

EABC Summer 2023

Python 4: Python File I/O

Recall the guidelines for team activities:

1. You should work as a team; **all** team members will be held responsible for all material. You may work together and contribute to one program and submit similar codes as long as the contributors to the development of the solution are documented.
2. Each team is responsible for submitting their own team assignment to Gradescope.

Assignment Background:

Computers can process large amounts of information which they access from files stored on external devices or user input from keyboard. Large databases of information often contain thousands or millions of records. A computer can access the file on a device and then search through it to locate specific information or alter part of the file with new information. This process requires accessing external hardware which is controlled by the operating system. Therefore, Python has functions that can request that the operating system access information from a device and store information to that device. The following tasks explore various methods for accessing information stored in files or from keyboard, processing it in some way, then outputting it to an external device (computer screen, hard drive etc).

Task 1 (of 2):

Learning Objectives:

Practice File I/O and looping in Python.

Task Instructions:

Part A:

Please answer the following questions:

- How would you read in a string?
- How would you read in an integer and a float? How is this different from a string?
- How could you read in a large list of data very quickly?

Include these in your PDF: *Py4_Team_teamnumber.pdf*

Part B:

In this task, you will create a Python script in which you will practice reading files in Python and writing them to a new output file.

Construct a text file called *Py4_Task1_input.txt* that has the following lines:

```
4
Independence Day 04 July 2021
Halloween 31 October 2021
Thanksgiving 22 November 2021
```

Christmas 25 December 2021

The first line of the file represents the number of lines in the data file.

Write a loop that reads in each additional line (one line at a time) and stores this line first as a string, then converts it to a list, before moving on to reading the next line. Hint: the string for the second line should be `Independence Day 04 July 2021` whereas the list for the second line should be `['Independence', 'Day', '04', 'July', '2021']`.

Create a second looping structure that outputs each line as a string, then as a list, before moving on to the next line. Name your output file `Py4_Task1_output.txt`.

Name your main program `Py4_Task1_teamnumber.py`. Be sure to add the flowchart associated with this task in the previously created pdf file.

Deliverables:

`Py4_Task1_teamnumber.py`

`Py4_Task1_output.txt`

`Py4_Team_teamnumber.pdf`

Task2 (of 2):

Learning Objectives

Understand how to read different data types from a file.

Task Instructions

In many biological systems it is difficult to simply measure the concentration of any one substance by itself. To accomplish such measurements methods of tagging with enzymes that produce color when they catalyze a reaction have been developed. Beer's Law is used to relate the absorbance of a sample to the concentration of the products produced by these enzymes. So, almost any protein concentration can be found by simply taking absorbance readings if it has first been tagged with an enzyme.

Beer's Law simply states that the rate of photon absorbance, A , is directly proportional to the concentration of the absorbers, c . The proportionality constant is the product of the path length the light must travel, b , and the molar extinction coefficient of the substance, ϵ .

Beer's law:

$$A = \epsilon cb$$

Write a Python script that will open a file containing the name of the substance that was tagged, the path length (b), the molar extinction coefficient of the absorbers (ϵ), and an absorbency (A), and then find the

concentration for each absorbency value. The input file containing the raw data is named `Py4_Task2_input.txt` and is located on Brightspace under the Python 4 module.

Within your main program, create a function named `Absorb_Calc` that takes relevant inputs to calculate the concentration for each value of absorbency. Make sure your program can calculate concentrations for any number of absorbency values given. Your program should then output the name of the substance and a list of the concentrations associated with that substance as follows to the screen. (You do not need to worry about units for this specific task, and you do not need to output results to a text file.).

Example output:

```
The name of the substance is Glucose Oxidase
For 0.9863 absorbency value, the concentration is 0.0000508
For 0.6868 absorbency value, the concentration is 0.0000354
For 0.4462 absorbency value, the concentration is 0.0000230
```

Name your main program: `Py4_Task4_teamnumber.py` Be sure to add the flowchart associated with this task in the previously created pdf file.

Hint: Look up `strip()` , `split()` functions

Deliverables:

`Py4_Team_teamnumber.pdf`

`Py4_Task2_teamnumber.py`