Lesson Topic: Atoms and Elements

Objective:
Students will be able to:

1. Define an atom as the smallest part of an element.
2. Label and recognize the charges of three subatomic particles of an atom: proton, electron, and neutron.
3. Understand that each atom has a distinct number of protons.
4. Recognize elements are pure substances and represented by a chemical symbol.

Time Required: 75 minutes

Materials Needed:

- Hula Hoops – 2 sizes
- 6 foam spheres – 3 different colors (2 protons, 2 electrons and 2 neutrons)
- Hot glue sticks
- Hot glue gun
- Clear nylon twine or string
- Copies of Anatomy of an Atom worksheet
- Copy of the periodic table for reference. (Can be displayed on interactive whiteboard, if unavailable, copies can be distributed and shared among the students)

Teacher Preparation:

- Assign a Legends of Learning Quick Play list for the day(s) you will be presenting the lesson.
    - Instructional – Middle School – Atoms and Elements
- Assign a Legends of Learning Quick Play list for the day(s) you will be presenting the lesson.
    - Concept Review – Middle School – Atoms and Elements
- Make copies of Anatomy of an Atom worksheet (1 per student)
- Build a model atom. Use the two hoops to represent orbitals for the foam electrons. Use the illustration on the Anatomy of an Atom worksheet to help visualize your atom. Use hot glue to connect the protons and neutrons to create a nucleus. Use the clear twine or string to suspend the nucleus from one of the hoops.

Engage (10minutes)

1. Pair – Share activity. After the students have answered the questions individually, instruct students to share their answers with at least two additional students. The students will start by answering the following questions:
    a. What is an example of an element?
    b. What are two qualities that make an element unique?
2. After the pair-share is complete, have the students share their answers as a class. Use this time to correct any misconceptions students may have.
3. Present the model of the atom to the class.

4. Request student observations using directed questioning about the positions of the foam spheres on the atoms, what the foam balls represent, and why are they all not located in the center of the atom?
    a. Answer: The foam spheres represent subatomic particles: protons, electrons, and neutrons. Protons and neutrons are in the center of the atom, which is called the nucleus. Protons have a positive charge, neutrons are electrically neutral, and electrons have a negative charge. Electrons orbit the nucleus.
5. Explain to the students that every atom has a unique number of protons. Show the periodic table.

Explore (30 minutes)

1. Have students sign into Legends of Learning. Instruct students to complete the Instructional playlist.
2. As students complete the assigned games, students will complete the Anatomy of an Atom worksheet.
3. Circulate as students work through the playlist and complete the worksheet.

Explain (20 minutes)

1. Review answers to Anatomy of an Atom handout by drawing the atom diagram and atomic symbol box on the classroom whiteboard or interactive whiteboard.
2. Relate student knowledge to the model of the atom introduced at the beginning of the lesson.
3. What part of the atom contains protons and neutrons? (nucleus)
1. What is the name of the particle on the outer edge of the hoop? (electron)
2. Why is that particle farther away from the center?
3. What would happen if the number of protons inside the nucleus changed? (It would be a different atom)
4. What are some characteristics of Helium? (gas, used to give lift to balloons)
5. Look at the periodic table, what element is formed if one additional proton is added to the nucleus of the model element? (lithium)
6. What are some characteristics of lithium that you learned from your game play in Legends of Learning? (used in batteries, solid)
7. Who can explain to the class the parts of the atom using the model?
    i. Have students identify the nucleus, protons, neutrons, and electrons.
8. Who can explain to the class how the atom model would look different if we were describing lithium?
    i. Have students identify the additional number of protons and electrons needed.
9. If we were to create an element box like the one in the Anatomy of an Atom handout, how would lithium look different? Who would like to create the element box for lithium?
    i. Erase the information from the helium element box on the board. Have the students fill in the chemical symbol for lithium, atomic number, and mass number.

Elaborate (5 minutes):

1. Explain to students that the periodic table is arranged by atomic number, the number

of protons in an element. Each element has unique characteristics as a result.
2. Elements can exist a solids, gas, and even liquids (use Mercury as an example).
3. Atoms are the smallest part of an element and can combine to form compounds in chemical reactions.
4. Show the Chemical Garden video, which shows a chemical reaction of a metal salt immersed in water.
   a. Explain to students that atoms combine to form compounds, and chemical reactions occur between compounds in certain conditions. They will study compounds and chemical reactions in the future.

Evaluate (10 minutes):

1. Have students sign into Legends of Learning and complete the Content Review quickplay list.
2. Analyze student results to access topics for reteaching.

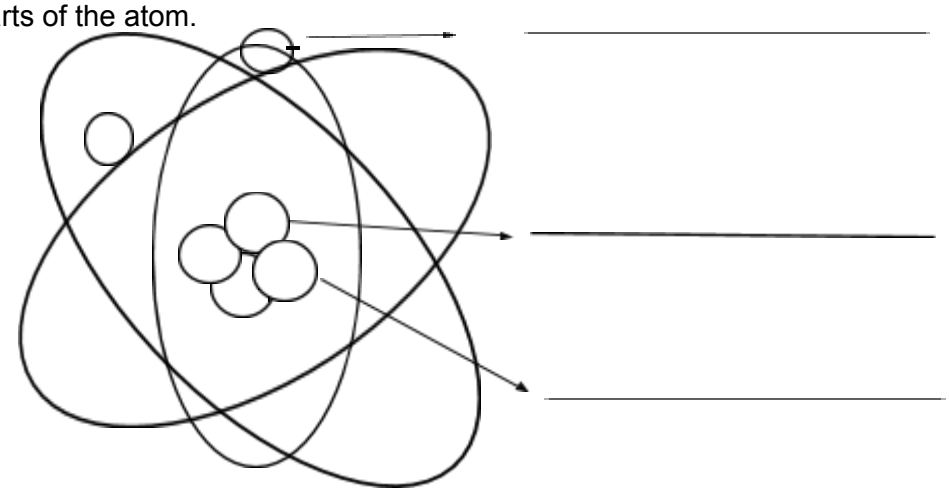
Additional Lesson Strategies:

- To use Legends for additional instruction, create a custom playlist with an instructional game and pre and post assessment.
- To use Legends for a quick formative assessment, create a 5-question assessment in a playlist.
- To use Legends for a student-directed experience, create a targeted freeplay playlist.
- Encourage students to play on their own at home in Legends of Learning: Awakening for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.

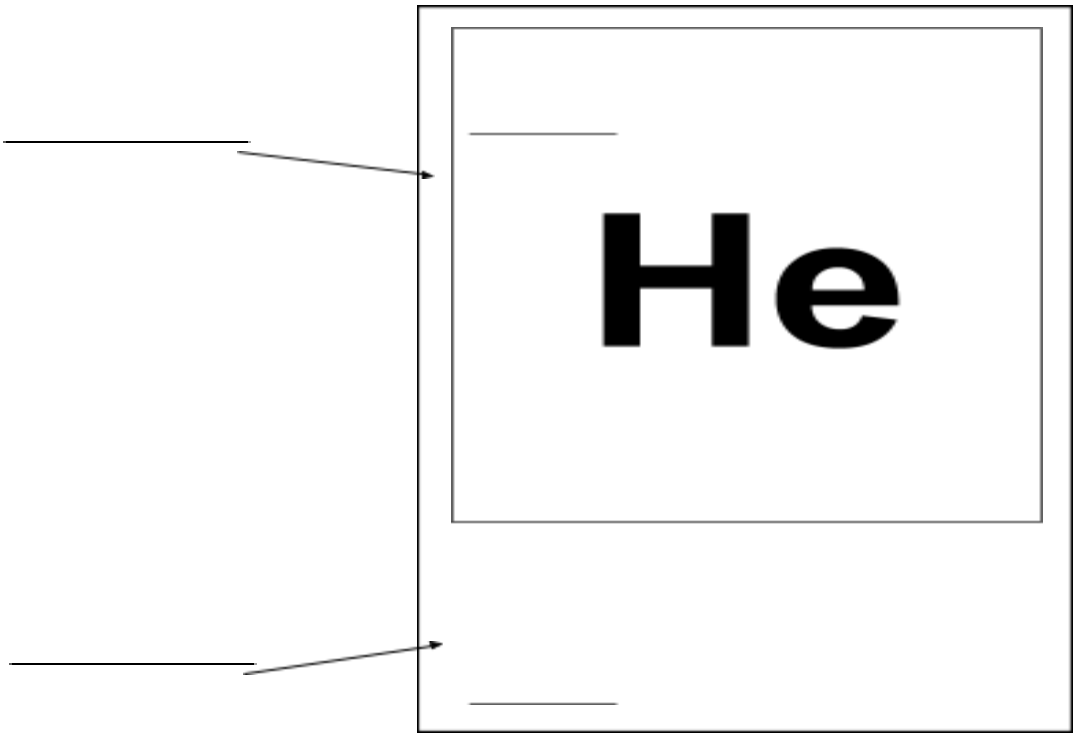
Anatomy of an Atom

Directions: While playing the first three instructional games in Legends of Learning, label the parts of the atoms and complete the missing information from the Helium element box below.

Part 1: Label the parts of the atom.



Part 2: Label the atomic number and the mass number to complete the Helium element box.



Anatomy of an Atom Answer Key

Name:_____

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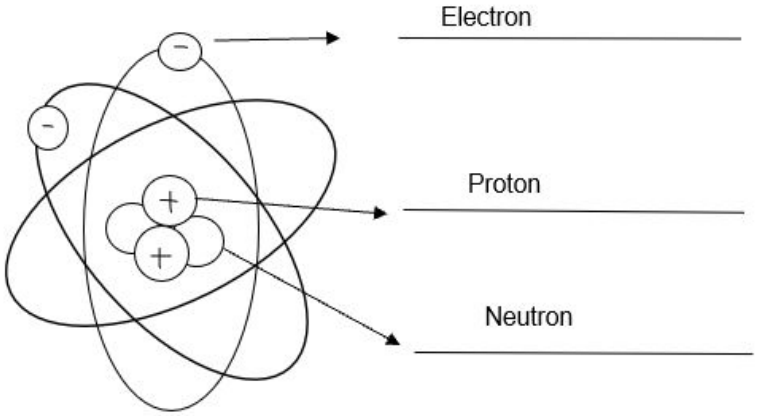

Part 2: Label the atomic number and the mass number to complete the Helium element box.