Name Period Date

Unit 2 – M&M Isotope Lab

Introduction

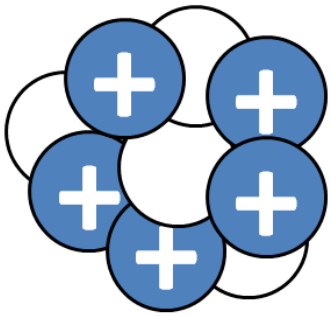
Isotopes are atoms of the same chemical element, each having a different mass number (different number of neutrons). Isotopes differ in mass number but never in atomic number (# of protons). Since we cannot see atoms, you will use M&M's to represent atoms. The purpose of this lab is to calculate the average atomic mass using M&M's, and to observe the difference between isotopes.

1. The **mass number** of the atom is the total number of _____ & _____

2. **Isotopes** are different types of atoms of the same element, but with a different number of _____

3. Carbon-13 is an isotope of Carbon with a mass number of 13. How many neutrons are in Carbon-13? _____

Refer to this picture of an atom's nucleus to answer questions 4-9.



4. How many **protons**? _____

5. What is the **atomic #?** _____

6. What **element** is this? _____

7. How many **neutrons**? _____

8. What is the **mass #**? _____

9. What is the **isotope** name? _____

Procedure

1. Each group will get 1 small bag of plain M&M's and 1 small bag of caramel M&M's.

2. Count the number of Plain M&M's in your bag and record this number in the data table below. Repeat this step for the caramel M&M's.

3. Using a piece of clean paper towel as a weighing boat, measure the total mass of your plain M&M's and record this number in the data table. Repeat this step for the caramel M&M's. ******REMEMBER to ZERO out the paper towel!***

DATA TABLE:	Number of M&M's	Mass of M&M's
Isotope #1 - Plain M&M's		
Isotope #2 – Caramel M&M's		
Total Number of all your M&M's		

Calculate the average mass of each isotope using the formula to the right.

$$Average\ Mass = \frac{Total\ Mass}{\#\ of\ M\&M's}$$

Isotope #1 – Plain M&M	Isotope #2 – Caramel M&M
10. Average mass of Isotope #1 =	**11.** Average mass of Isotope #2 =

Calculate the percent abundance of each isotope. Of all the M&M's you have, what % of them are plain and what % are caramel?

$$\%\ abundance = \frac{\#\ of\ each\ type\ of\ M\&M}{TOTAL\ \#\ of all\ M\&M's}\ x\ 100$$

Isotope #1 – Plain M&M	Isotope #2 – Caramel M&M
12. % abundance of Isotope #1 =	**13.** % abundance of Isotope #2 =

14. Calculate the average "atomic mass" of your M&M's.

$$\boldsymbol{Average\ Atomic\ Mass} = \frac{(\boldsymbol{mass\ of\ isotope\ 1})(\%\ \boldsymbol{abundance}) + (\boldsymbol{mass\ of\ isotope\ 2})(\%\ \boldsymbol{abundance})\ \ldots}{\boldsymbol{100}}$$

Average Atomic Mass = _____

Conclusion Questions

15. Is your average "atomic mass" close to or the same as students in other groups?

16. Would using king size bags of M&M's make a difference to the average "atomic mass"? Why or why not?

17. How do Hydrogen-1, Hydrogen-2, and Hydrogen-3 differ from each other?

18. Sulfur has 4 isotopes: **sulfur-32 is 95.0%, sulfur-33 is 0.76%, sulfur-34 is 3.22%,** and **sulfur-36 is 0.89%** abundant. Calculate its average atomic mass.

Average Atomic Mass = _____