☆ Add ‾ for 3 s.d. → ALL 3 except 6, 8, 9, 10 (2 s.d.) #61 (1-8, not 5) #62
☆ #7 typo

Worksheet
Gas Laws

Name____________________
Date_________Hour________

#61 1. If 400 cm^3 (400 mL) of oxygen are collected at a pressure of 980 mbar, what volume will the gas occupy if the pressure were changed to 940 mbar? Boyle's

$P_1V_1 = P_2V_2$

$\frac{(980\ mbar)(405\ cm^3)}{945\ mbar} = \frac{(945\ mbar)(V_2)}{945\ mbar}$ $V_2 = 417\ cm^3$ or mL

#61 2. What is the volume of hydrogen at a pressure of 1. 06 atm. if 200 cm^3 of the hydrogen were collected at a pressure of 1. 00 atm.? Boyle's

$P_1V_1 = P_2V_2$

$\frac{(1.06\ atm)(V_1)}{1.06\ atm} = \frac{(1.00\ atm)(205\ cm^3)}{1.06\ atm}$ $V_1 = 189\ cm^3$ or mL

#61 3. The pressure on 2. 50 L of anesthetic gas is changes from 760 mm Hg to 304 mm Hg. What will be the new volume if the temperature remains constant? Boyle's

$P_1V_1 = P_2V_2$

$\frac{(760\ mmHg)(2.50\ L)}{304\ mmHg} = \frac{(304\ mmHg)(V_2)}{304\ mmHg}$ $V_2 = 6.25\ L$

#61 4. A gas sample occupies 200 mL at 760 mm Hg. What volume does the gas occupy at 400 mm Hg? Boyle's

$P_1V_1 = P_2V_2$

$\frac{(760\ mmHg)(200\ mL)}{400\ mmHg} = \frac{(400\ mmHg)(V_2)}{400\ mmHg}$ $V_2 = 380\ mL$

#62 5. Nitrogen gas in a steel cylinder is under a pressure of 150 atm. at 27.0°C. What will the pressure in the tank be if the tank is left in the sun and the internal temperature rises to 55.0°C? Amonton's

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$ $\frac{150\ atm}{300.15\ K} = \frac{P_2}{328.15\ K}$

$T_1 = 27°C + 273.15 = 300.15\ K$

$T_2 = 55°C + 273.15 = 328.15\ K$

$P_2 = 164\ atm$

#61 6. If a sample of a gas occupies 6. 8 L at 327°C, what will be its volume at 27°C if the pressure does not change? Charles'

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $\frac{6.8\ L}{600.15\ K} = \frac{V_2}{300.15\ K}$

$T_1 = 327° + 273.15 = 600.15\ K$

$T_2 = 27° + 273.15 = 300.15\ K$

$V_2 = 3.4\ L$

#61 7. A gas occupies a volume of 560 cm^3 at a temperature of 100°C. To what temperature must the gas be lowered, if it is to occupy 400 cm^3? Assume constant pressure.

Charles'

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \qquad \frac{560\ cm^3}{373.15\ K} = \frac{400\ cm^3}{T_2}$$

$T_1 = 100°C + 273.15 = 373.15\ K$

$T_2 = ?$

$T_2 = 267\ K$ or $-6.61°C$

#61 8. What is the volume of a gas at -20°C if the gas occupied 50. 0 cm^3 at a temperature of 0°C?

Charles'

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \qquad \frac{V_1}{253.15\ K} = \frac{50.0\ cm^3}{273.15\ K}$$

$T_1 = -20°C + 273.15 = 253.15\ K$

$T_2 = 0°C + 273.15 = 273.15$

$V_1 = 46\ cm^3$

9. What pressure will be exerted by 0. 450 mole of a gas at 25°C if it is contained in a vessel whose volume is 650 cm^3?

Ideal

$650\ mL = .650\ L$

$T = 25°C + 273.15 = 298.15\ K$

$PV = nRT$

$$P(.650\ L) = (0.450\ mol)\left(.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(298.15\ K)$$

$P = 17\ atm$

10. Determine the volume occupied by 0. 582 mole of a gas at 15°C if the pressure is 622 mmHg.

Ideal

$$\frac{PV}{P} = \frac{nRT}{P} \qquad V = \frac{nRT}{P}$$

$$V = \frac{(0.582\ mol)\left(62.4\ \frac{L \cdot mmHg}{mol \cdot K}\right)(288.15\ K)}{622\ mmHg}$$

$T = 15°C + 273.15 = 288.15\ K$

$V = 17\ L$

11. What is the temperature of the gas inside a 750 mL balloon filled with 0. 015 mole H_2 gas? The pressure of the balloon is 1. 2 atm.

Ideal

$750\ mL = .750\ L$

$$\frac{PV}{nR} = \frac{nRT}{nR} \qquad T = \frac{PV}{nR}$$

$$T = \frac{(1.2\ atm)(0.750\ L)}{(0.015\ mol)\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)}$$

$T = 731\ K$

12. From the volume, temperature, and pressure, calculate the number of moles and the mass in grams for the gas listed below.

Ideal

* 5. 00 L SO_2 at 21°C and 0. 95 atm.

$T = 21°C + 273.15 = 294.15\ K$

$$\frac{PV}{RT} = \frac{nRT}{RT} \qquad n = \frac{PV}{RT}$$

$$n = \frac{(0.95\ atm)(5.00\ L)}{\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(294.15\ K)}$$

$n = 0.197\ mol\ SO_2$

$$\frac{0.197\ mol\ SO_2 \times 64.07\ g\ SO_2}{1\ mol\ SO_2} = 12.6\ g\ SO_2$$