Name KEY 2010 - 2011 Date ____________

Boyle's Law Worksheet #1

1. State the pressure-volume law both in words and in the form of an equation.

When temperature is constant, pressure & volume are inversely related $P_1V_1 = P_2V_2$

2. To compress nitrogen at 1.0 atm from 750 mL to 500.0 mL, what must the new pressure be if the temperature is kept constant?

$P_1V_1 = P_2V_2$ $\frac{(1.0\ atm)(750\ mL)}{500.0\ mL} = \frac{P_2\ (500.0\ mL)}{500.0\ mL}$

$1.5\ atm = P_2$

3. If 5.0 mL of oxygen at 128 kPa is allowed to expand at constant temperature until its pressure is 101.3 kPa, how much larger will the volume become?

$P_1V_1 = P_2V_2$ $\frac{(128\ kPa)(5.0\ mL)}{101.3\ kPa} = \frac{(101.3\ kPa)\ V_2}{101.3\ kPa}$

$6.3\ mL = V_2$ (1.3 mL larger)

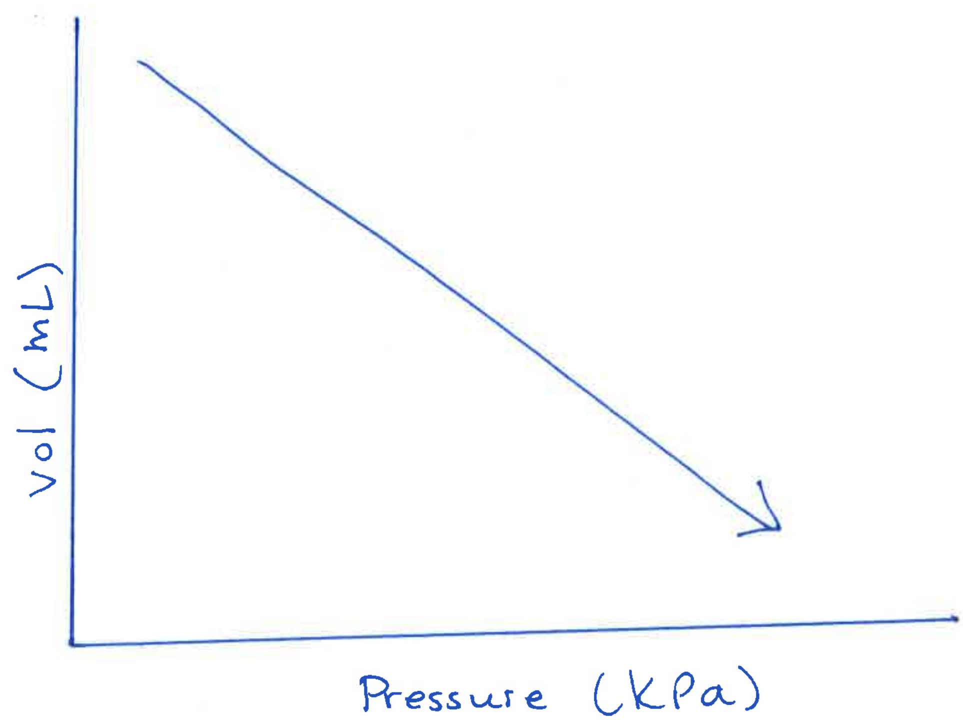
4. A sample of nitrogen at 20.0°C was compressed from 300.0 mL to 0.360 mL and its new pressure was found to be 400.0 Pa. What was the original pressure in kPa?

$P_1V_1 = P_2V_2$ $\frac{P_1\ (300.0\ mL)}{300.0\ mL} = \frac{(400.0\ Pa)(0.360\ mL)}{300.0\ mL}$

$P_1 = 0.480\ Pa = 0.000480\ kPa$

5. A sample of nitrogen at 101.3 kPa with a volume of 100.0 mL is carefully compressed at constant temperature in successive changes in pressure, equaling 5.00 kPa at a time, until the final pressure is 133.3 kPa. Calculate each new volume and prepare a plot of P versus V, showing P on the horizontal axis.

Pressure (kPa)	Volume (mL)
101.3	100.0
106.3	95.30
111.3	91.02
116.3	87.10
121.3	83.51
127.3	79.58
133.3	75.99



6. The pressure on 6.00 L of a gas is 200.0kPa. What will be the volume if the pressure is doubled, keeping the temperature constant?

$P_1V_1 = P_2V_2$ $\frac{(200.0\ kPa)(6.00\ L)}{400.0\ kPa} = \frac{(400.0\ kPa)V_2}{400.0\ kPa}$

$3.00\ L = V_2$

7. What would be the new volume if the pressure on 600.0 mL is increased from 90.0 kPa to 150.0 kPa?

$P_1V_1 = P_2V_2$ $\frac{(90.0\ kPa)(600.0\ mL)}{150.0\ kPa} = \frac{(150.0\ kPa)V_2}{150\ kPa}$

$36\bar{0}\ mL = V_2$

8. A student collects 25.0 mL of gas at 96.0 kPa. What volume would this gas occupy at 101.325 kPa. There is no change in temperature or mass.

$P_1V_1 = P_2V_2$ $\frac{(96.0\ kPa)(25.0\ mL)}{101.325\ kPa} = \frac{(101.325\ kPa)V_2}{101.325\ kPa}$

$23.7\ mL = V_2$

9. A gas measuring 525.0 mL is collected at 104.66 kPa. What volume does this gas occupy at 99.33 kPa?

$P_1V_1 = P_2V_2$ $\frac{(104.66\ kPa)(525.0\ mL)}{99.33\ kPa} = \frac{(99.33\ kPa)V_2}{99.33\ kPa}$

$553.2\ mL = V_2$

10. A mass of gas occupies 1.00 L at 1.00 atm. At what pressure does this gas occupy

a) 2.00 liters? $P_1V_1 = P_2V_2$ $\frac{(1.00\ atm)(1.00\ L)}{2.00\ L} = \frac{P_2(2.00\ L)}{2.00\ L}$ $0.500\ atm = P_2$

b) 0.50 liters? $P_1V_1 = P_2V_2$ $\frac{(1.00\ atm)(1.00\ L)}{0.50\ L} = \frac{P_2(0.50\ L)}{0.50\ L}$ $2.0\ atm = P_2$

11. From the data in the following table calculate the missing quantity (assuming constant temperature).

a) V_1 = 22.4 L; P_1 = 1.00 atm; P_2 = 8.00 atm; V_2 = 2.80 L

a) $\frac{(1.00\ atm)(22.4\ L)}{2.80\ L} = \frac{P_2(2.80\ L)}{2.80\ L}$

b) V_1 = 60.0 mL; P_1 = 27.0 kPa; P_2 = 101.3 kPa; V_2 = 16.0 mL

b) $\frac{P_1(60.0\ mL)}{60.0\ mL} = \frac{(101.3\ kPa)(16.0\ mL)}{60.0\ mL}$

c) V_1 = omit m^3; P_1 = 40.0 Pa; P_2 = 100.0 kPa; V_2 = 1.00L

d) V_1 = 2.50 L; P_1 = 7.50 atm; P_2 = 188 atm; V_2 = 100.0 mL

d) $\frac{100.0\ mL}{} \left| \frac{10^{-3}\ L}{1\ mL} \right. = 0.1000\ L$

$\frac{(2.50\ L)(7.50\ atm)}{0.1000\ L} = \frac{P_2(0.1000\ L)}{0.1000\ L}$