Packet 6

1) How many grams of titanium are in 3.55 moles?	9) How many moles of magnesium are in 90.87 g?
2) How many atoms of gold are there in 2.34 moles?	10) How many grams of lithium are in 6.54×10^{2} moles?
3) How many moles of ruthenium are in 56.78 g?	11) How many atoms of uranium are there in 1.95×10^{-2} moles?
4) How many grams of cesium are in 8.34×10^{-3} moles?	12) How many atoms of carbon are there in 4.56×10^{-2} moles?
5) How many atoms of iodine are there in 4.68 moles?	13) How many moles of oxygen are in 8.99×10^{4} g?
6) How many moles of indium are in 9.88×10^{4} g?	14) How many atoms are there in 5.98 g of calcium?
7) How many grams of silver are in 1.25×10^{5} moles?	15) What is the mass of 4.89×10^{24} atoms of copper?
8) How many atoms of niobium are there in 7.55×10^{-8} moles?	

16) From the following information determine the average atomic mass of copper:
69.17% Copper−63 (62.929599 amu)
30.38% Copper−65 (64.927792 amu)

17) From the following information determine the average atomic mass of magnesium:
78.90% Mg−24 (23.985045 amu)
10.00% Mg−25 (24.985839 amu)
11.00% Mg−26 (25.982595 amu)

18) The average atomic mass for lithium is 6.9417 and the two isotopes for lithium are Li−6 (mass = 6.015123 amu) and Li−7 (7.016005 amu), what is the percent abundance of these isotopes?

19) The average atomic mass of indium is 114.8179 amu, the major isotope is In−115 (114.903875 amu) with a percent abundance of 95.70%, what is the mass of the other isotope for indium?

20) The average mass of bromine is 79.904, what is the percent abundance of each of the isotopes of bromine:
Br−79 (78.918336 amu) and Br−81 (80.9162920 amu)

Discussion

Amedeo Avogadro

As part of understanding molar mass and calculating the average atomic mass of the elements, we need to understand the history of Avogadro's Number. You will write a two paragraph description of: who Amedeo Avogadro was, why he has a number named after him, and how that number was determined.

The day that it is due you will be split into groups and discuss what you found out. These reports are individual in nature and not meant to be lengthy. Two to three paragraphs is sufficient.

Demonstration

Counting by Weighing Activity

SHOW WORK FOR ALL CALCULATIONS!!!

1. Obtain an empty paper cup and a cup of M&M's from your teacher

2. Weigh and record the mass of the empty cup

3. Weigh and record the mass of one M&M being careful not to let the M&M touch the scale or any other surface (other than inside the cup). Repeat four more times (using a total of 5 different M&M's, one at a time). Record the masses in the spaces below.

4. Calculate the average mass of an M&M.

5. Pour all of your M&M's into the cup you weighed in step 2 and record the total mass. Record this mass.

6. Calculate (without counting) how many M&M's are in your cup of M&M's.

7. Count the number of M&M's in your cup

8. How many M&M's would you expect to find in a 1 ounce fun size bag of M&M's?

9. How many M&M's would you expect to find in a 12.6 ounce bag of M&M's?

10. According to the 12.6 ounce package, a serving size would be 42g. How many M&M's would be in a serving size? How many servings would be in the 12.6 ounce bag?

Complete the table

	Number of M&Ms	Mass of M&Ms
6 Score		
3 Gross		
16 Dozen		
1 Century		
12 Reams		
1 Mole		

Demonstration

A Penny for Your Thoughts Lab

Each question should be answered in complete sentences.

Purpose: To determine the isotopes of "Pennium" and the atomic mass of "Pennium".

Introduction: Unless you're a coin collector, you probably think all United States pennies are pretty much the same. To the casual observer, all the pennies in circulation do seem to be identical in size, thickness, and composition. But just as elements have one or more isotopes with different masses, the pennies in circulation have different masses. In this investigation, you are going to use pennies with different numbers masses to represent different "isotopes" of an imaginary element called pennium, or Pe. Remember that chemical isotopes are atoms that have the same number of protons, but different numbers of neutrons. Thus, chemical isotopes have nearly identical chemical properties, but some different physical properties.

In this investigation, you will determine the relative abundance of the isotopes of pennium and the masses of each isotope. You will then use this information to determine the atomic mass of pennium. Recall that the atomic mass of an element is the weighted average of the masses of the isotopes of the element. This average is based on both the mass and the relative abundance of each isotope as it occurs in nature. (From Prentice Hall Chemistry)

Materials per Group: 20 Pennies Balance Calculator Graph Paper

Pre-Lab Questions:

1. What do the 20 pennies in this investigation represent?

2. What information do you need to calculate the average atomic mass for an element?

3. What do the different masses of the pennies represent?

Procedures:

1. Obtain a plastic bag with pennies from your teacher. At your lab area, remove and count the pennies in your bag.

2. Examine your pennies and describe any differences in the pennies. Are all the pennies the same?

3. Use the balance to find the combined mass of ALL 20 pennies and create a data table indicating the year and mass of each penny. Be sure to put the pennies in chronological order.

4. Use this question as your hypothesis: Will the mass of any one penny in your sample multiplied by 20 be equal to the mass of all 20 pennies? Explain.

5. Place the 20 pennies in the plastic bag and return to the area designated by your teacher. Clean your work area.

Data Analysis Questions:

1. Create a line graph from your data.

2. Inspect your data table and your graph. Do you notice any groups of masses that are similar? Explain your answer.

3. Using your data table and graph, determine the year in which the mass of a penny changed.

4. Why do some pennies have different masses?

Calculations:

1. Determine the number of isotopes of Pe that are present? How many different groups of masses do you have?

2. Calculate the fractional abundance of each isotope in your sample.

$$\text{Fractional abundance} = \frac{\text{\# of pennies each isotope}}{\text{Total \# of pennies}}$$

Isotope #1 Isotope #2

3. Calculate the average atomic mass of each isotope.

$$\text{Average atomic mass} = \frac{\text{total mass of pennies of each isotope}}{\text{\# of pennies of that isotope}}$$

4. Using the fractional abundance (answers from #2) and the average atomic mass of each isotope (answers from #3), calculate the atomic mass of Pe.

  [(average mass of isotope 1) x (fractional abundance 1)]
+ [(average mass of isotope 2) x (fractional abundance 2)]
average atomic mass

Conclusion Questions:

1. Why are the atomic masses for most elements not whole numbers?

2. How are the isotopes of Lead (Pb- 204, Pb- 206, Pb- 207 and Pb- 208) alike?

3. How are the isotopes of Lead (Pb- 204, Pb- 206, Pb- 207 and Pb- 208) different?

4. If we were to repeat this experiment using the new state quarters from 1999 and regular quarters from years prior to 1999, what do you predict the outcome of this activity to be? Explain

5. Describe two weaknesses in this laboratory investigation. (What are two things that could have been done better and don't you dare say that you could have done the calculations better)

Lab

Massing Elements

While performing labs it is important that you be able to obtain a correct number of particles of a particular element. Your mission should you choose to accept it (and you have to accept it) is to determine the number of moles and number of particles of each of the elements that has been placed on the table before you.

As part of this lab you will have to describe each element qualitatively. The best way to do this is to make a table so that the data is easily seen. Show all your calculations when determining the number of moles and particles of each element.

The point distribution will be as follows:

Section	Points	Description
Title	2	A creative name for the lab that you have performed. Please make it your own, no need to copy.
Procedure	5	A numbered list of how you went about finding the information you did.
Observations/Data	5	Should include anything important you find about the elements.
Calculations	10	SHOW YOUR WORK!!!! Anything that you find pertinent to the goal of the lab.
Conclusion	8	A paragraph or two summarizing what you have done in the lab. Did you accomplish what we set out to do? Are there things about working in the lab that you learned? What are some of the problems with the lab?

Resources

Schaums – Chapter 2: Pgs 16–18 Problems: 11–15, 24, 29, 32, 36

Chang's – Sections 3.1 and 3.2 Problems: Chapter 3 1–22

Links - http://misterguch.brinkster.net/october2002.pdf
http://www.chemteam.info/Mole/AverageAtomicWeight.html
http://www.kentchemistry.com/links/AtomicStructure/atomicmasscalc.htm

Khan Academy – http://www.khanacademy.org/video/the-mole-and-avogadro-s-number?playlist=Chemistry