Gas Law Worksheet Answer Details

1. A cylinder of argon gas contains 50.0 L of Ar at 18.4 atm and 127 °C. How many moles of argon are in the cylinder?

Use Gas Law equation
PV = nRT
where:
P = pressure
V = volume
n = number of moles of gas
R = gas constant = 0.08 atm L/mol K
T = absolute temperature

Step 1: Convert °C to Kelvin
T = °C + 273
T = 127 + 273
T = 400 K

Step 2: Solve Gas Law equation for n

$$n = \frac{PV}{RT}$$

$$n = \frac{(18.4 \text{ atm})(50 \text{ L})}{(0.08 \text{ atm L/mol K})(400 \text{ K})}$$

n = 28.75 mol of argon

Answer: There are 28.75 moles of argon in the cylinder.

2. A 283.3-g sample of $X_2(g)$ has a volume of 30 L at 3.2 atm and 27 °C. What is element X?

Step 1: Convert °C to Kelvin
T = °C + 273
T = 27 + 273
T = 300 K

Step 2: Solve Gas Law equation for n

$$n = \frac{PV}{RT}$$

$$n = \frac{(3.2 \text{ atm})(30 \text{ L})}{(0.08 \text{ atm L/mol K})(300 \text{ K})}$$

n = 4 mol of X_2

Step 3: Find mass of 1 mol of X_2
4 mol X_2 = 283.3 g
1 mol X_2 = 70.8 g

Step 4: Find mass of 1 mol of X
1 mol X_2 = 70.8 g
1 mol X = 35.4 g

Step 5: Identify the element with molecular mass 35.4 g
Chlorine has a molecular mass of 35.4 g

Answer: Element X is Chlorine