Calculate the Atomic Mass of the Element “Snackium”

Background: Most elements in nature occur as a mixture of isotopes. The weighted average atomic mass of an element can be determined from the atomic mass and the relative abundance of each isotope. In this activity, you will model isotopes of the imaginary element “Snackium.” The measurements you make will be used to calculate a weighted average mass that represents the average atomic mass of “Snackium.”

Problem
How are the atomic masses of the natural isotopic mixtures calculated?

Objectives
- **Observe** the impact of the weights of different sub-atomic particles on the element.
- **Infer** the importance of each type of particle to the final weight of the element.
- **Calculate** the average mass of your element.
- **Compare** this element with elements observed in nature.

Materials
- balance calculator
- bag of snack mix

Safety Precautions
- Warning: Do not eat the food used in the lab work.

Pre-Lab
1. Read the entire CHEMLAB.
2. What sub-atomic particles do the different types of snacks represent?

3. The mass of neutrons and protons is much greater than the mass of electrons; therefore the mass of an element is dominated by the mass of the nucleus. Predict which, if any, types of snacks will dominate the mass of your imaginary element.

4. How will the mass of an isotope differ from the mass of the element?
5. You will need to record the data that you collect during the lab. Use the data table below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Mass</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>5</td>
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</tbody>
</table>

**Procedure**

1. Read and complete the lab safety form.
2. Create a table to record your data. The table will contain the mass and the Abundance of each type of snacks present in the mixture.
3. Open your snack mix bag. Handle the pieces with care.
4. Organize the snack pieces into groups based on their types.
5. Count the number of snack pieces in each of your groups.
6. Record the number of snack pieces in each group and the total number of snack pieces in your data table.
7. Measure the mass of one piece from each group and record the mass in your Data table.
8. **Cleanup and Disposal** Dispose of the snack pieces as directed by your teacher. Return all equipment to its designated location.

**Analyze and Conclude**

1. **Calculate** Find the percent abundance of the pieces by dividing the individual piece quantity by the total number of snack pieces.

2. **Calculate** Use the isotopic percent abundance of the snack pieces and the mass to Calculate the weighted average atomic mass for your element “Snackium.”

3. **Interpret** Explain why the weighted average atomic mass of the element “Snackium” is not equal to the mass of any of the pieces.
4. **Peer Review** Gather the average atomic mass data from the other lab groups. Explain the differences between your data and the data obtained by other groups.

5. **Error Analysis** Why are the atomic masses on the periodic table not expressed as whole numbers like the mass number of an element?

6. **Research** Look in a chemical reference book to determine whether all elements in the periodic table have isotopes. What is the range of the numbers of isotopes chemical elements have?

7. **Error Analysis** What sources of error could have led the lab groups to different final values? What modifications could you make in this investigation to reduce the incidence of error?

**Inquiry Extension**

Based on your experience in this lab, look up the atomic masses of several elements on the periodic table and predict the most abundant isotope for each element.