Name: _____ **Date:** _____

Chemistry *~ Ms. Hart* **Class:** Anions or Cations

THE URBAN ASSEMBLY SCHOOL FOR CRIMINAL JUSTICE

Candium Experiment – Lab #8

PURPOSE: To simulate the process of calculating average atomic mass using a mythical element, *candium* and its three different isotopes.

INTRODUCTION:

Candium is an interesting element found only at UASCJ. We will be using this special new element today to learn about atomic mass calculations. The atomic mass listed on the periodic table for each element is a "weighted" average. Although, for example, sulfur is listed as having an atomic mass of 32.06 amu, there are no sulfur atoms that have a mass of 32.06 amu. Sulfur atoms only have masses of 32, 33, 34, or 36 amu (each of these is called an isotope of sulfur).

Isotopes exist when one element has different versions—each with different numbers of neutrons. For instance, Sulfur-32 has 16 protons and 16 neutrons. Sulfur-33 has 16 protons and 17 neutrons. Sulfur-34 has 16 protons and 18 neutrons. Sulfur 36 has 16 protons and 20 neutrons. To get the number of 32.06 scientists use the weighted average of the different masses of Sulfur.

To show you how weighted averages work, consider how you can calculate grades in a college class:

Tests: 65%
Quizzes: 10%
Homework: 10%
Labs: 15%

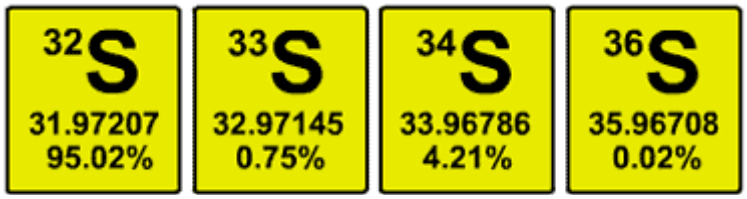
If your test average is 90%, your homework average is 80%, your lab average is 70%, and your quiz average is 80%, here is how your grade would be calculated:

58.5 + 8 + 10.5 + 8 =

(90 * 0.65) + (80 * 0.10) + (70 * 0.15) + (80 * 0.10) = .85 x 100% = 85%

Tests Homework Lab Quizzes

Consider these four isotopes of Sulfur.



Number of protons: _____ _____ _____ _____

Number of neutrons: _____ _____ _____ _____

Number of electrons: _____ _____ _____ _____

Relative mass = 0.9502 x 31.97207 0.0075 x 32.97145 0.0421 x 33.96786 0.0002 x 35.96708

_____ + _____ + _____ + _____ = _____
avg atomic mass

MATERIALS:

- Candium—represented by M & Ms, Reese's Pieces and Skittles
- Balances

PROCEDURE:

1. Measure the mass of the cup with the laboratory balance. Record in the data and observations section.
2. Separate the candium into 3 "isotopes"—M&M's, Skittles, and Reeses.
3. Count the total number of pieces of each isotope and record in the table.
4. Put the M&M's into the cup and measure the mass on the lab balance. Record the mass of the M&Ms in the table. Make sure to subtract out the mass of the cup!
5. Remove the M&M's from the cup. Repeat step 4 with the Skittles, and then the Reeses.
6. Once you have finished all of your measurements, it is okay to eat your candium sample.

DATA AND OBSERVATIONS:

Fill in the data table. Show calculations below and include units!

Mass of empty cup: _____

	Formulas	**M& M's**	**Skittles**	**Reeses**	**Totals**
Total Mass (g)	Mass of each candy – empty cup				
Number of Pieces	Count the number of each candy				
Average Mass of 1 (g)	$\frac{\text{total mass}}{\#\text{ of pieces}}$				
% Abundance	$\frac{\#\text{ of pieces of single type}}{\#\text{ of pieces total}} \times 100$				100%
Relative Abundance	$\frac{\%\text{ Abundance}}{100}$				1
Relative Mass	relative abundance × avg. mass				**

**Calculate the average mass of all candium particles by adding the relative masses. This average mass is the atomic mass of candium.

Relative mass of M & M: _____ +

Relative mass of Skittles: _____ +

Relative mass of Reeses: _____ =

Average atomic mass of candium: _____ g.

ANALYSIS QUESTIONS:

1. Explain the difference between percent abundance and relative abundance.

2. Compare your atomic mass of candium with one of your neighbors. Explain why the difference would be smaller if larger samples were used.

3. Give the number of protons, neutrons, and electrons in the atom symbolized by $^{90}_{38}\mathrm{Sr}$. Strontium-90 occurs in fallout from nuclear testing. It can accumulate in bone marrow and may cause leukemia and bone cancer.

4. Write the symbol for the magnesium atom with a mass number of 24. How many neutrons and electrons does this atom have?

5. Silver has two isotopes, $^{107}_{47}Ag$ (52.00%), and $^{109}_{47}Ag$ (48.00%). What is the atomic mass of silver?

6. Data for chromium's four naturally occurring isotopes is provided in the table below. Calculate chromium's atomic mass.

	Chromium Isotope Data	
Isotope	Percent abundance	Mass (amu)
Cr-50	4.35%	49.946
Cr-52	83.79%	51.941
Cr-53	9.50%	52.941
Cr-54	2.36%	53.939

CONCLUSION:

Directions: In the space below, write a one paragraph conclusion that summarizes your results and findings and what that means average atomic mass. Explain what isotopes are and how they differ from each other.

_____

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Data, Observation, Data Analysis	☐ Data is properly recorded ☐ Calculations are correct ☐ Table is set up in a logical, easy-to-read manner.	☐ Data is properly recorded ☐ Calculations are correct ☐ Table is set up but not entirely easy to follow.	☐ Data is properly recorded ☐ 1 error in calculations ☐ Table is incomplete.	☐ Data is incomplete. ☐ More than 1 error in calculations ☐ Results not presented in a table
Analysis Questions	☐ All answers are correct. ☐ All answers are thoroughly explained and supported by the experimental data.	☐ 4 answers are correct. ☐ Most answers are thoroughly explained and supported by the experimental data.	☐ 3 answers are correct. ☐ Most answers are thoroughly explained and supported by the experimental data.	☐ Less than 3 answers are correct.
Conclusion	☐ Answers the purpose of the lab ☐ Summarizes observations clearly. ☐ Explains a connection to calculating average atomic masses for actual elements.. ☐ Makes a connection to how this procedure could have been changed to more accurately reflect the original experiment.	☐ Answers the purpose of the lab ☐ Summarizes observations clearly. ☐ Explains connection to calculating average atomic masses for actual elements.	☐ Answers the purpose of the lab ☐ Summarizes observations clearly.	☐ Answers the purpose of the lab

OVERALL LAB: _____/12 POINTS