Name _____ Chemistry ___/___/___

Gas Laws Review – Practice Test

1._____ When a sample of oxygen gas in a closed container of constant volume is heated until its absolute temperature is doubled, which of the following is also doubled?

(A) The density of the gas **(B) The pressure of the gas** **(**C) The number of molecules per cm^3

(D) The average velocity of the gas molecules (E) The potential energy of the molecules

2._____ Equal masses of three different ideal gases, X, Y, and Z, are mixed in a sealed rigid container. If the temperature of the system remains constant, which of the following statements about the partial pressure of gas X is correct?

(A) It is equal to 1/3 the total pressure

(B) It depends on the intermolecular forces of attraction between molecules of X, Y, and Z.

(C) It depends on the relative molecular masses of X, Y, and Z.

(D) It depends on the average distance traveled between molecular collisions.

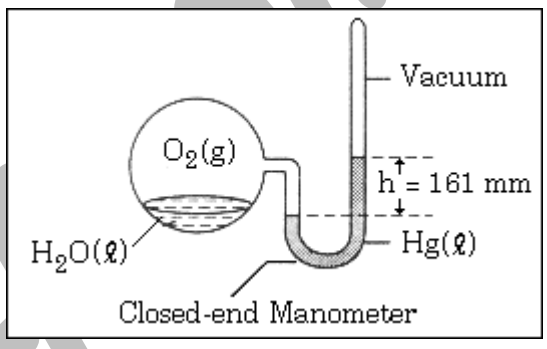
(E) It can be calculated with knowledge only of the volume of the container.

3._____ The system shown to the right is at equilibrium at 28°C. At this temperature, the vapor pressure of water is 28 millimeters of mercury. The partial pressure of $O_2(g)$ in the system is:

(A) 28 mm Hg (B) 56 mm Hg

(C) 133 mm Hg (D) 161 mm Hg

(E) 189 mm Hg



4._____ What is the volume of 3.00 mol of gas @ STP?

(A) 22.4 L **(B) 3 x 22.4 L**

(C) 3 x 22.4 L x 760 (D) 3 x 22.4 L x 273 / 760

(E) It cannot be determined without knowing which gas is involved.

5._____ An ideal gas of volume 189 mL is collected over water at 30°C and 777 torr. The vapor pressure of water is 32 torr @ 30°C. What pressure is exerted by the dry gas under these conditions?

(A) 320 torr **(B) 745 torr** (C) 777 torr (D) 32 / 77 torr (E) 32 x 777 torr

6._____ Two flexible containers for gases are at the same temperature and pressure. One holds 0.50 gram of hydrogen and the other holds 8.0 grams of oxygen. Which of the following statements regarding these gas samples is FALSE?

(A) The volume of the hydrogen container is the same as the volume of the oxygen container.

(B) The number of molecules in the hydrogen container is the same as the number of molecules in the oxygen container.

(C) The density of the hydrogen sample is less than that of the oxygen sample.

(D) The average kinetic energy of the hydrogen molecules is the same as the average kinetic energy of the oxygen molecules.

(E) The average speed of the hydrogen molecules is the same as the average speed of the oxygen molecules.

7._____ As the temperature is raised from 20°C to 40°C, the average kinetic energy of neon atoms changes by a factor of

(A) ½ (B) $(313/293)^{1/2}$ **(C) 313/293** (D) 2 (E) 4

8._____ Which of the following is the same for one mole samples of ideal monatomic gases at standard temperature and pressure?

(A) The total kinetic energy of the molecules (B) The density of the sample

(C) The number of collisions per second of molecules with the wall (D) The average speed of the molecules

(E) The root-mean-square speed of the molecules

9._____ At 25 °C, a sample of NH_3 (molar mass 17 grams) effuses at the rate of 0.050 mole per minute. Under the same conditions, which of the following gases effuses at approximately one-half that rate?

(A) O_2 (molar mass 32 grams) (B) He (molar mass 4.0 grams) (C) CO_2 (molar mass 44 grams)

(D) Cl_2 (molar mass 71 grams) (E) CH_4 (molar mass 16 grams)

10._____ A rigid metal tank contains oxygen gas. Which of the following applies to the gas in the tank when additional oxygen is added at constant temperature?

(A) The volume of the gas increase.
(B) The pressure of the gas decreases.
(C) The average speed of the gas molecules remains the same.
(D) The total number of gas molecules remains the same.
(E) The average distance between the gas molecules increases.

11._____ A sample of an ideal gas is cooled from 50.0 °C to 25.0 °C in a sealed container of constant volume. Which of the following values for the gas will decrease?

I. The average molecular mass of the gas
II. The average distance between the molecules
III. The average speed of the molecules

(A) I only (B) II only **(C) III only** (D) I and III (E) II and III

12._____ Equal numbers of moles of He(g), Ar(g), and Ne(g) are placed in a glass vessel at room temperature. If the vessel has a pinhole-sized leak, which of the following will be true regarding the relative values of the partial pressures of the gases remaining in the vessel after some of the gas mixture has effused?

(A) $P_{He} < P_{Ne} < P_{Ar}$ (B) $P_{He} < P_{Ar} < P_{Ne}$ (C) $P_{Ne} < P_{Ar} < P_{He}$
(D) $P_{Ar} < P_{He} < P_{Ne}$ (E) $P_{He} = P_{Ar} = P_{Ne}$

13._____ Argon gas initially at 25ºC is heated to 50ºC in a closed container. Which statement is correct?

(A) The average kinetic energy of the argon atoms does not change.
(B) The average kinetic energy of the argon atoms doubles.
(C) The pressure of the gas decreases by about 50 percent.
(D) The pressure of the gas doubles.
(E) The pressure of the gas increases by about 8 percent.

14._____ 100 grams of O_2(g) and 100 grams of He(g) are in separate containers of equal volume. Both gases are at 100ºC. Which of the following statements is true?

(A) Both gases would have the same pressure.
(B) The average kinetic energy of the O_2 molecules is greater than that of the He molecules.
(C) The average kinetic energy of the He molecules is greater than that of the O_2 molecules.
(D) There are equal numbers of He molecules and O_2 molecules.
(E) The pressure of the He(g) would be greater than that of the O_2(g).

15._____ Which one of the following is NOT an assumption of the kinetic theory of gases?

(A) Gas particles are negligibly small.
(B) Gas particles are in constant motion.
(C) Gas particles don't attract each other.
(D) Gas particles undergo elastic collisions.
(E) Gas particles undergo a decrease in kinetic energy when passed from a region of high pressure to a region of low pressure.

16._____ Which of the following would express the approximate density of carbon dioxide gas at 0°C and 2.00 atm pressure (in grams per liter)?

(A) 2 g/L **(B) 4 g/L** (C) 6 g/L (D) 8 g/L (E) none of the above

17._____At 25°C, a sample of NH_3 (molar mass 17 grams) effuses at the rate of 0.050 mole per minute. Under the same conditions, which of the following gases effuses at approximately double that rate?

(A) O_2 (molar mass 32 grams) **(B) He (molar mass 4.0 grams)** (C) CO_2 (molar mass 44 grams)
(D) Cl_2 (molar mass 71 grams) (E) CH_4 (molar mass 16 grams)

18._____A sample of 0.0100 mole of oxygen gas is confined at 37°C and 0.216 atmosphere. What would be the pressure of this sample at 15°C and the same volume?

(A) 0.0876 atm (B) 0.175 atm **(C) 0.201 atm** (D) 0.233 atm (E) 0.533 atm

19._____ A sample of 3.30 grams of an ideal gas at 150.0 °C and 1.25 atmospheres pressure has a volume of 2.00 liters. What is the molar mass of the gas? The gas constant, R, is 0.0821 L atm mol^{-1} K^{-1}).

(A) 0.0218 gram/mole (B) 16.2 grams/mole (C) 37.0 grams/mole
(D) 45.8 grams/mole (E) 71.6 grams/mole

20._____ A sample of 0.1973 mole of nitrogen gas is confined at 37° C and 0.216 atmosphere. What would be the pressure of this sample at 15° C and the same volume?

(A) 0.0876 atm (B) 0.175 atm **(C) 0.201 atm** (D) 0.233 atm (E) 0.533 atm

Part II: Problems. Solve each of the following. You must show your work to receive any credit.

21. **448 m/s** Calculate the root mean square velocity of fluorine molecules at 33 °C.

22. **386 m/s** Carbon monoxide travels at 450. m/s. How fast would a fluorine molecule travel at the same conditions?

23. **1.5 L** Calculate the volume of a balloon at 3.5 atm of pressure and -10. °C if it has a volume of 5.3 liters at STP.

24. **7.89 g** Calculate the mass of xenon gas if it has a volume of 1.65 liters at a pressure of 700. torr and a temperature of 35 °C.

25. **371 mL** If temperature is constant and a gas has a volume of 880. mL at 2.50 atm, what would the volume be if the pressure rose to 5.94 atm?

26. **155 kPa** A gas exerts a pressure of 141 kPa at 30.0 °C. Calculate the pressure if the volume remains constant at the temperature rises to 60.0 °C.

27. **106 K** Calculate the temperature at which a balloon has a volume of 380. mL if it has a volume of 1.50 liters at 419 K.

28. **1.62 atm** Determine the total pressure if the partial pressure of nitrogen is 333 mm Hg, the partial pressure of chlorine gas is 222 mm Hg, the partial pressure of neon is 111 mm Hg and the partial pressure of carbon dioxide is 565 mm Hg. GIVE YOUR ANSWER IN atmospheres!!!

29. **20.8 L** Calculate the volume of 32.0 grams of nitrogen gas at 120. kPa and -10. °C.

30. **8.3 L** A balloon has a volume of 25 liters at 23 psi at standard temperature. If temperature is constant, what is the volume if the pressure triples?

31. **89 g/L** Calculate the density of xenon at a pressure of 2.5 atm and a temperature of 45 K.

32. **3.17 L** $Mg(s) + 2HCl\ (aq) \rightarrow H_2(g) + MgCl_2(aq)$
Calculate the volume of Hydrogen produced if 3.55 grams of Mg react with excess HCl if the pressure is 1.10 atm and the temperature is 18.0 °C.