**Answer sheet: Take-home Exam 4 Chem 1114 section 2 60 pts total**

Your name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4.1. Basic Gas Law Problems** (20 pts total)

1) T2 (oC) on Pike’s Peak = \_\_\_\_\_\_\_\_\_\_\_oC \_\_\_/5

2) P(atm) in pressure cooker = \_\_\_\_\_\_\_\_\_\_\_atm \_\_\_/5

3)molecular weight of unknown gas= \_\_\_\_\_\_\_\_\_\_\_g/mol \_\_\_/5

4) Initial Pressure, P1  in piston = \_\_\_\_\_\_\_\_\_\_ atm \_\_\_/5

**4.2. Novel Gas Law Problems (40 pts total)**

5) Final Pressure in sphere = \_\_\_\_\_\_\_\_\_\_\_ atm \_\_\_\_/10

6) Final Pressure in two tanks = \_\_\_\_\_\_\_\_\_\_\_ atm \_\_\_\_/10

7) Identities of A and B \_\_\_\_\_\_\_=A \_\_\_\_\_\_=B \_\_\_\_/10

8 ) P(PCl5)= \_\_\_\_\_\_\_\_\_\_ atm P(PCl3)= \_\_\_\_\_\_\_\_\_\_ atm P(Cl2) = \_\_\_\_\_\_\_\_\_\_\_ atm

**Extra Credit explanation (10 pts)**

**Takehome Exam #4 Chem 1114 section 2 60 points total**

**due (with all work attached to answer sheet): Wednesday 7 December by 4 PM**

**You must show all work or no credit will be given. Use the Answer Sheet provided and firmly staple any additional work**

**4.1. Basic Gas Law Problems (20 points total/ 5 pts each)**

1) A small balloon initially at sea level has a volume, V1, of 2.0 L at T1= 300 K and a pressure P1=1.00 atm. At 1 mile above sea level (Pike’s Peak) the balloon has a volume V2 = 11 L and a pressure P2= 0.1691 atm. **What is the temperature, T2 in oC on Pike’s Peak ?**

**2**) A pressure cooker with a volume of 6 L is filled with 27 grams of water and heated to 390.2 K. **What is the pressure (atm) in the cooker?**

3) A 0.0097561 g quantity of an unknown gas occupies 0.2 L at 500 K and 2 atm. **What is the Molecular**

**Weight (MW) of the gas ?**

4) A fixed amount of gas initially at 100 K and pressure P1 is expanded from 1 L to 100 L in a piston. The temperature, T2, of the gas at this point is 50 K. The piston is then locked at constant volume

V2=100 L and half the gas is pumped out at a constant temperature of T2 . The observed pressure, P3, after half the gas is removed under these conditions is 0.03 atm. **What was the initial pressure, P1 ?**

**4.2. Novel Gas Law Problems (40 pts/ 10 pts each)**

5) 1 gram of C3H8 gas and 1 gram of O2 gas are delivered to a metal sphere with a fixed volume of 1 L. After the two gases are introduced, the two reactants are ignited and burned according to the balanced reaction: C3H8(g) + 5O2(g) 🡪3CO2(g) + 4H2O(g)

After reaction, the sphere is held at 226.25 oC. **What is the final pressure in the sphere given that all the compounds inside are gases and the limiting reagent is completely consumed with 100% yield ?**

6) The valve between a 5 liter tank in which the gas pressure is 911.925 kPa and a 10 liter tank containing gas at 4560 torr is turned open and equilibrium is established at constant temperature. What is the final pressure in the two tanks in atmospheres?

7)Two gas tanks containing compounds A and B are connected by separate valves to two ends of a 10 meter glass tube as shown below. When both valves are thrown open at the same time A and B travel down the tubes towards each other. A white ring of precipitate initially forms at the position shown below.

**10 meters**

A 3.534 meters B

Given that A and B are one of the compounds below **determine what A and B’s identities are.**

Possible compounds that can be A and B: **HF, HCl, HBr, HI (acids) NH3, NCl3, NF3, PH­3, PCl3 (bases)**

**8)** A sample of PCl5  weighing 2.69 grams is placed in a 1.000 liter flask and vaporized completely at 250 o C.

The final pressure observed at this temperature is 1.000 atmospheres. Note that some, but not all of the PCl5 decomposes according to the equation: PCl5 (g) ---------> PCl3 (g) + Cl2 (g)

**What are the pressures ( in atm) of PCl5  , PCl3 and Cl2 once the reaction is complete and at equilibrium ?**

EXTRA CREDIT (10 pts): Provide a simple explanation for the behavior of the two balloon experiment demonstrated in class

start