Chp.4 – Radioactive Growth/Decay

The goal of this activity is to create a program that calculates either the growth or decay of a number of atoms over a period of time. Be sure to create a header comment with the title of this program, your name, and the date, along with a short summary in your own words about the purpose of your program. Your program should be made up of the following steps:

Part 1 – Ask the user whether they'd like to calculate radioactive growth or decay:

```
Would you like to calculate radioactive growth or decay? ▌
```

Part 2 – As long as the user did not choose "done", your program should do all of the following:

Part 3 – Ensure that the user chose either “growth”, “decay”, or “done”. If they did not choose either of those options, keep asking them to choose again until they choose one of the valid options:

```
Invalid choice! Try again
Would you like to calculate radioactive growth or decay? ▌
```

Part 4 – In the event that the user chose decay, your program should do all of the following:

Decay formula:

$$A_{decayed} = A_{initial} - \left(A_{initial} * \%_{decay}\right)$$

Note: $A_{decayed}$ stands for the number of atoms left after the initial amount has decayed for one day, $A_{initial}$ stands for the initial number of atoms before one day of decay has occurred, and $\%_{decay}$ stands for the percent rate of decay.

Part 4a – Ask the user what the percent rate of decay is. After being given the percent rate of decay(value from 0-100), convert it to a decimal number. Then ask the user what the initial number of atoms is (Note: the initial number must be an integer):

```
What is the percent rate of decay? ▌

What is the initial number of atoms? ▌
```

Part 4b – Use a loop to determine how many days it will take for the initial number of atoms to decay to less than 10 atoms. Note: Every day, the number of atoms decreases by the user given percent decay rate.

Part 4c – Round down to a whole number the total number of atoms that remain once the total number of atoms has decayed to less than 10. Then display to the user how many days it took to decay, and the number of atoms that remained:

```
The radioactive decay took ________ days.
The number atoms decayed to only about _________ atoms.
```

Part 5 – In the event that the user chose growth, your program should do all of the following:

Growth formula:

$$A_{grown} = A_{initial} + (A_{initial} * \%_{growth})$$

Note: A_{grown} stands for the new total number of atoms after the initial amount has grown for one day, $A_{initial}$ stands for the initial number of atoms before one day of growth has occurred, and $\%_{growth}$ stands for the percent rate of growth.

Part 5a – Ask the user what the percent rate of growth is(value from 0-100). After being given the percent rate of growth, convert it to a decimal number. Then ask the user what the initial number of atoms is (Note: the initial number must be an integer). Also, ask the user for how many days this collection of atoms will be growing:

```
What's the percent rate of growth? 
What is the initial number of atoms? 
How much time do you have (in days)? 
```

Part 5b – Use a loop to determine how many atoms the initial number of atoms will increase to after the user provided number of growth days. Note: Every day, the number of atoms increases by the user given percent rate of growth.

Part 5c – Now round up the new total number of atoms so that it is a whole number. Then display the number of days that the number of atoms grew, and also what the actual number of atoms became after that period of growth:

```
The radioactive growth took ______ days.
The number atoms grew to about _______ atoms.
```

Example Test Cases:

In the instance that the user initially chooses “hello” instead of growth or decay, your program should continue to ask them to choose again until they choose a valid option, such as “growth”. The user then provides “10” for the percent rate of growth, “100” for the initial number of atoms, and “5” for the number of days. Your program should display the following results:

```
Would you like to calculate radioactive growth or decay? hello
Invalid choice! Try again
Would you like to calculate radioactive growth or decay? growth
What's the percent rate of growth? 10
What is the initial number of atoms? 100
How much time do you have (in days)? 5
The radioactive growth took 5 days.
The number atoms grew to about 162 atoms.
```