Gases Review – Ch. 10 & 11

FOR EACH OF THE FOLLOWING, <u>NAME THE GAS LAW</u> AND SOLVE THE PROBLEM:

1. Hydrogen is collected over water at 0.975 atm and 28°C. What is the partial pressure of H_2?

2. How many moles of chloroform, $CHCl_3$, are required to fill a 253-mL flask at 100.0°C and 940 torr?

3. You want the pressure inside a bottle to be 75.0 kPa at 23°C. At what temperature in Celsius should you seal the bottle when the pressure is 1.12 atm?

4. A diver's lungs hold about 20.0 L of air underwater at a pressure of 875 mm Hg. Assuming he holds his breath and his lungs don't burst, what will be the volume of air in his lungs at standard pressure on the water's surface.

5. A soccer ball containing 12.0 dm^3 of gas at 21°C is left outside on a cold, winter day. What is the temperature outside in Celsius if the ball shrunk to 10,500 cm^3?

6. What pressure is required to compress a gas that occupies 6500 L at 25°C and 1.0 atm to a volume of 40.0 L at 18°C?

7. Oxygen gas diffuses how many times faster than sulfur dioxide?

8. When a canning jar is sealed at 100°C the pressure inside is 101.3 kPa. What is the pressure inside the jar when it cools to room temperature, about 21°C?

9. CO_2 gas is collected over water at 100.3 kPa and 19°C. Find the pressure of the dry gas.

10. A Marshmallow Peep® has a volume of about 45.0 cm^3 at 101 kPa. What pressure is required to increase its size to 150.0 cm^3 assuming no air escapes from the Peep®.

11. What is the temperature of a 0.00893 mol sample of neon gas that has a volume of 302 mL and a pressure of 0.941 atm?

12. A gas occupies 4.78 L at 78.1 kPa and 25°C. What will the volume be at 0.975 atm and 15°C?

13. What is the molar mass of a gas that diffuses 0.71 times as fast as oxygen?

14. A shampoo bottle contains 443 mL of air at 65°C. What is its volume when it cools to 22°C?

15. A balloon is filled with helium to a volume of 12.5 liters at 25°C and 101 kPa. How many grams of helium are in the balloon?

16. A sample of propane has a volume of 250.0 L at 125 kPa and 38°C. What volume will this sample have at 100.0 kPa and 95°C?

17. At a certain temperature and pressure, chlorine molecules have an average speed of 0.0380 m/s. What is the average speed of SO_2 molecules under the same conditions?

18. The pressure in a can of hairspray is 2.50 atm at 298 K. What is the pressure in the can when it is heated to 398 K?

19. What is the molar mass of an unknown gas if it diffuses 0.906 times as fast as argon?

SOLVE THE FOLLOWING GAS STOICHIOMETRY PROBLEMS:

20. What volume of chlorine is required to produce 25.4 g of copper(II) chloride at 18°C and 2.13 atm?
$$Cu + Cl_2 \rightarrow CuCl_2$$

21. At 778 mm Hg and 25°C, how many grams of zinc are required to produce 25.2 liters of hydrogen gas?
$$\_Zn + \_HCl \rightarrow \_ZnCl_2 + \_H_2$$

22. If 5.45 g of potassium chlorate decompose, how many liters of oxygen gas are given off at 1.58 atm and 32°C?
$$2KClO_3 \rightarrow 2KCl + 3O_2$$

23. When aluminum is burned in 15.0 L of oxygen at 97.3 kPa and 21°C, how many grams of aluminum oxide are formed?
$$4Al + 3O_2 \rightarrow 2Al_2O_3$$

24. If 12.8 g of $CaCO_3$ decomposes at 38°C and 0.96 atm, how many dm^3 of CO_2 are formed in addition to CaO?
$$CaCO_3 \rightarrow CaO + CO_2$$

25. What mass of glucose ($C_6H_{12}O_6$) is required to produce 150 cm^3 of carbon dioxide at 102 kPa and 23°C?
$$C_6H_{12}O_6 + 2O_2 \rightarrow 2CH_3COOH + 2CO_2 + 2H_2O$$

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ANSWER KEY

1. Dalton, 95.0 kPa

2. Ideal, 0.0099 mol

3. Gay-Lussac, 175°C

4. Boyle, 23.0 L

5. Charles, -16°C

6. Combined, 160 atm

7. Graham, 1.415

8. Gay-Lussac, 79.8 kPa

9. Dalton, 98.1 kPa

10. Boyle, 30.3 kPa

11. Ideal, 388 K

12. Combined, 3.65 L

13. Graham, 63 g/mol

14. Charles, 387 mL

15. Ideal, 2.04 g

16. Combined, 370. L

17. Graham, 0.0400 m/s

18. Gay-Lussac, 3.34 atm

19. Graham, 48.7 g/mol

20. 2.12 L Cl_2

21. 68.7 g Zn

22. 1.06 L O_2

23. 40.6 g Al_2O_3

24. 3.4 dm^3 CO_2

25. 0.56 g $C_6H_{12}O_6$