

### 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

$$T = ^\circ\text{C} + 273$$

$$T = 127 + 273$$

$$T = 400 \text{ K}$$

Step 2: Solve Gas Law equation for n

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

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

$$n = 28.75 \text{ mol of argon}$$

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

$$T = ^\circ\text{C} + 273$$

$$T = 27 + 273$$

$$T = 300 \text{ K}$$

Step 2: Solve Gas Law equation for n

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

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

$$n = 4 \text{ mol of } X_2$$

Step 3: Find mass of 1 mol of  $X_2$

$$4 \text{ mol } X_2 = 283.3 \text{ g}$$

$$1 \text{ mol } X_2 = 70.8 \text{ g}$$

Step 4: Find mass of 1 mol of X

$$1 \text{ mol } X_2 = 70.8 \text{ g}$$

$$1 \text{ mol } X = 35.4 \text{ g}$$

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