CS 115 - Introduction to Programming in Python
Lab Guide 7

Lab Objectives: Classes and Objects.

a) Create a class, **`Element`**, which represents an element from the periodic table. Each Element should have the following data members and methods. Note all data members and class variables should be private (__).

Data Members:

- **`eName`**: string name of the Element (ex: Hydrogen).
- **`elementData`**: a dictionary where the keys are the property of the element (ex: Atomic Number) and the values are the value of the given property (ex: 1).

Methods:

- **`__init()__:`**
  - takes a string element name and a dictionary of element properties as parameters.
  - For each element in the dictionary, converts the value to a float value (if possible).
  - Set the `eName` and the `elementData` to the values passed as parameters.
- **`__eq__:`** Element objects are equal if their element names are equal.
- **`__lt__ :`** an Element is less than another if its atomic number is less.
- **`repr()__:`** returns a string representation of an Element object. See the sample run for details.
- **`get_property():`** takes the name of an element's property as a parameter, and returns the value for the given property if it exists, None if it doesn't.

b) Write an application, **`Lab07.py`** that does the following:

- Reads the data from the file `data.txt` into a numpy array, using `np.loadtxt`. The file is tab-delimited, and the data should be stored as string data (hint: `dtype='str'`)
- Each column in the file contains data about a property of an element, and the first row contains the names of the properties.
- ***For each element in the file (row)***, create a ***new*** dictionary where the keys are the property names from the header row (Atomic Number, Atomic Name, etc) and the values are the values for each property. Note: you should not add the Element Name (column 1) as a property to the dictionary.
- Create a new Element object for each element in the array, using the element name and the dictionary of properties.
- Add all Elements to a list.
- Sort the list of elements using the default sort method.
- Print the list of elements.
- Input the name of a discoverer, and print the Element(s) they discovered (an error if no such discoverer exists)

Sample Run:

```
| Element Name:       :  Hydrogen
| Chemical symbol     :  H
| Origin of symbol    :
| Atomic Number       :  1.00
| Atomic mass         :  1.01
| Density             :  0.084 g/l
| Melting point       :  -259.10
| Boiling point       :  -252.90
| Year of discovery   :  1766.00
| Discoverer          :  Cavendish


| Element Name:       :  Helium
| Chemical symbol     :  He
| Origin of symbol    :
| Atomic Number       :  2.00
| Atomic mass         :  4.00
| Density             :  0.17 g/l
| Melting point       :  -272.20
| Boiling point       :  -268.90
| Year of discovery   :  1 895.00
| Discoverer          :  Ramsay and Cleve


| Element Name:       :  Lithium
| Chemical symbol     :  Li
| Origin of symbol    :
| Atomic Number       :  3.00
| Atomic mass         :  6.94
| Density             :  0.53
| Melting point       :  180.50
| Boiling point       :  1317.00
| Year of discovery   :  1817.00
| Discoverer          :  Arfvedson


| Element Name:       :  Beryllium
| Chemical symbol     :  Be
| Origin of symbol    :
| Atomic Number       :  4.00
| Atomic mass         :  9.01
| Density             :  1.85
| Melting point       :  1278.00
| Boiling point       :  2970.00
| Year of discovery   :  1797.00
| Discoverer          :  Vauquelin


| Element Name:       :  Boron
| Chemical symbol     :  B
```

```
| Origin of symbol    :
| Atomic Number       :  5.00
| Atomic mass         :  10.81
| Density             :  2.46
| Melting point       :  2300.00
| Boiling point       :  2550.00
| Year of discovery   :  1808.00
| Discoverer          :  Davy and Gay-Lussac

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| Element Name:       :  Ununoctium
| Chemical symbol     :  Uuo
| Origin of symbol    :
| Atomic Number       :  118.00
| Atomic mass         :
| Density             :
| Melting point       :
| Boiling point       :
| Year of discovery   :
| Discoverer          :

Enter name of discoverer to search: Davy
Davy discovered:
| Element Name:       :  Sodium
| Chemical symbol     :  Na
| Origin of symbol    :  Latin Natrium
| Atomic Number       :  11.00
| Atomic mass         :  22.99
| Density             :  0.97
| Melting point       :  97.80
| Boiling point       :  892.00
| Year of discovery   :  1807.00
| Discoverer          :  Davy

Davy discovered:
| Element Name:       :  Potassium
| Chemical symbol     :  K
| Origin of symbol    :  German Kalium
| Atomic Number       :  19.00
| Atomic mass         :  39.10
| Density             :  0.86
| Melting point       :  63.70
| Boiling point       :  774.00
| Year of discovery   :  1807.00
| Discoverer          :  Davy

Davy discovered:
| Element Name:       :  Calcium
| Chemical symbol     :  Ca
| Origin of symbol    :
```

```
| Atomic Number       :  20.00
| Atomic mass         :  40.08
| Density             :  1.54
| Melting point       :  839.00
| Boiling point       :  1487.00
| Year of discovery   :  1808.00
| Discoverer          :  Davy

Davy discovered:
| Element Name:       :  Barium
| Chemical symbol     :  Ba
| Origin of symbol    :
| Atomic Number       :  56.00
| Atomic mass         :  137.33
| Density             :  3.65
| Melting point       :  725.00
| Boiling point       :  1640.00
| Year of discovery   :  1808.00
| Discoverer          :  Davy

Enter name of discoverer to search: Joe Smith
No such discoverer...
```