Ideal Gas Law Practice Worksheet

Solve the following problems using the ideal gas law:

1) How many moles of gas does it take to occupy 120. liters at a pressure of 2.30 atmospheres and a temperature of 340. K? (9.89 mol)

2) If I have a 50. liter container that holds 45 moles of gas at a temperature of 200. ^{0}C, what is the pressure inside the container? (35 atm)

3) It is not safe to put aerosol canisters in a campfire, because the pressure inside the canisters gets very high and they can explode. If I have a 1.00 liter canister that holds 2.00 moles of gas, and the campfire temperature is 1400.^{0} C, what is the pressure inside the canister? (275 atm)

4) How many moles of gas are in a 30. liter scuba canister if the temperature of the canister is 300 K and the pressure is 200 atmospheres? (240 mol)

5) I have a balloon that can hold 100. liters of air. If I blow up this balloon with 3.00 moles of oxygen gas at a pressure of 1.00 atmosphere, what is the temperature of the balloon? (406 K - one hot balloon!)

1) $V = 120.\,L$, $P = 2.30\ atm$, $T = 340.\,K$, $n = ?$

$$\frac{PV}{RT} = n \qquad \frac{(2.30\ atm)(120.\,L)}{\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(340.\,K)} = 9.89\ mol$$

2) $V = 50.\,L$, $n = 45\ mol$, $T = 473\,K$, $P = ?\ atm$

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

$$P = \frac{(45\ mol)\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(473\,K)}{50.\,L}$$

$P = 35\ atm$

3) $V = 1.00\,L$, $T = 1{,}673\,K$, $n = 2.00\ mol$, $P = ?\ atm$

$$P = \frac{nRT}{V} = \frac{(2.00\ mol)\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(1673\,K)}{1.00\,L}$$

$P = 275\ atm$

4) $V = 30.\,L$, $T = 300\,K$, $P = 200\ atm$, $n = ?\ mol$

$$\frac{PV}{RT} = n \qquad \frac{(200\ atm)(30.\,L)}{\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(300\,K)} = 243\ mol$$

$n \sim 200\ mol$

5) $V = 100.\,L$, $n = 3.00\ mol$, $P = 1.00\ atm$, $T = \_\_\_\ K$

$$PV = nRT \qquad \frac{PV}{nR} = T \qquad \frac{(1.00\ atm)(100.\,L)}{(3.00\ mol)\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)} = 406\,K$$