RUBRIC **FOR GAS LAW LAB**

# Lab Notebook 50 pts

 **1)Pre-lab (purpose)** **5** vagueness will be unmercifully punished

 **format** **3** (page #, dates, signature, pages titled,

 all sections labeled and present)

 **2)Procedure** **8** clear, paragraph form with headers and

 Error free English. No misspellings.

**3)Data /Observations** **8** tables and other numeric information

clearly labeled and delineated . Calculations are not mixed in with Observations

pictures of Ideal gas law experiment

 **4)Calculations 10** mass Al from P,V,T with water vapor

corrections for both trials ; clear tabulations of results ; % EDA calculations; English used to stitch together the calculations performed

**Results 10** Al mass estimated vs actual, %EDA

 Error range <5%

Workmanship 6 Note book is readable, neat and well-organized

Total **30**

# Formal Report 30 pts

Theory 44 See attached outline

Workmanship 6 English, organization, neatness & general

 appearance

  **30**

**Verification of Ideal Gas Law**

**Pre-lab (purpose)** \_\_\_ **5** **format \_\_\_/3** **Procedure** \_\_\_**8**

**Data /Observations** \_\_ **8** **Calculations \_\_\_10** **Results\_\_\_/10**

 Workmanship\_\_\_6 Total \_\_\_ **50**

**Suggested Outline for Theory**

**1. The Ideal gas law**

* Statement of law (PV=nRT); define units
* Microscopic assumptions (masses have no volume, elastic collisions, gas particles don’t interact)….note that R =0.08215 atm L/K mol assumes these conditions
* Connection of Ideal law to empiric laws (Boyle, Gay-Lussac, Avogodro, Charles)

**2. Reaction Stoichiometry**

* Statement of balanced reaction run (in molecular reaction format)
* Brief discussion of mole connection between Al and H2
* Re-expression of mass Al to moles Al and volume H2 to moles H2 given T, Ph2 and R

**3. Correction of P(obs) with H2O vapor pressure**

* Explain how and why we correct observed barometric P=Pobs with water

 vapor pressure data at room temperature to extract an estimate of PH2

**4. Testing the Ideal gas Law prediction**

Clearly express how the Ideal gas law is tested and what big assumption must be made (…that the stoichiometry and mole concepts used to compute moles are correct)

 **Key issues**

* How you compute Al moles from nH2 derived from Ideal gas law
* Rationale for why this `tests’ ideal gas law: be particularly careful to explain that if the moles of n(Al) computed from the Ideal gas law theory match that of Al derived from weight, that the theory is supported…otherwise not.
* Make a brief comment on how stoichiometry and mole concept form the basis of `actual’ in order to test PV-nRT validity (reflects essentially mass conservation)
* Briefly explain error estimation (don’t jsut parrot the equation. Explain in words what the equation below tells us.)

%EDA= 100\*n(Al , ideal gas prediction) - n(Al actual))/n(Al actual)

**5. Expected Sources of error**

Discuss what you see as 3 major error sources. Note that `human error’ is not an option. Errors must be connected to perceived limitations in equipment, experiment design or assumptions .

**Grading Template for Theory \_\_\_\_/50**

**1. The Ideal gas law (\_\_/5)**

\_\_/1 Statement of law (PV=nRT); define units

\_\_/4Discussconnection of Ideal law to empiric laws (Boyle, Gay-Lussac, Avogodro, Charles)

**2. Reaction Stoichiometry (\_\_/10)**

\_\_/1 Statement of balanced reaction run (in molecular reaction format)

\_\_/2 Brief discussion of mole connection between Al and H2

\_\_/3 Re-expression of mass Al to moles Al to moles H2 predicted by stoichiometry

**3. Correction of P(obs) with H2O vapor pressure (\_\_/4)**

\_\_/2 Explain how and why we correct observed barometric P=Pobs with water

 vapor pressure data at room temperature to extract an estimate of PH2

**4. Testing the Ideal gas Law prediction (\_\_/20)**

Clearly express how the Ideal gas law is tested and what big assumption must be made (…that the stoichiometry and mole concepts used to compute moles are correct)

 **Key issues**

\_\_/4 How you compute n(H2) moles from Ideal gas law

\_\_/5 Rationale for why this `tests’ ideal gas law: be particularly careful to explain that if the moles of n(H2) computed from the Ideal gas law theory match that of n(H2) derived from weight of Al, that the theory is supported…otherwise not.

\_\_/5 Make a brief comment on how stoichiometry and mole concept form the basis of `actual’ in order to test PV-nRT validity (reflects essentially mass conservation)

\_\_/2 Briefly explain error estimation (don’t just parrot the equation. Explain in words what the equation below tells us.)

%EDA= 100\*n(H2 , ideal gas prediction) - n(H2 actual))/n(AH2actual)

**\_\_/5 Expected Sources of error**

Indicate at least 3 different sources of error. FYI …”human error” and “accuracy” are not one of them.

**\_\_/6 workmanship**

Neatness

 evidence of good effort

clarity;

 English usage

**Verification of Ideal Gas Law**

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