## 15. GAS LAWS, GAS DENSITIES, AND PARTIAL PRESSURES (Ch. 10) CHE 111 Q & A

These problems are intended to ***supplement*** the problems in the textbook, not ***replace*** them.

### Questions

1. What pressure will 7.62 moles of an ideal gas have in a 2.00 liter container at 13.6 °C?

2. If 0.346 g of carbon dioxide has a pressure of 98 kPa at 32 °C, how big is the container?

3. What quantity of gas (moles) would occupy 375.0 mL with a pressure of 1096 mm Hg at 46.21 °C?

4. What temperature (°C) is needed for 5.625 g of oxygen to exert a pressure of 1.20 bar in a 3.00 L container?

5. If 48.69 millimoles of nitrogen occupy 1.72 cubic feet at 53.6 °F, what is the pressure?

6. What volume would an ideal gas occupy if $6.642\times10^{-3}$ mol exerts a pressure of 85.72 millibars at 16.91 °C?

7. How many helium atoms are needed to exert a pressure of 15.0 atm in a 100.0 mL container at 25.0 °C?

8. If 4.093 lbs. of ammonia gas exert a pressure of 97.3 psi in a 50.0 gallon container, what is the temperature?

9. If a sample of ideal gas occupies 298 mL at 377 mm Hg, what volume will be occupied at 522 mm Hg and the same temperature?

10. The volume is held constant as a sample of nitrogen is heated from 22.67 °C to 69.35 °C. If the initial pressure was 105.6 kPa, what will the final pressure be?

11. If 0.357 mol of carbon monoxide has a pressure of 1.44 atm, what pressure will 12.88 g of carbon monoxide have at the same volume and temperature?

12. The temperature and pressure are held constant as more gas is added to an expanding container. If the initial volume is 1.00 L with 11.2 mol, how many moles of gas must be added to make the final volume 5.83 L?

13. If 395 mL of an ideal gas sample has a temperature of 94.73 °F, then what will the volume be if the temperature is changed to 25.91 °F and the pressure remains constant? (Assume the gas does not condense.)

14. If the pressure of a gas sample is 56.1 psi in a 4.00 L container at 34 °C, then what will the pressure be if the volume is changed to 7.00 L and the temperature is changed to 2 °C?

15. A sample of gas occupies 935 mL at 16.33 °C and 136.3 kPa. If the pressure is changed to 1378 mm Hg, and the volume is changed to 711 mL, what is the new temperature (°C)?

16. A 3.00 L container holds 12.0 grams of methane at 0.724 bar. If the temperature is held constant, then what will be the new pressure if 5.00 grams more are added and the gas is transferred to a 6.00 L container?

17. What is the density of nitrogen dioxide gas at STP?

18. What is the density of hydrogen sulfide gas at 25 °C and 24.9 psi?

19. At what temperature does oxygen gas have a density of 1.94 kg/m$^3$ at 93.44 kPa?

20. What is the molar mass of the gas which has a density of $2.523\times10^{-3}$ g/mL at 37.35 °C and 1.086 atm?

21. What are the partial pressures and the total pressure in a gas mixture containing 4.00 g oxygen, 3.00 g methane, and 14.00 g chlorine in a 500.0 mL container at 20.44 °C? (Assume no chemical reactions occur.)

22. A mixture of gases contains 15.0 grams each of ammonia, nitrogen, and carbon monoxide. If the total pressure of the mixture is 145.6 kPa, what is the partial pressure of each component? (Assume no chemical reactions occur.)

23. A mixture of gases contains 1.578 grams of methane and some amount of carbon dioxide. If the total pressure is 972.41 mm Hg, the volume is 10.00 L, and the temperature is 31.0 °C, how many grams of carbon dioxide are there? (Assume no chemical reactions occur.)

24. A 2.00 liter vessel holds chlorine gas at 25.0 °C and 1.79 atm. A 7.00 liter vessel holds nitrogen gas at 16.0 °C and 0.884 atm. The two gases are combined into a 750.0 mL vessel at 19.58 °C. What is the total pressure in this last vessel? (Assume no chemical reactions occur.)

25. A 10.00 liter vessel holds nitrogen gas and oxygen gas at 19.55 °C. The mole fraction of nitrogen is 0.681 and the total pressure is 1.13 atm. How many grams of oxygen are in the vessel? (Assume no chemical reactions occur.)

26. A mixture of argon and neon gases is in a 15.0 liter container at 225 K. No reaction takes place. If the total pressure is 3.50 atm, and the mole fraction of argon is 0.365, then how many grams of neon are in the container? (Assume no chemical reactions occur.)

**Answers**

If you cannot figure out how to get the correct answer, go to your instructor, the Science Tutoring Center, SI, etc.

NOTE: if your answer is different only in the last decimal place, then you probably rounded off at different points during the calculations. Don't be concerned about this.

NOTE: molar mass values were taken from the CHE 111 Lab Manual and used without rounding, the gas constant used was 0.08206 atm·L/mol·K, and standard temperature was 273.15 K

1. 89.7 atm
2. 0.20 L
3. 0.02063 mol
4. –28 °C
5. 0.0234 atm
6. 1.869 L
7. $3.69\times10^{22}$ He atoms
8. $1.40\times10^{2}$ K or –133 °C
9. 215 mL
10. 122.3 kPa
11. 1.85 atm
12. 54.1 mol added
13. 346 mL
14. 28.7 psi
15. 24 °C
16. 0.513 bar
17. 2.053 g/L
18. 2.36 g/L
19. 185 K or –88 °C
20. 59.19 g/mol
21. 24.6 atm total, 6.03 atm $O_2$, 9.02 atm $CH_4$, 9.53 atm $Cl_2$
22. 65.7 kPa $NH_3$, 39.9 kPa $N_2$, 40.0 kPa CO
23. 18.23 g $CO_2$
24. 13.0 atm
25. 4.80 g $O_2$
26. 36.3 g Ne