdot 0.250L}{0.0821 \cdot 273K} = 0.0111 mol \cdot \frac{4g}{1 mol} = 0.044g$ (He)

5. A 1500mL rigid container contains .75 moles of N_2 at 25°C. What is the pressure in atmospheres?

$PV = nRT$

$P = \frac{nRT}{V} = \frac{0.75 \cdot .0821 \cdot 298}{1.5L} = 12.2 atm$

6. What is the pressure in mmHg of a 1 gallon rigid container with a temperature of 212°F and 4 grams of helium? (3.78L)

100°C → 373K → 1 mol

$PV = nRT \longrightarrow P = \frac{nRT}{V} \qquad \frac{1 \cdot .0821 \cdot 373}{3.78L} = 8.10 atm$

7. A clown puts 15 grams of Nitrogen in a balloon at STP. What is the volume of the balloon?

moles: $15g \cdot \frac{1 mol}{28g} = 0.535 mol$

$PV = nRT$

$V = \frac{nRT}{P} \qquad \frac{0.535 \cdot .0821 \cdot 273}{1} = 12.0 \qquad 0.535 mol \cdot \frac{22.4L}{1 mol} = 11.98L$

8. An empty pop bottle has a volume of 591mL. Assuming the bottle is filled with only nitrogen, what is the mass of the air in the bottle at STP?

N_2 (28g/mol) 0.591L

$0.591L \cdot \frac{1 mol}{22.4L} = 0.0263 mol \cdot \frac{28g}{1 mol} = 0.73g\ N_2$