

GAS LAWS PRACTICE TEST

1. A glass column is filled with mercury and inverted in a pool of mercury. The mercury column stabilizes at a height of 530 mm above the pool of mercury. What is the pressure of the atmosphere?

a) 0.697 atm b) 0.735 atm c) 0.967 atm d) 1.03 atm e) 194 atm

2. The valve between a 5-L tank containing a gas at 9 atm and a 10-L tank containing a gas at 6 atm is opened. Calculate the final pressure in the tanks. (Note: Draw a manifold diagram to help you)

a) 3 atm b) 4 atm c) 7 atm d) 15 atm

3. Use the ideal gas law to predict the relationship between n and T in a system of constant pressure and volume.

a) n is proportional to T b) n is proportional to $1/T$ c) $n/T = \text{constant}$ d) $PT = nRV$ e) $PV/T = R$

For the following three questions consider these Flasks all at STP

A) NH_3 B) NO_2 C) N_2

4. Which contains the largest number of molecules?

a) flask A b) flask B c) flask C d) all are the same

5. In which flask do the molecules have the highest average velocity?

a) flask A b) flask B c) flask C d) all are the same e) none

6. In which flask do the molecules have the highest average kinetic energy?

a) flask A b) flask B c) flask C d) none e) all are the same

7. A 6.35-L sample of carbon monoxide is collected at 55°C and 0.892 atm. What volume will the gas occupy at 1.05 atm and 20°C?

a) 1.96 L b) 5.46 L c) 4.82 L d) 6.10 L

8. A sample of gas is in a 50.0-mL container at a pressure of 645 torr and a temperature of 25°C. The entire sample is heated to a temperature of 35°C and transferred to a new container whose volume is 65.0 mL. The pressure of the gas in the second container is:

a) 867 torr b) 694 torr c) 480. torr d) 760. torr e) none of these

9. For which gas do the molecules have the highest average velocity?

a) He b) Cl_2 c) CH_4 d) NH_3 e) all gases the same

10. The mass of 1.12 liters of gas Y is found to be 6.23 g. The density of gas Y is

a) 10.6 g/L b) 5.56 g/L c) 15.6 g/L d) 0.200 g/L e) 0.180 g/L

11. The molar mass of gas Y is (at STP)

a) 56.0 g/mol b) 89.0 g/mol c) 125 g/mol d) 140. g/mol e) 157 g/mol

12. Argon has a density of 1.78 g/L at STP. How many of the following gases will have a density at STP GREATER than that of argon?

Cl₂ He NH₃ NO₂ a) 0 b) 1 c) 2 d) 3 e) 4

13. C₂H₄ reacts with O₂ according to the following equation:



What volume of oxygen at STP is needed to react with 1.50 moles of C₂H₄?

a) 4.50 L b) 33.6 L c) 101 L d) 67.2 L e) not enough information is given to solve the problem

14. If a 2.15-g sample of a gas occupies 750 mL at STP, what is the molar mass of the gas?

a) 3.07×10^{-2} b) 64.2 c) 70.1 d) 75.0 e) not enough information is given

15. A vessel with an internal volume of 10.0 L contains 2.80 g of nitrogen gas, 0.403 g of hydrogen gas, and 79.9 g of argon gas. At 25C, what is the pressure (in atm) inside the vessel?

a) 0.471 b) 6.43 c) 3.20 d) 5.62 e) 2.38

16. A 275.0-mL sample of O₂ is collected over water at 60.0C. The total pressure is 755 torr. What is the volume of the O₂ at STP? (The vapor pressure of water at 60C is 149 torr.)

a) 180. mL b) 224 mL c) 244 mL d) 333 mL

17. Which of the following is NOT a postulate of the kinetic molecular theory of gases?

a) The molecules possess a volume that is negligibly small compared to the volume of the container.

b) Gases consist of discrete particles that are in constant chaotic motion.

c) The average kinetic energy of the molecules is directly proportional to the absolute temperature.

d) The pressure and volume of a gas are directly related.

e) All of the above are postulates of the kinetic molecular theory of gases.

18. The van der Waals equation, $nRT = [P + (n^2a/V^2)](V - nb)$, incorporates corrections to the ideal gas law in order to account for the properties of real gases. One of the corrections accounts for:

a) the possibility of chemical reaction between molecules.

b) the finite volume of molecules.

c) the quantum behavior of molecules.

d) that average kinetic energy is inversely proportional to temperature.

e) the possibility of phase changes when the temperature is decreased or the pressure is increased

19. Order the following in increasing rate of effusion: F₂, Cl₂, NO, NO₂, CH₄

a) Cl₂ < NO₂ < F₂ < NO < CH₄ b) Cl₂ < F₂ < NO₂ < CH₄ < NO c) CH₄ < NO₂ < NO < F₂ < Cl₂ d) CH₄ < NO < F₂ < NO₂ < Cl₂ e) F₂ < NO < Cl₂ < NO₂ < CH₄

20. An oxygen sample has a volume of 4.50 L at 27°C and 800.0 torr. How many oxygen molecules does it contain?

a) 1.16×10^{23} b) 5.8×10^{22} c) 2.32×10^{24} d) 1.16×10^{22}

21. A 6.5-L sample of nitrogen at 25°C and 1.5 atm is allowed to expand to 13.0 L. The temperature remains constant. What is the final pressure?

a) 0.063 atm b) 0.12 atm c) 0.75 atm d) 3.0 atm e) 0.38 atm

22. What is the root mean square velocity of oxygen gas at 27°C?

a) 15 b) 48 c) 145 d) 484 (UNITS are all m/s)

ANSWERS: 1)a 2)c 3)b 4)d 5) a 6)e 7) c 8)e 9)a 10)b 11) c 12)c 13)c 14)b 15)d 16) a 17) d

18) b 19) a 20) a 21) c 22) d
