Name:_____ Date:_____ Period:_____

Gas Laws Worksheet #2: Boyle, Charles, and Combined Gas Laws

atm = 760.0 mm Hg = 101.3 kPa= 760 .0 torr

Boyle's Law Problems:

1. If 22.5 L of nitrogen at 748 mm Hg are compressed to 725 mm Hg at constant temperature. What is the new volume?

$22.5(748) = V_2(725)$ $V_2 = 23.2\ L$

2. A gas with a volume of 4.0L at a pressure of 205kPa is allowed to expand to a volume of 12.0L. What is the pressure in the container if the temperature remains constant?

$(4.0)(205) = (12.0)P_2$ $P_2 = 68.3\ kPa$

3. What pressure is required to compress 196.0 liters of air at 1.00 atmosphere into a cylinder whose volume is 26.0 liters?

$196.0\ (1.00) = (26.0)P_2$ $P_2 = 7.5\ atm$

4. A 40.0 L tank of ammonia has a pressure of 12.7 kPa. Calculate the volume of the ammonia if its pressure is changed to 8.4 kPa while its temperature remains constant.

$(40.0)(12.7) = V_2(8.4)$ $V_2 = 60.5\ L$

Charles' Law Problems:

5. Calculate the decrease in temperature when 6.00 L at 20.0 °C is compressed to 4.00 L.

$\frac{6.00}{293} = \frac{4.00}{T_2}$ $T_2 = 195\ K = -78°C$

6. A container containing 5.00 L of a gas is collected at 100 K and then allowed to expand to 20.0 L. What must the new temperature be in order to maintain the same pressure (as required by Charles' Law)?

$\frac{5.00}{100} = \frac{20.0}{T_2}$ $T_2 = 400\ K$

7. A gas occupies 900.0 mL at a temperature of 27.0 °C. What is the volume at 132.0 °C?

$\frac{900.0}{300} = \frac{V_2}{405}$ $V_2 = 1215\ mL$

8. If 15.0 liters of neon at 25.0 °C is allowed to expand to 45.0 liters, what must the new temperature be to maintain constant pressure?

$\frac{15.0}{298} = \frac{45.0}{T_2}$ $T_2 = 894\ K$

Combined Gas Law Problems:

9. A gas balloon has a volume of 106.0 liters when the temperature is 45.0 °C and the pressure is 740.0 mm of mercury. What will its volume be at 20.0 °C and 780 .0 mm of mercury pressure?

$\frac{(106.0)(740)}{318} = \frac{(780)V_2}{293}$ $V_2 = 92.7\ L$

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10. If 10.0 liters of oxygen at STP are heated to 512 °C, what will be the new volume of gas if the pressure is also increased to 1520.0 mm of mercury?

$\frac{10.0(760)}{273} = \frac{(1520)V_2}{785}$ $V_2 = 14.4\ L$

11. A gas is heated from 263.0 K to 298.0 K and the volume is increased from 24.0 liters to 35.0 liters by moving a large piston within a cylinder. If the original pressure was 1.00 atm, what would the final pressure be?

$\frac{(1.00)(24.0)}{263} = \frac{(35.0)P_2}{298}$ $P_2 = .777\ atm$

12. The pressure of a gas is reduced from 1200.0 mm Hg to 850.0 mm Hg as the volume of its container is increased by moving a piston from 85.0 mL to 350.0 mL. What would the final temperature be if the original temperature was 90.0 °C?

$\frac{(1200)(85.0)}{363} = \frac{(850)(350)}{T_2}$ $T_2 = 1059\ K$

Mixed Problems

13. The gas in a sealed can is at a pressure of 3.00 atm at 25°C. A warning on the can tells the user not to store the can in a place where the temperature will exceed 52°C. What would the gas pressure in the can be at 52 °C?

$\frac{3.00}{298} = \frac{P_2}{325}$ $P_2 = 3.27\ atm$

14. A sample of hydrogen exerts a pressure of 0.329 atm at 47°C. The gas is heated 77°C at constant volume. What will its new pressure be?

$\frac{.329}{320} = \frac{P_2}{350}$ $P_2 = .360\ atm$

15. A sample of neon gas occupies a volume of 752 mL at 25°C. What volume will the gas occupy at standard temperature if the pressure remains constant?

$\frac{752}{298} = \frac{V_2}{273}$ $V_2 = 689\ mL$

16. A sample of oxygen gas has a volume of 150 mL when its pressure is 440 mmHg. If the pressure is increased to standard pressure and the temperature remains constant, what will the new gas volume be?

$150(440) = V_2(760)$ $V_2 = 86.8\ mL$

17. Ralph had a helium balloon with a volume of 4.88 liters at 150 kPa of pressure. If the volume is changed to 3.15 liters, what would be the new pressure in atm?

$4.88(150) = (3.15)P_2$ $P_2 = 232\ kPa$

18. 5.36 liters of nitrogen gas are at -25°C and 733 mm Hg. What would be the volume at 128°C and 1.5atm?

$\frac{5.36(733)}{248} = \frac{1140V_2}{401}$ $V_2 = 5.57\ L$

19. At constant temperature, 2 L of a gas at 4 atm of pressure is expanded to 6 L. What is the new pressure?

$(2)(4) = 6P_2$ $P_2 = 1.33\ atm$