Gas Stoichiometry Problem Set 1 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Pressure and Gas Laws*** Period \_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*PRESSURE*

***Pressure Concepts (3 points)***

1. The following figure shows a picture of a barometer. Which of the following statements is the best explanation of how this barometer works? Explain the correct answer.



**1 point**

* 1. Air pressure outside the tube causes the mercury to move in the tube until the air pressure inside and outside the tube is equal.
	2. Air pressure inside the tube causes the mercury to move in the tube until the air pressure inside and outside the tube is equal.
	3. Air pressure outside the tube counterbalances the weight of the mercury in the tube.
	4. Capillary action of the mercury causes the mercury to go up the tube.
	5. The vacuum that is formed at the top of the tube holds up the mercury.

(Zumdahl, 7th edition, Ch. 5, 2)

1. When you are in a plane flying at high altitudes, your ears experience pain. The discomfort can be temporarily relieved by yawning or swallowing some water. Explain.

**2 points**

(Chang, 11th edition, 5.4)

1. a) If you put a drinking straw in water, place your finger over the opening, and lift the

 straw out of the water, some water stays in the straw. Explain.

**3 points**

b) Mars has an average atmospheric pressure of 0.007 atm. Would it be easier or

 harder to drink from a straw on Mars than on Earth? Explain.

(Zumdahl, 7th edition, Ch. 5, 6 and Brown/Lemay, 12th edition, 10.1)

***Pressure Conversions (2 points)***

1. Freon-12 (CF2Cl2) is commonly used as the refrigerant in central home air conditioners. The system is initially charged to a pressure of 4.8 atm. Express this pressure in each of the following units:
2. mm Hg b) torr c) Pa

**1 point**

(Zumdahl, 7th edition, Ch. 5, 27)

1. A gauge on a compressed gas cylinder reads 2200 psi (pounds per square inch); 1 atm = 14.7 psi). Express this pressure in each of the following units:
2. standard atmospheres b) megapascals (MPa) c) torr

**1 point**

 *(Zumdahl 7th edition, Ch. 5, 28)*

1. In the United States, barometric pressures are generally reported in inches of mercury. On a beautiful summer day in Chicago, the barometric pressure is 30.45 in Hg.
	1. Convert this pressure to torr.
	2. Convert this pressure to atm.
	3. A meteorologist explains the nice weather by referring to a “high-pressure” area. In light of your answers to parts (a) and (b), explain why this makes sense.

**2 points**

**AP CHEMISTRY – GAS LAWS PRACTICE**

Review of gas laws (temperature MUST be in Kelvin for all gas laws – K = °C + 273,
 pressure and volume units must the SAME on both sides)

Boyle’s (P and V): P1V1 = P2V2 Charles: $\frac{V\_{1}}{T\_{1}}=\frac{V\_{2}}{T\_{2}}$ No Name: $ \frac{P\_{1}}{T\_{1}}=\frac{P\_{2}}{T\_{2}}$

 Combined: $\frac{P\_{1}V\_{1}}{T\_{1}}=\frac{P\_{2}V\_{2}}{T\_{2}}$ Avogadro’s: $\frac{n\_{1}}{V\_{1}}=\frac{n\_{2}}{V\_{2}}$

 STP = 0°C = 273 K, 1 atm = 760 mm Hg = 101.3 kPa Molar volume at STP: 1 mol = 22.4 L

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***Gas Laws (with calculator) (7 points)***

1. A 1.53 L balloon at STP was moved to an environment with a pressure of 87.8 kPa and 25.2°C. What is the final volume of the balloon?

**1 point**

1. At a deep-sea station 200. m below the surface of the Pacific Ocean, workers live in a highly pressurized environment. How many liters of gas at STP must be compressed on the surface to fill the underwater environment with 2.00 x 107 L of gas at 20.0 atm?

**1 point**

1. An ideal gas is contained in a cylinder with a volume of 5.0 x 102 mL at a temperature of 30.ºC and a pressure of 710. torr. The gas is then compressed to a volume of 25 mL, and the temperature is raised to 820.ºC. What is the new pressure of the gas?

**1 point**

*(Zumdahl, 7th edition, Ch. 5, 47)*

1. A canister with fixed volume at 97.2 kPa and 23.0°C is compressed to a pressure of 1.88 atm. What is the final temperature in the canister in degrees Celcius?

**2 points**

1. How big a volume of dry oxygen gas at STP would you need to take in order to have the same

number of oxygen molecules as there are hydrogen molecules in 25.0 L at 0.850 atm and 35°C?

**2 points**

1. A gas has a pressure of 4.62 atm when its volume is 2.33 L. What will be the pressure in torr when

the volume is changed to 1.03 L?

**2 points**

***Gas Laws (no calculator) (3 points)***

1. A 2.00-liter sample of nitrogen gas at 27 °C and 600. millimeters of mercury is heated until it occupies a volume of 5.00 liters. If the pressure remains unchanged, the final temperature of the gas is (no calculator!!!)

(A) 68 °C (B) 120 °C (C) 477 °C (D) 677 °C (E) 950. °C

**1 point**

1. Rationalize the following observations:
	1. Aerosol cans will explode if heated.
	2. You can drink through a soda straw.

**2 points**

* 1. A thin-walled can will collapse when the air inside is remove by a vacuum pump.
	2. Manufacturers produce different types of tennis balls for high and low elevations.

*(Zumdahl, 7th edition, Ch. 5, 16)*

1. You have a gas confined to a cylinder with a movable piston. What would happen to the gas pressure inside the cylinder if you do the following?
	1. Decrease the volume to one-fourth the original volume while holding the temperature constant.
	2. Reduce the temperature (in Kelvin) to half its original value while holding the volume constant.

**3 points**

* 1. Reduce the amount of gas to one-fourth while keeping the volume and temperature constant.

*(Brown/Lemay, 12th edition, 10.27)*

***BOOK REFERENCE PAGES = 189-198***