Name: Period:

Lab Partner: Date:

**Lab Three – Unit 3.2**

# Atomic Structure – A Journey into the Atom

**Introduction:**

Atoms are composed of subatomic particles, such as the protons and the neutrons, which make up the nucleus of the atom and are similar in mass, and electrons, which are found orbiting the nucleus in an electron, cloud and have a negligible mass. All atoms contain the same kinds of particles but may differ in the number of each particle. This accounts for the presence of isotopes and ions for the different elements.

This activity will allow you to use what you know about the composition of the atom, as well as isotopes and ions, to describe sixteen atoms. The atoms are contained in Ziploc bags and the subatomic particles are coded as follows.

 Protons – black beans

 Neutrons – white beans

 Electrons – popcorn

**Purpose:**

Students will collect data and relate number of subatomic particles to atomic number, mass number, electrical charge, atomic symbol, and name of element.

**Equipment:** **Materials:**

 Ziploc bags representing atoms

**Procedure:**

 Analyze each Ziploc bag (atom) and record its vital statistics in the data table provided.

**Data Analysis:**

1. List all sets of isotopes. How do you know they are isotopes?
2. List all sets of ions. How do you know they are ions?

**Conclusions:**

 A nuclear reactor generates a very large amount of energy by splitting a uranium-235 atom to produce Barium-139 and Krypton-94. How would each of these atoms be represented using the coding system used for atoms #1 - 16?

# Atomic Structure – A Journey into the Atom

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bag # | # of Protons | # of Neutrons | # of Electrons | Atomic Number | Mass Number | Electrical Charge | Chemical Symbol | Name |
| 1 |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |  |

**Lab Three – Unit 3.2**

## Atomic Structure – A Journey into the Atom

# Description

This activity will allow students to use what they know about the composition of the atom, as well as isotopes and ions, to describe sixteen atoms. The atoms are contained in Ziploc bags and the subatomic particles are coded as follows.

 Protons – black beans

 Neutrons – white beans

 Electrons – popcorn

**Time Frame:** 50 minutes (1 class period)

**Materials:** Sixteen Ziploc bags representing atoms with different combinations of beans and popcorn.

**Procedures**: See student handout. Atomic Structure – A Journey into the Atom.

**Teacher Talk**: Prepare Ziploc bags as follows

#1: 6 black beans, 6 white beans, 6 popcorn

#2: 1 black beans, 1 white beans, 1 popcorn

#3: 1 black beans, 2 white beans, 1 popcorn

#4: 6 black beans, 8 white beans, 6 popcorn

#5: 7 black beans, 7 white beans, 7 popcorn

#6: 7 black beans, 8 white beans, 7 popcorn

#7: 1 black beans, 1 white beans, 0 popcorn

#8: 7 black beans, 7 white beans, 10 popcorn

#9: 19 black beans, 21 white beans, 19 popcorn

#10: 19 black beans, 19 white beans, 19 popcorn

#11: 19 black beans, 19 white beans, 18 popcorn

#12: 8 black beans, 8 white beans, 8 popcorn

#13: 8 black beans, 8 white beans, 10 popcorn

#14: 15 black beans, 17 white beans, 15 popcorn

#15: 11 black beans, 13 white beans, 11 popcorn

#16: 11 black beans, 13 white beans, 10 popcorn

**Extensions:** Propose the following question to students.

Sometimes isotopes that are radioactive are used as medical tracers to detect disease. One of the most useful is iodine-131 which is used to detect abnormalities in the thyroid gland. The isotope can even be used to treat thyroid cancer since the radioactivity destroys cancer cells. Cancers that cannot be treated with an internalized radioisotope may utilize cobalt-60 for external radiotherapy. How would these two very useful isotopes and their non-radioactive states be represented using the coding system?