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| Name | Period | Date |  |
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| **Unit 2 – M&M Isotope Lab** |



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| **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? |  |
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| **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 of 3 will get 1 small bag of plain M&M’s and 1 small bag of peanut 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 Peanut 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 Peanut M&M’s. \*\*\**REMEMBER to ZERO out the paper towel!*

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| **DATA TABLE:** | **Number of M&M’s** | **Mass of M&M’s** |
| **Isotope #1 - Plain M&M’s** |  |  |
| **Isotope #2 - Peanut M&M’s** |  |  |
| **Total Number of all your M&M’s** |  |  |

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| **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 – Peanut M&M** |
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| **10.** Average mass of Isotope #1 = | **11.** Average mass of Isotope #2 = |

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| **Calculate the percent abundance of each isotope. Of all the M&M’s you have, what % of them are plain and what % are peanut?** | $$\% abundance= \frac{\# of each type of M\&M}{TOTAL \# ofall M\&M's} x 100$$ |
| **Isotope #1 – Plain M&M** | **Isotope #2 – Peanut M&M** |
|  |  |
| **12.** % abundance of Isotope #1 = | **13.** % abundance of Isotope #2 = |

**14.** Calculate the average “atomic mass” of your M&M’s.

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

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|  | Average Atomic Mass = |  |

**Conclusion Questions**

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| **15.** Is your average “atomic mass” close to or the same as students in other groups? |
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| **16.** Would using king size bags of M&M’s make a difference to the average “atomic mass”? Why or why not? |
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| **17.** How do Hydrogen-1, Hydrogen-2, and Hydrogen-3 differ from each other? |
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| **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 = |  |