# Progamming 9 Homework: C++ in CLION

## P9H1: Calculate Spherical Volumes

Write a C++ program to calculate the volume of a sphere given a series of radii.

### Pseudocode:

1. PROGRAM SphericalVolumes:
2. Ask user for largest radius
3. FOR each radius from 1 to largest radius
4.    Calculate spherical volume
5.    print radius and spherical volume
6. ENDFOR
7. END

### Example Output:

```
This program will calculate the volume of a series of sphe
from a radius of 1 to the given largest radius in unit int

Enter largest Radius: 3
Radius =    1 > Volume =       4.19
Radius =    2 > Volume =      33.49
Radius =    3 > Volume =     113.04
```

**Tips/Help:**

- Do not forget to comment your code.
- Equation for the calculating spherical volume:
  - $V = \frac{4}{3}\pi r^3$
- Yes, I do expect you match the output exactly.

## Submit the following:

- Your console output (Similar to example image above)
  - You should be outputting to a minimum radius of at least 12
- You C++ source code

# P9H2: Debugging a Division Calculator

Identify each error & fix in the following C++ program.

```
1. #include <iosteam>
2. int main (){
3.    int X, Y;
```

```
4.   cout << "Enter X:  "; cin >> X;
5.   cout << "Enter Y:  "; cin >> Y;
6.   Z = X/Y;
7.   cout<< "X/Y=" << Z;
8.   cout<< "End of program." endl;
```

A properly formatted console output for this program would be:

```
Enter X:789.876
Enter Y:-2.364
   X/Y = -334.13
End of program.
```

## Requirements

- Re-enter the code in your own application and make the program run correctly.
- Include a header block for submission info.
- Note the errors through comments.
  - For instance:

    ```
    #include <iostream> // Corrected a spelling error.
    // iostream was misspelled as iosteam
    ```

- Use floating point numbers as your test case

## Help

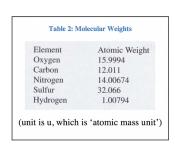Not all errors will stop the program from running...

## Submission

- Your console output
  - Use any floating point values for your X and Y inputs.
- · Your updated C++ source code

# P9H3: Amino Acid Molecular Weight Calculator

As you may have learned in Chemistry, the amino acids in proteins are composed of atoms of oxygen (O), carbon (C), nitrogen (N), sulfur (S) and hydrogen (H), as shown in the Table 1.

## Table 1: Amino Acid Molecules

| Amino Acid | O | C | N | S | H |
|---|---|---|---|---|---|
| Alanine | 2 | 3 | 1 | 0 | 7 |
| Arginine | 2 | 6 | 4 | 0 | 15 |
| Asparagine | 3 | 4 | 2 | 0 | 8 |
| Aspartic | 4 | 4 | 1 | 0 | 6 |
| Cysteine | 2 | 3 | 1 | 1 | 7 |
| Glutamic | 4 | 5 | 1 | 0 | 8 |
| Glutamine | 3 | 5 | 2 | 0 | 10 |
| Glycine | 2 | 2 | 1 | 0 | 5 |
| Histidine | 2 | 6 | 3 | 0 | 10 |
| Isoleucine | 2 | 6 | 1 | 0 | 13 |
| Leucine | 2 | 6 | 1 | 0 | 13 |
| Lysine | 2 | 6 | 2 | 0 | 15 |
| Methionine | 2 | 5 | 1 | 1 | 11 |
| Phenylanlanine | 2 | 9 | 1 | 0 | 11 |
| Proline | 2 | 5 | 1 | 0 | 10 |
| Serine | 3 | 3 | 1 | 0 | 7 |
| Threonine | 3 | 4 | 1 | 0 | 9 |
| Tryptophan | 2 | 11 | 2 | 0 | 11 |
| Tyrosine | 3 | 9 | 1 | 0 | 11 |
| Valine | 2 | 5 | 1 | 0 | 11 |

The molecular weights of an atom of the individual elements are as follows in Table 2.

### Table 2: Molecular Weights

| Element | Atomic Weight |
|---|---|
| Oxygen | 15.9994 |
| Carbon | 12.011 |
| Nitrogen | 14.00674 |
| Sulfur | 32.066 |
| Hydrogen | 1.00794 |

(unit is u, which is 'atomic mass unit')

The molecular weight of each acid can be computed by multiplying the number of atoms of each substance times the weight of each atom.

Example: Alanine

Alanine contains:

2 Oxygen, 3 Carbon, 1 Nitrogen, 0 Sulfur, 7 Hydrogen

The weight of a molecule of Alanine is:

2 * 15.9994 + 3 * 12.011 + 1 * 14.00674 + 0 * 32.066 + 7 * 1.00794 = 89.094 u.

The average atomic weight of Alanine is 89.094/(2+3+1+0+7) = 6.853 u.

# Requirements

Write a C++ program that asks the user (via the keyboard) to enter the number of atoms of each of the elements for an amino acid. The program should then compute the molecular weight for this amino acid and the average weight per atom and print out these values.

- use data type double
- The printout values should be in fixed format, using 3 decimal precision.
- The program should ask the user if they want to calculate the weights for another amino acid and exit when the user finally says "No" is some form.
  - Use a do while loop to achieve this
- Comment your code
  - Use your pseudocode to create your initial comments to scaffold your code

You should then use the program to compute the molecular weight and average weight per atom for the following acids:

1. Cysteine
2. Glycine
3. Methionine

Example output (Without program introduction or loop):

```
Enter # of atoms of Oxygen:   2
Enter # of atoms of Carbon:   3
Enter # of atoms of Nitrogen: 1
Enter # of atoms of Sulfur:   0
Enter # of atoms of Hydrogen: 7
The total molecular weight is: 89.094 u
The average atomic weight is:   6.853 u
```

## Notes

If you have a situation were the console output has unexplained newlines in it, this is a buffering issue in CLION. The buffer between your running program and the console window will eventually fill up. When it maxes out, it clears and forces a newline. You can either go into CLION preferences and increase the buffer size or you can include an "endl" to force a new line and that buffer to clear. If neither solutions worked and your output still has these breaks, that's fine. This is a known issue and acknowledge that it exists and you tried the provided solutions somewhere in the comments of your code.

## Extra Credit

For Part 3, the program should also ask for the name of the acid and use it in its output of the molecular weight and average atomic weight.
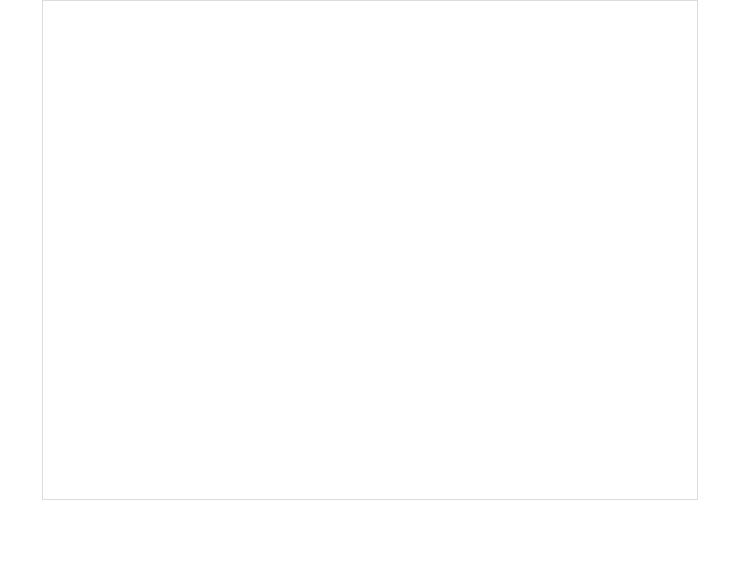
Example Output:

```
Enter the name of the acid: Alanine
Enter # of atoms of Oxygen:   2
Enter # of atoms of Carbon:   3
Enter # of atoms of Nitrogen: 1
Enter # of atoms of Sulfur:   0
Enter # of atoms of Hydrogen: 7
The total molecular weight of Alanine is: 89.094 u
The average atomic weight of Alanine is:  6.853 u
```

## Submissions

- Pseudo Code/Flowchart – Write this first.
  - No assistance without seeing pseudo code attempt first
- Your console output
  - Show outputs for Cysteine, Glycine, and Methionine
  - Include in one pdf or incorporated into your C++ code pdf.
- Your C++ source code

The following survey is not required. It provides feedback that informs the updating of assignments and development of new assignments for future semesters. The feedback is very useful so yours is appreciated. It will not be checked until after the completion of the current semester.

# Rubric

## P9H1: Calculate Spherical Volumes

20% Total

### Code

- 2.5% - Runs without errors
- 2.5% - Appropriate Commands
- 5% - Commented throughout and cleanly
- 5% - Performs as required

### Console Output

- 5% - Output meets the requirements

# P9H2: Debugging a Division Calculator

30% Total

## Debugging

- 10% - All errors found
- 10% - Communicated through comments

## Console Output

- 5% - Output meets the requirements

## Code

- 5% - Performs as required


# P9H3: Amino Acid Molecular Weight Calculator

50% Total

## Pseudo-Code

- 10% - Logical approach to issue
- 10% - Well written/Communicated

## Console Output

- 5% - Shows intended functionality

## Code

- 5% - Performs as required
- 10% - Appropriate Commands
- 10% - Commented throughout and cleanly