**Activity 1**

**Tell Me The U-238 Story**

**Purpose**

In this assessment activity, you will

* Tell the transformation story of uranium-238
* Complete a diagram to show the transformation of uranium-238 to lead-206
* Write nuclear equations representing some of the stages of the transformation of U-238.

**Materials**

Paper and Pencil / pen

Periodic table of elements

**Procedure**

1. With your groupmates, analyze the chart in the next page. The chart “shows” what happens to uranium-238 before it finally transforms into lead.
2. For the section assigned to your group:
	1. Indicate on the chart which nuclei the U-238 transforms into. Write the symbol in the space provided.

* 1. Write a balanced nuclear equation for each transformation in the series.
	2. Apply what you have learned about the properties of nuclear radiation to write a poem or narrative on this phase of the U-238 transformation.

**U**

**238**

**234**

**230**

**226**

**222**

**218**

**214**

**210**

**206**

**81**

**82**

**83**

**84**

**85**

**86**

**87**

**88**

**89**

**90**

**91**

**92**

ATOMIC NUMBER

MASS NUMBER

Section 1

Section 2

Section 3

Section 4

Figure 2.28-1. Nuclear Transformation chart of U-238

**Part B.**

A. Complete and balance the following equations:

1. 
2. 
3. 
4.   \_\_\_\_ + 

B. Write and then balance the following equations:

1. Lead-214 decays by beta emission
2. Bismuth-213 decays into polonium-213
3. Rubidium-77 decays into strontium-77
4. Radium-226 decays by alpha emission

**Activity Sheet 2**

*MATCHING GAME*

**DIRECTIONS:**

  The boxes at the right describe how fission proceeds. Find the right illustration for these boxes.

A U-236 nucleus with excess energy forms. This nucleus oscillates violently.

The neutron strikes the nucleus and is absorbed.

In about 10-14 seconds, Coulomb forces stretch out the nucleus.

The nucleus splits, releasing two or more neutrons

The fission fragments lose some of their kinetic energy and comes to rest, emitting gamma rays.

Fission is complete. The fission products may continue to lose energy through radioactive decay.

**Activity Sheet 3**

TUTORIAL ON ENERGY FROM FISSION

To calculate the energy involved in the reaction: , we need to compare the masses of the reactants and the products:

|  |  |  |  |
| --- | --- | --- | --- |
| (1)  | mass of the reactants 🡪 |  | = 235.0439  |
|  |  |  | = 1.0087  |
|  | Total mass of reactants | = 236.0526  |
|  |  |  |  |
| (2) | Mass of the products 🡪 |  | = 137.9050  |
|  |  |  | = 94.9  |
|  |  | 3  | = 3.0260  |
|  | Total mass of products | = 235.831  |
|  |  |  |  |

Note that the total mass of the products is less than the total mass of the reactants!

From here, we can use Einstein’s equation, **E = mc2**, to compute for the energy released in the reaction. Here, the ‘loss of mass’ indicates the release of an equivalent amount of energy. The mass defect m is:

|  |  |
| --- | --- |
| Total mass of reactants | = 236.0526  |
| Total mass of products | = 235.831  |
| m | = 0.2216   |
|  |  0.222  |

The equivalent energy **E** is computed thus :

 **E** = (0.222 ) (931 MeV/)

 = 206 MeV

Now, try the same procedure with other possible fission reactions of U-235:

(1) 

(2) 