

CHM 130 Gas Worksheet

Pressure Conversions

- A. Convert 557 mm Hg to atm, torr, and psi given $1 \text{ atm} = 760 \text{ torr} = 760 \text{ mm Hg} = 14.7 \text{ psi}$
- B. Convert 1.345 atm to torr and psi

Combined Gas Law and Ideal Gas Law

- 1) If I initially have a gas at a pressure of 12.0 atm, a volume of 23.0 liters, and a temperature of 200.0 K, and then I raise the pressure to 14.0 atm and increase the temperature to 300.0 K, what is the new volume of the gas?
- 2) A gas takes up a volume of 17.0 liters, has a pressure of 2.30 atm, and a temperature of 299 K. If I raise the temperature to 350.0 K and lower the pressure to 1.50 atm, what is the new volume of the gas?
- 3) A gas that has a volume of 28 liters, a temperature of 45°C , and an unknown pressure has its volume increased to 34 liters and its temperature decreased to 35°C . If I measure the pressure after the change to be 2.0 atm, what was the original pressure of the gas?
- 4) A gas has a temperature of 14°C , and a volume of 4.5 liters. If the temperature is raised to 29°C and the pressure is not changed, what is the new volume of the gas?
- 5) If I have 17.0 liters of gas at a temperature of 67.0°C and a pressure of 88.89 atm, what will be the pressure of the gas if I raise the temperature to 94.0°C and decrease the volume to 12.0 liters?
- 6) I have an unknown volume of gas at a pressure of 0.500 atm and a temperature of 325 K. If I raise the pressure to 1.20 atm, decrease the temperature to 320.0 K, and measure the final volume to be 48.0 liters, what was the initial volume of the gas?
- 7) If I have 21.0 liters of gas held at a pressure of 78.0 atm and a temperature of 900.0 K, what will be the volume of the gas if I decrease the pressure to 45.0 atm and decrease the temperature to 750.0 K?
- 8) If I have 2.9 L of gas at a pressure of 5.0 atm and a temperature of 50.0°C , what will be the temperature of the gas if I decrease the volume of the gas to 2.4 L and decrease the pressure to 3.0 atm?
- 9) I have an unknown volume of gas held at a temperature of 115 K in a container with a pressure of 60.0 atm. If by increasing the temperature to 225 K and decreasing the pressure to 30.0 atm causes the volume of the gas to be 29 liters, how many liters of gas did I start with?
- 10) What is the pressure of 0.525 moles of gas at 35.0°C in a 9.00 L container?
- 11) What is the volume of 1.25 moles of gas at 47.2°C and 1.25 atm?
- 12) What is the temperature of 0.750 moles of gas at 25.0 L and 1.18 atm?

Answers

A. 557 mm Hg = 557 torr since they are the same. $557 \text{ torr} (1 \text{ atm} / 760 \text{ torr}) = 0.733 \text{ atm}$
 $0.733 \text{ atm} (14.7 \text{ psi} / 1 \text{ atm}) = 10.8 \text{ psi}$

B. $1.345 \text{ atm} (760 \text{ torr} / 1 \text{ atm}) = 1022 \text{ torr}$ $1.345 \text{ atm} (14.7 \text{ psi} / 1 \text{ atm}) = 19.77 \text{ psi}$

- 1) 29.6 L
- 2) 30.5 L
- 3) 2.5 atm
- 4) 4.7 L
- 5) 136 atm

6) $\left(\frac{0.500 \text{ atm } V_1}{325 \text{ K}}\right) = \left(\frac{1.20 \text{ atm} \times 48.0 \text{ L}}{320.0 \text{ K}}\right)$ solve for $V_1 = 117 \text{ L}$

7) $\left(\frac{78.0 \text{ atm} \times 21.0 \text{ L}}{900.0 \text{ K}}\right) = \left(\frac{V_2 \times 45.0 \text{ atm}}{750.0 \text{ K}}\right)$ solve for $V_2 = 30.3 \text{ L}$

- 8) 160 K
- 9) 7.4 L

10) Nothing is changing use ideal gas law. Solve for $P = nRT / V$
 $P = (0.525 \text{ mol})(0.08206 \frac{\text{L atm}}{\text{mol K}})(308 \text{ K}) / 9.00 \text{ L} = \mathbf{1.47 \text{ atm}}$

11) Nothing is changing use ideal gas law. Solve for $V = nRT / P$
 $V = (1.25 \text{ mol})(0.08206 \frac{\text{L atm}}{\text{mol K}})(320.2 \text{ K}) / 1.25 \text{ atm} = \mathbf{26.3 \text{ L}}$

12) Nothing is changing use ideal gas law. Solve for $T = PV / nR$
 $T = (1.18 \text{ atm})(25.0 \text{ L}) / (0.750 \text{ mol}) (0.08206 \frac{\text{L atm}}{\text{mol K}}) = \mathbf{479 \text{ K}}$