**Lesson Plan**

**Teacher: Holland Sloan**

**Subject: Chemistry**

**Lesson: Alpha, beta, and gamma rays**

**Standards:** CHEM1.PS1. 10 Compare alpha, beta, and gamma radiation in terms of mass, charge, and penetrating power. Identify examples of application of different radiation types in everyday life (such as its application in cancer treatment).

SEP: Obtain, evaluate, and communicate information

CCC: Energy and Matter

DCI: Matter and its interactions: Structure and properties of matter

**Objectives:** Student will obtain, evaluate, and communicate information in order to show the difference in alpha, beta, and gamma rays highlighting the exchange of energy and matter.

**Materials and Resources:** The following documents are required to complete this activity:

* <https://newsela.com/read/lib-convo-radiation-and-radioactivity/id/28307/>
* Anticipation guide – provided by H. Brewer
* Activity organizer – provided by H. Brewer

The students be working hands-on building models of an atom to visualize the stability of an atom. Students will need the following materials for the lab:

* food coloring (pink and yellow)
* toothpicks
* zip lock plastic bags
* marshmallows – large and mini
* pipe cleaners

**Instructional Procedure:**

This will require some work of teacher before demonstration: large marshmallows must be dyed pink and yellow. Pink marshmallows will simulate protons, and yellow marshmallows will simulate neutrons. Each group should have a minimum of 20 neutrons, 20 protons, and 20 electrons.

**Beginning:**

The teacher will begin by asking students to explain what radiation is. Most students will know that it is used to treat cancer but will not have a thorough understanding of exactly how it is used. This activity will help to further understanding of alpha, beta, and gamma rays; additional explanation will be needed for students to take this information and understand how it is used to treat cancer. The teacher will have students complete an anticipation guide. The anticipation guide is a series of true and false statements that students will use their previous knowledge to answer; of course, the anticipation guide incorporates information over radiation that students may not yet know. The teacher will have students complete this before introducing a reading passage over the difference between radiation and radioactivity. Students will revisit anticipation guide after reading and discussing the passage. The passage will be chunked into multiple parts and paired with literacy-enhancing strategies to encourage thorough student understanding.

-The first section will be read by students. Students will then complete a two-column chart/graphic organizer supplying main ideas with coordinating details from the passage. -Teacher will stop and review with students.

-Students will read section two then and complete a three-column chart/graphic organizer explaining the three types of radiation, what happens with each type, and the results caused be each of the types.

-At this point, teacher will step away from passage to lecture/provide instruction over results of alpha, beta, and gamma rays to assist students with completing the results portion of the graphic organizer.

-Students will read section three of the passage, and teacher will stop and have students summarize concepts presented in that section in their own words.

-Students will read sections four, five, and six of the passage to complete another three-column chart/graphic organizer explaining the three types, what happens, and results of radiation.

-After assignments have been completed, students will answer the four questions associated with passage to check for mastery of material.

-Teacher will revisit anticipation guide at this time and discuss possible response changes from **before** reading and instruction to **after** reading and instruction.

**Middle:**

All group bags should already be prepared, but the teacher will conduct a demonstration of the activity. Students will then work with their groups to complete the activity and a graphic organizer to show work. Students will select three elements from the elements carbon through calcium. The teacher will use boron as a demonstration to show the effects of each type of decay and how to complete the activity. Students will first create an alpha, beta, and gamma ray using the marshmallows from already given zip lock bags. First, they will create the appropriate element they have chosen, with the correct number of protons, neutrons, and electrons. Then students will take that element and show an alpha ray. In another zip lock bag, the student will remove the amount of protons, neutrons, and electrons needed and place it into the other zip lock bag; this will show the newly created element and helium atom. This will be repeated with a new element chosen by student and with gamma and beta rays. This allows students to create a model and visually see the changes the element goes through during decay. Students must record information in model on student graphic organizer.

**End/Closure:**

Students will come back together as a whole group after the activity to discuss the differences between a stable atom and a radioactive atom. Students can use desk partners or activity groups for these discussions. Teacher should be moving around the classroom listening to student discussions. Teacher will also revisit concepts presented in the original article to highlight key differences between radiation and radioactive decay.

**Grouping:**

Students will be in groups of two to three based upon heterogeneous mixtures. Students will assign roles within their group and make sure the roles are being followed. Suggested roles are as follows: facilitator, communicator, and reporter. The facilitator is responsible for collecting materials and keeping the group on task. The communicator is the only person within the group allowed to ask the teacher questions. Group communication must happen first before the teacher is asked questions. Reporter is responsible for recording data and sharing with the class/whole group and submits any final paperwork required of teacher.

**Exit Ticket:**

Ask each student to turn in this exit ticket to check for understanding. Complete the following alpha decay equation for Livermorium and the beta decay equation for Hassium. This should show that students understand what is happening to each of these elements during alpha and beta decay. These are more complex elements (higher atomic number and atomic mass), but the process is the same.