Name:

Introduction: James Chadwick, a student of Ernest Rutherford (gold-foil experiment), set out to find the missing particle of the atom. Due to experiments and calculations done by many scientists, it was now understood that atoms contained negatively charged electrons and positively charged protons. However, atoms had a greater mass that could not be explained by these charged particles alone. Rutherford proposed that these unknown particles were actually electrons and protons bound together resulting in a zero net charge. He called these theoretical particles neutrons. And, in 1932, Chadwick actually discovered these neutrons as the result of experiments he carried out with an element called Beryllium. However, they were not electrons bound with protons; they were an entirely new sub-atomic particle separate from electrons and protons. Neutrons are contained in the nucleus, have no charge, but contribute to the overall mass of an element. Their discovery became a crucial piece of the puzzle in understanding the structure of atoms.

Materials:

Various puff balls	Modeling clay
Pipe cleaners	Foam mounting board
Yarn	Labels
Thread	Pins
Glue	Markers and Paints

*Any other art or craft item in the class that you can think of to use to create your model

Methods: You will be creating a 3D model of an atom for a particular element given to you by your teacher. Use the Bohr atomic model, which is also called the planetary model, as a template (example) for your own atomic model. You will be required to label the following structures:

Nucleus	Orbital
Electron	Proton
Neutron	

Type of Atom you modeled

Before you create your model, you must first determine how many protons, neutrons and electrons your assigned element contains. This information was covered in your lesson.

Recall: Atomic number - Atomic Mass (rounded to the nearest whole number) = # of Neutrons

When you determine the # of electrons in your assigned element, you will need to fill the electron shell according to the laws that govern the energy levels of atoms. The rules are as follows:

1st shell: holds up to 2 electrons

2nd shell: holds up to 8 electrons

3rd shell: holds up to 18 electrons

*Lower shells fill before going to higher level shells.

Data:

Name of your element:	
Number of protons in your element:	
Number of electrons in your element:	
Number of neutrons in your element:	
(show math calculations below)	

Show work:

Conclusion and Analysis: This will be your final atomic model with labels.
Questions and Lexicon:

1. What particles form the nucleus?

2. Explain why atoms are generally neutral?

3. Why do scientists say that the mass of an atom is primarily in the nucleus?

4. Define atomic number.

5. What is an ion?

6. Please draw your assigned atom as an ion. It may be positive or negative.

7. What is an isotope?

7. Can you give an example of an application of your element. (what is it used for? You may have to look for an outside resource)

8. Define atomic mass

Geometry Math group

Mass number is another indicator of what an atom is made of. For example, if I write Chlorine-35, the number 35 after the element specifies the combined number of protons and neutrons in that element. It is the mass number. Chlorine-37 is an isotope of Chlorine-35 with an additional 2 neutrons (remember that the number of protons determines the element not the neutrons).

Atomic mass is calculated based upon the ratio of types of elements that are found in nature, meaning the elements and their isotopes. If Boron-10 makes up 20% of all boron found in nature and Boron-11 makes up the other 80%, calculate the atomic mass of boron. You can use the periodic table to check your work. You **MUST** show your math calculations.

Algebra Math Group

Mass number is another indicator of what an atom is made of. For example, if I write Chlorine-35, the number 35 after the element specifies the combined number of protons and neutrons in that element. It is the mass number. (similar to the atomic mass)

Determine the number of protons, electrons and neutrons in an atom of aluminum-27

Recall: Mass number - Atomic number = # of Neutrons

Please show calculation below: