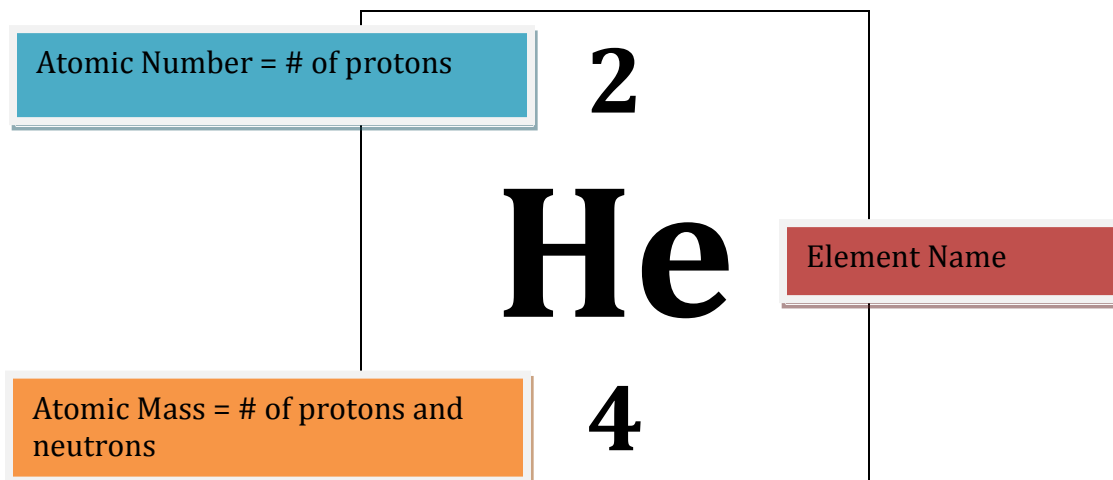


## The Electron Shuffle

**Overview:** The Fridge and the rest of the Bears will go down in history as the creators of the Super Bowl Shuffle, but you and your class will always be known for the **Electron Shuffle!** Atoms are collections of particles called protons, neutrons, and electrons. In this fun activity, your students will learn the parts of an atom, read the atomic symbol, and create atomic models.

**Procedure:**

- 1) Show the students a picture of a balloon and ask them to recreate the picture in their science notebooks. Then ask the students to draw only what is inside the balloon. Lead a discussion based on how they chose to draw the Helium. Explain that Scientist use models to represent this and other things that we cannot see with our eyes.
- 2) Present students with background knowledge on atoms. [Click here](#) for a simple step by step approach to explaining the parts of an atom. Explain to the students that while atoms are too small to be seen, they are going to create models or representations of atoms.
- 3) On a whiteboard, chalkboard, or overhead projector, show the students an atomic symbol. The example below demonstrates how to read an atomic symbol. For our purposes, all symbols will be read as they are written in the Periodic Table of Elements.



Explain the atomic symbol as the map of how to represent the parts of an atom. (For this purpose, round to whole numbers when necessary.)

- 4) Clear out space in the center of the room, placing an empty basket in the middle. This will be the Nucleus.
- 5) The atomic number shows how many protons will be in the nucleus. Using the above example, Helium has 2 protons. Students will put (throw) two balls in the basket with plus signs taped to them to represent protons.
- 6) As a class solve the problem “Atomic Mass – Atomic # = Neutrons” Using Helium  $4-2=2$ . Students throw two unmarked balls in the basket to represent neutrons and complete the atomic mass.
- 7) Choose two students to represent electrons by placing the – symbols on their shirts. The number of electrons is equal to the number of protons. Have them make a shell (circle) around the nucleus (basket) holding the jump ropes between them.

- 8) Once the correct number of electrons are represented in the shell, it's time to do the Electron Shuffle! Electrons are constantly in motion and the best way to represent this concept is to put on some music and have a short Electron Dance Party.
- 9) Empty out the basket and show a different element, this time showcasing that the first electron shell holds just two electrons, while the 2<sup>nd</sup> shell can hold up to 18. Have the students read the atomic symbol to figure out how many protons, neutrons, and electrons to include. Once the students have worked out the answer and the correct number is in the shell, it's time to once again celebrate by doing the Electron Shuffle.
- 10) Repeat with at least three other elements chosen from the periodic table, each time reinforcing the correct answer with the Electron Shuffle.
- 11) Write the atomic symbol of each element on a sticky note or card with tape on the back and ask the students to arrange the element from largest to smallest by atomic mass. Ask the students to find other ways to arrange the elements (e.g. by # or protons, # of electrons, or by # of neutrons).
- 12) Ask student to create a bar graph of one of the chosen arrangements. Students can do so by filling in a teacher created bar graph, by creating one of their own, or by using the sticky notes or index cards to create a physical graph.
- 12) As a closing, ask students to look back at their drawing. Give them time to reflect and redraw how to represent the Helium inside the balloon.

### **ASOLs Covered in this Activity:**

#### **SCIENCE**

- 5S-SI 2** The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
- b) estimates are made and accurate measurements of length, mass, volume, and temperature are made in metric units using proper tools;;
  - g) data are collected, recorded, analyzed, and communicated using proper graphical representations and metric measurements; (see Math Extension)
  - i) inferences are made and conclusions are drawn;
- 8S-FME 2:** The student will investigate and understand that all matter is made up of atoms. Key concepts include:
- a) atoms consist of particles, includes electrons, protons, and neutrons;
  - b) atoms of a particular element are alike but are different from atoms of other elements;
  - c) elements may be represented by chemical symbols
- 8S-SI 1:** The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
- h) data are analyzed and communicated using graphical representation
  - i) models and simulations are designed and used to illustrate and explain phenomena and systems

**HSS-SI 1** The student will plan and conduct investigations in which  
c) scales, diagrams, charts, graphs, tables, imagery, models, and profiles are  
constructed and interpreted;

### **READING & WRITING**

**3E-RW 2a:** The student will use newly acquired vocabulary drawn from reading and other content areas.

**3E-CN 1g:** The student will sequence at least two steps in a procedure or ideas/incidents in an event.

**4E-RW 1c:** The student will use newly acquired vocabulary drawn from reading and other content areas.

**5E-RW 1f:** The student will demonstrate understanding of content-specific words.

**7E-CN 1e:** The student will use content words and phrases from a nonfiction text.

**8E-RW 1e:** The student will acquire and use content words and phrases.

**8E-WP 1a:** The student will write to convey ideas and information including facts, details, and other information.

**b:** The students will write about a personal experience by introducing the event or experience, at least one character, and two or more events in sequence.

**d:** The student will use content specific vocabulary when writing about a topic.

**8E-WP 3b:** The student will write to convey ideas and information including facts, details, and other information as well as graphics and multimedia as needed.

**8E-WP 5a:** The student will write an argument to support a claim with one clear reason or piece of evidence.

**HSE-WP 1b:** The student will write to convey ideas and information using clear organization and including facts, details, and other information as well as graphics and multimedia as needed.

**c:** The student will write about an event or personal experience by introducing the event or experience, at least one character, and describing multiple events in sequence.

**HSE-RW 2c:** The student will acquire and use content words and phrases.

### **Extension Idea:**

Ask student to convey through original writing, by sequencing pre-made cards, or by drawing out the steps to reading and creating a model of an atom. Students will refer to themselves in the first person, creating the story of how they used themselves and their classmates to create the Electron Shuffle. Make certain that content vocabulary words are used.

### **MATH**

**3M-PSPFA 1b:** The student will use picture or bar graphs to answer questions.

**c:** The student will insert data into a pre-constructed bar graph template.

**d:** The student will interpret data from a variety of graphs to answer questions.

**4M-NSCE 1b:** The student will compare whole numbers.

**5M-PSPFA 1a:** The student will compare two sets of data within a single data display such as a picture graph, line plot, or bar graph.

**6M-PSPFA 1a:** The student will display data on a graph or table that shows variability in the data.

**b:** The student will summarize data distributions on a graph or table.

**c:** The student will answer a question related to the collected data from an experiment, given a model of data, or from data collected by the student.

**8M-PSPFA 1b:** The student will describe how a graph represents a relationship between two quantities.

**HSM-FS 2a:** The student will indicate general trends on a graph or chart.

**HSM-FS 3a:** The student will, given data, construct a simple graph and answer questions about the data.

**3M-NSCE 3:** The student will differentiate a fractional part from a whole.

**4M-NSCE 2:** The student will represent equivalent fractions.

**6M-NSCE 3:** The student will compare the relationships between two unit fractions.

**7M-NSCE 1:** The student will add fractions with like denominators with sums less than or equal to one.

**8M-NSCE 2:** The student will subtract fractions with like denominators with minuends less than or equal to one.

**Extension Idea:**

Use the atomic symbols modeled to lead a conversation about how fractions are everywhere. Ask the students to create fractions using the Atomic Number over the Atomic Mass. These fractions can be reduced, made into equivalent fractions, added, subtracted, multiplied or divided based on individualized needs.

**8M-PSPFA 2:** The student will solve algebraic equations using simple addition and subtraction.

**HSM-EO 1:** The student will match an algebraic expression involving one operation to represent a given word expression with an illustration.

**HSM-EI 1:** The student will solve an algebraic equation using subtraction.

**Extension Idea:**

Referring to the actual models created by the class, extend this topic by creating the following algebraic word problem: # of Protons + # of Neutrons = Atomic Mass or  $P+N = \text{Mass}$ . Use the periodic table to solve how many Neutrons are in each element. This can be done by solving using paper and pencil or by using manipulatives to keep the equation in balance.

**Materials Needed:**

- basket or large container for nucleus
- balls market + for neutrons
- ball with no marking for Neutrons
- cut out – signs for students to represent electrons
- jumpropes to create the electron shell

- Periodic Table of Elements in which to refer
- Radio for music

**Instructional Setting:**

This activity requires space. Tables and chairs can be moved to the outsides of the room, or if Atomic Symbols are pre-made, would be great fun to do outside or in the school gym.

**Community Connections and/or Peer Interaction:**

- Students can work together in small groups.
- Pair with typically developing peers to do this during PE class.

**Functional Activity/Routine:**

- This activity encourages functional skills such as turn-taking, following instructions, and cleaning up afterward.
- Students in a wheelchair should be given opportunities to practice this in a variety of settings allowing for the space needed to navigate their wheelchair.

**Strategies to Collect Evidence:**

- For collection of evidence, be sure that each student records data, math work, and draws the element individually.
- Provide choice boards and/or voice output devices for students to comment and respond. An adult should be assigned to collect data on the student responses.
- Eye gaze frame with elements and other information to allow students to comment and respond. An adult will be needed to help document student responses.

**Specific Options for Differentiating this Activity:**

- Conduct the experiment on a surface that can be accessed by all students.
- Allow students to use their preferred "pencil" when writing. This may include a writing utensil, keyboard, alternative pencil, or dictating to a scribe.
- Prepare, as necessary, for each student to make choices and communicate with their preferred method. This may include using augmentative communication.