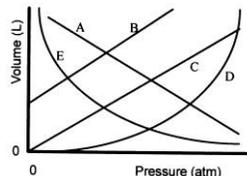


## CHAPTER 6 – PROPERTIES OF GASES

## The Gas Laws

1. Which of the lines on the figure is the best representation of the relationship between the volume of a gas and its pressure, other factors remaining constant?

- A.  
B.  
C.  
D.  
E.



2. Boyle's Law states that:

- A. the volume of a gas is inversely proportional to the number of moles of gas  
B. the volume of a gas is directly proportional to its pressure  
C. the volume of a gas is inversely proportional to its pressure  
D. the volume of a gas is inversely proportional to its temperature  
E. a watched pot never boils

3. A sample of neon gas occupies a volume of 12.6 L at 25.0°C. If the temperature is changed to -35.0°C, what will be the new volume of the gas (in L) if the pressure remains constant?

- A. -17.7 L  
B. 15.8 L  
C. 13.2 L  
D. 10.1 L  
E. 22.4 L

4. A sample of the inert gas krypton has its pressure tripled while its temperature remained constant. If the original volume is 12 L, what is the final volume?

- A. 4.0 L  
B. 6.0 L  
C. 9.0 L  
D. 24 L  
E. 36 L

5. What is the mass of xenon gas in a 385 mL cylinder at a pressure of 1587 torr and a temperature of 25.0°C?

- A. 0.0329 g  
B. 2270 g  
C. 29.9 g  
D. 4.31 g  
E. 298 g

6. A sample of argon gas occupies a volume of 225 mL at 755 torr and 25.0°C. What will the pressure be (in torr) if the volume is changed to 336 mL and the temperature to 75.0°C?

- A. 966 torr  
B. 433 torr  
C. 1520 mL  
D. 590. torr  
E. none of the above

7. What is the pressure (in torr) of a 5.00 g sample of CH<sub>4</sub> gas (MM = 16.04 g/mol) in a container having a volume of 750.0 mL and a temperature of 25.0°C?

- A. 1370 torr  
B. 7740 torr  
C. 4510 torr  
D. 9070 torr  
E. 3150 torr

8. At what temperature is the volume of an ideal gas zero?

- A. 0°C  
B. -45°F  
C. -363 K  
D. -273.15 K  
E. -273.15°C

9. How many molecules of F<sub>2</sub> gas are present in 22.4 L of gas at STP conditions?

- A. 1.00 molecules  
B. 4.05×10<sup>21</sup> molecules  
C. 7.60×10<sup>2</sup> molecules  
D. 6.02×10<sup>23</sup> molecules  
E. none of the above

## Gas Law Stoichiometry

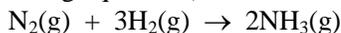
10. Lithium hydroxide, LiOH, is used in spacecraft to recondition the air by absorbing the carbon dioxide exhaled by the astronauts. The reaction that occurs is:



If the spacecraft carries 625 g of LiOH (MM 23.95 g/mol), how many liters of CO<sub>2</sub> gas (MM 44.01 g/mol) can be absorbed at 27°C and 258 torr?

- A. 948 L  
B. 1890 L  
C. 29.8 L  
D. 112 L  
E. 1.24 L

11. How many liters of  $\text{H}_2$  gas will react with 7.2 L of  $\text{N}_2$  gas in the following equation (at STP conditions)?



- A. 14 L
- B. 3.6 L
- C. 22 L
- D. 2.4 L
- E. none of the above

12. What is the density of sulfur trioxide,  $\text{SO}_3$ , at STP?

- A. 15.6 g/L
- B. 22.4 g/L
- C. 4.57 g/L
- D. 3.57 g/L
- E. 19.8 g/L

### Partial Pressures and Dalton's Law

13. A 12.3 L vessel was found to contain  $\text{N}_2$ , Ar, He, and Ne. The total pressure in the vessel was 987 torr and the partial pressures of nitrogen, argon, and helium were 44 torr, 486 torr, and 218 torr, respectively. What was the pressure of neon in the vessel?

- A. 42.4 torr
- B. 19.4 torr
- C. 521 torr
- D. 239 torr
- E. 117 torr

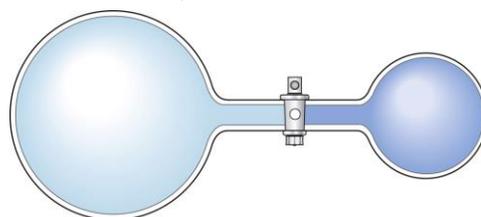
14. A gas mixture contains 2.345 atm of  $\text{N}_2$  and 0.655 atm of  $\text{O}_2$ . Calculate the mole fraction of  $\text{O}_2$  in the mixture.

- A. 0.218
- B. 0.426
- C. 0.551
- D. 0.328
- E. 0.665

15. A 5.00 L tank contains a mixture of 52.5 g of oxygen gas and 65.1 g carbon dioxide gas at  $27^\circ\text{C}$ . Calculate total gas pressure in the container.

- A. 15.4 atm
- B. 8.07 atm
- C. 7.33 atm
- D. 579 atm
- E. 0.762 atm

16. Consider the flasks in the following diagram. What are the final partial pressures of  $\text{H}_2$  and  $\text{N}_2$ , and the total pressure, after the valve between the two flasks is opened, and the gases are allowed to mix? (Assume the final volume is 3.00 L.)



2.00 L  $\text{H}_2$   
475 torr

1.00 L  $\text{N}_2$   
0.200 atm

- A.  $P_{\text{H}_2} = 317$  torr,  $P_{\text{N}_2} = 50.7$  torr,  $P_{\text{total}} = 368$  torr
- B.  $P_{\text{H}_2} = 475$  torr,  $P_{\text{N}_2} = 152$  torr,  $P_{\text{total}} = 627$  torr
- C.  $P_{\text{H}_2} = 50.7$  torr,  $P_{\text{N}_2} = 317$  torr,  $P_{\text{total}} = 368$  torr
- D.  $P_{\text{H}_2} = 627$  torr,  $P_{\text{N}_2} = 627$  torr,  $P_{\text{total}} = 1250$  torr
- E. none of the above

### The Kinetic-Molecular Theory of Gases

17. Which gas effuses faster, and by how much, Ar or  $\text{Cl}_2$ ?

- A. Ar effuses 1.77 times faster than  $\text{Cl}_2$
- B.  $\text{Cl}_2$  effuses 1.65 times faster than Ar
- C. Ar effuses 1.33 times faster than  $\text{Cl}_2$
- D.  $\text{Cl}_2$  effuses 1.83 times faster than Ar
- E. none of the above

18. Select the gas with the highest average kinetic energy per mole at 298 K.

- A.  $\text{O}_2$
- B.  $\text{CO}_2$
- C.  $\text{H}_2\text{O}$
- D. Ar
- E. all have the same average kinetic energy

19. Which of the following gases will be the slowest to diffuse through a room?

- A. methane,  $\text{CH}_4$
- B. carbon dioxide,  $\text{CO}_2$
- C. hydrogen sulfide,  $\text{H}_2\text{S}$
- D. water,  $\text{H}_2\text{O}$
- E. all will diffuse through a room at equal rates

20. What is the model which is used to explain the behavior of gases at the molecular level?

- A. kinetic-molecular theory
  - B. Boyle's law
  - C. the ideal gas law
  - D. the van der Waals equation
  - E. Hess's Law
- 

21. When the temperature of a gas is increased, the pressure increases (at constant volume) because

- A. the particles of gas are on average moving faster, and thus striking the walls of the container with more force.
  - B. the particles of gas are becoming larger.
  - C. the particles of gas strike the walls of the container less often.
  - D. the bonds between the particles of gas are becoming stronger.
  - E. none of the above
- 

22. You are holding four identical balloons each containing 10.0 g of a different gas. The balloon containing which gas is the largest balloon?

- A.  $H_2$
  - B. He
  - C. Ne
  - D.  $O_2$
  - E. All have the same volume.
- 

23. Use the kinetic molecular theory of gases to predict what would happen to a closed sample of a gas whose temperature increased while its volume decreased.

- A. Its pressure would decrease.
  - B. Its pressure would increase.
  - C. Its pressure would hold constant.
  - D. The number of moles of the gas would decrease.
  - E. The average kinetic energy of the molecules of the gas would decrease.
-