**Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Isotopes Lab**

Guiding Question: Scientists from BNL have found some unknown atoms in their scientific research. They have asked you to determine their identities based on subatomic particles. The black pom-poms represent protons and the red represent neutrons. Can you use the protons and neutrons to identify the unknown atoms?

Pre-Lab Questions: Write a scientific explanation to either agree or disagree with the following statement from a former student: *“All atoms of the same element must have the same number of protons, but they can vary in their amounts of neutrons.”*

**Prediction:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Reasoning**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Procedure:

1. Count the amount of black and red pom-poms and record.
2. Rotate to each station and repeat.
3. Use the reference tables to identify the atoms and write the

symbol as represented in the box to the right.

| **Atom** | **Protons** | **Neutrons** | **Isotope symbol** |
| --- | --- | --- | --- |
| **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |
| **4** |  |  |  |
| **5** |  |  |  |
| **6** |  |  |  |
| **7** |  |  |  |
| **8** |  |  |  |
| **9** |  |  |  |
| **10** |  |  |  |
| **11** |  |  |  |
| **12** |  |  |  |
| **13** |  |  |  |
| **14** |  |  |  |

Questions:

1. Were there any atoms in which the number of black outnumbered the number of red pom-poms? Why? Explain in terms of protons, neutrons and charges.
2. From your data, find two atoms that have the same number of protons. Give their symbols. What do they have that is different?
3. What is the definition of an isotope?
4. At a new lab station, assume 100 atoms were given to you. If 97 atoms were identical to your atom #1, 2 atoms were identical to your atom #2, and 1 atom was identical to your atom #3, calculate the average mass of the element.
5. Give a definition of atomic mass.
6. Construct a **claim** that supports or contradicts the prediction made in the pre-lab questions. Provide **evidence** that supports your claim. Use your **reasoning** skills to explain why your evidence is relevant.
7. Draw models that represent the known isotopes of carbon: C-12 and C-14.