Gas Laws- Unit Test

A. Matching

Match each term in Column B with the correct description in Column A. Write the letter of the correct term in the blank provided. (1 mark each)

Column A	Column B
___ **1.** ideal gas constant (R)	**A.** The volume of a fixed mass of gas is directly proportional to the Kelvin temperature if the pressure is kept constant.
___ **2.** Boyle's law	**B.** At constant volume and temperature, the total pressure exerted by a mixture of gases is equal to the sum of the partial pressures.
___ **3.** Dalton's law of partial pressures	**C.** $\frac{8.31\ L \times kPa}{K \times mol}$
___ **4.** ideal gas law	**D.** the contribution each gas in a mixture makes the total pressure.
___ **5.** combined gas law	**E.** A gas tends to move to an area of lower concentration until the concentration is uniform.
___ **6.** Charle's law	**F.** $\frac{P_1 \times V_1}{T_1} = \frac{P_2 \times V_2}{T_2}$
___ **7.** diffusion	**G.** PV=nRT
___ **8.** partial pressure	**H.** For a given mass of gas at constant temperature, the volume of gas varies inversely with pressure.

B. Multiple Choice (1 mark each)

9. A sample of oxygen gas was found to effuse or diffuse at a rate equal to two times that of an unknown gas. What is the molecular weight of the unknown gas?

a. 64 g/mol b. 128 g/mol c. 8 g/mol d. 16 g/mol

10. Increasing the volume of a given amount of gas at constant temperature causes the pressure to decrease because:

a. the molecules are striking a larger area with the same force
b. there are fewer molecules
c. the molecules are moving more slowly
d. there are more molecules

11. When a container is filled with 3.00 mol of H_2, 2.00 mol Of 0_2, and 1.00 mol of N_2, the pressure in the container is 465 kPa. The partial pressure of 0_2 is:

a. 78 kPa
b. 116 kPa
c. 155 kPa
d. 212 kPa

12. A box with a volume of 22.4 L contains 1.0 mol of nitrogen and 2.0 mol of hydrogen at 0°C. Which of the following statements is true?

a. the total pressure in the box is 202.6 kPa
b. the partial pressures of H_2 and N_2 are equal
c. the total pressure is 101.3 kPa
d. the partial pressure of N_2 is 101.3 kPa

13. As the temperature of the gas in a balloon decreases:

a. the volume increases.
b. the pressure increases.
c. the average kinetic energy of the gas particles decreases.
d. All of the above are true.

14. At a certain temperature and pressure, 0.20 Mol Of $C0_2$ has a volume of 3.1 L. A 3.1 L sample of hydrogen at the same temperature and pressure:

a. has a higher density
b. contains the same number of molecules
c. has the same mass
d. contains the same number of atoms

15. Which of the following gases has a density of 0.900 g/L, at STP?

a. $CH_{4(g)}$
b. $Ne_{(g)}$
c. $CO_{(g)}$
d. $NO_{(g)}$

16. How many litres of water, at STP would be required to produce 7.5 g of NH3 (g) according to the equation below:

$$Mg_3N_{2(s)} + 6H_2O_{(g)} \rightarrow 3Mg(OH)_{2(aq)} + 2NH_{3(g)}$$

a. 0.059 L
b. 30 L
c. 0.039 L
d.44 L

C. Calculation Problems

Solve the following problems in the space provided please. Be certain to show the original form of any equation, any rearrangement of the formula, and then unit cancellations required once values are substituted into the equation. Mark value is indicated for each question.

17. The planet Jupiter has a mass 318 times that of Earth and its surface temperature is 140K. Mercury has a mass 0.05 times that of Earth and its surface temperature is between 600 and 700 K. On which planet is the atmosphere more likely to obey the ideal-gas law? Explain your answer. (3)

18. Container A contains $H_{2\,(g)}$ at O°C and 100 kPa. Container B contains $0_{2\,(g)}$ at 20°C and 50 kPa.
The two containers have the same volume. **Explain with justification**… (10)

a) Which container contains more molecules?

b) Which contains more mass?

c) In which container is the average kinetic energy of molecules higher?

d) Which gas has the higher density?

e) Which of the two gases will have a higher rate of effusion through a pinhole leak?

19. Aliens land on an island in the Pacific and see a strange sight - a smoke like gas coming out of a cone-like part of the island. They collect 600 cm^3 of this gas at 227°C for experimental purposes. Calculate the volume of gas they will have when they reach the cone where temperature is 30°C.
Assume that the pressure of the atmosphere is constant. (3)

20. Saturn's moon, Titan, has a high atmospheric concentration of a gas that contains 80.0 % carbon, the remainder being hydrogen. (8)

a) Calculate the empirical formula of the compound.

b) On the surface of Titan, where the temperature is 87°C and the pressure is 150 kPa, 1.00 L of this gas has a mass of 3.00 g. Calculate the molar mass of the gas.

c) Use the results of your calculations on parts (a) and (b) to determine the molecular formula of the gas.

Answer Key

A. Matching

1. C
2. H
3. B
4. G
5. F
6. A
7. E
8. D

B. Multiple Choice

9. B
10. A
11. C
12. D
13. C
14. B
15. B
16. B

C. Calculation Problems

17. At higher temperature gas particles average Kinetic energy is high.. More likely to obey gas laws on Mercury.

18.a) Container A with hydrogen has more molecules.
b) Container B with oxygen has more mass.
c) Container B
d) Container B
e) Container A

19. 367 cm^3

20. a) CH_3
b) $M_R = 60\ g\ mol^{-1}$
c) C_4H_{12}