Gas Laws: Combined Gas law & Ideal Gas law.

1) At 25°C, the pressure in a 5.50 L cylinder is 5.05 atm containing 8.00 mols of a gas. What will be the new pressure if gas is added to give a total mols of 10.2 mol at a temp. of 33°C and the volume is compressed to 4.00 L?

$T_1 = 25°C + 273 = 298\,K$ $P_1 = 5.05\,atm$ $V_1 = 5.50\,L$ $n_1 = 8.00\,mol$

$T_2 = 33°C + 273 = 306\,K$ $P_2 = ?$ $V_2 = 4.00\,L$ $n_2 = 10.2\,mol$

$$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$$

$$P_2 = \frac{P_1V_1n_2T_2}{V_2n_1T_1} = \frac{5.05\,atm \times 5.50\,L \times 10.2\,mol \times 306\,K}{4.00\,L \times 8.00\,mol \times 298\,K}$$

$$= \boxed{9.09\,atm}$$

Ideal Gas Law $PV = nRT$

R = gas const. $= 0.0821\ \frac{L\,atm}{mol\,K}$

2) What is the volume of 5.12 mols of an ideal gas at 32°C and 1.00 atm?

$n = 5.12\,mol$

$T = 32°C + 273 = 305\,K$

$P = 1.00\,atm$

$V = ?$

$$PV = nRT$$

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

$$= \frac{5.12\,mol \times 0.0821\ \frac{L\,atm}{mol\,K} \times 305\,K}{1.00\,atm}$$

$$= 128\,L$$

$$= \boxed{130\,L}$$