# Lab 3

Stat 427

Fall 2020

## Instructions

Complete all questions. To prepare for the randomly collected lab, follow the instructions on the class website to prepare the work for submission. These submission rules will apply to all labs throughout the semester.

### R Functions

(1) Use the molar mass function from lecture to calculate the molar masses of the following compunds. You will have to do some research to find the atomic weights of the compounds listed here.

(a) Carbon dioxide
(b) Methane
(c) Glucose (not the same as sucrose as done in lecture)
(d) Sulphur Dioxide
(e) Sodium Nitrate
(f) table salt
(g) Iron oxide
(h) Uranium hexaflouride

(2) The percentage composition of a chemical compound is the percentage of total mass contributed by each element in the compound, referring to the given equation below. The total mass of an element in a compound is the molar mass of the element multiplied by the number of atoms of that element in the compound. Write an `R` function to calculate the percentage composition for any element in any compound, given appropriate inputs. Consider what the arguments need and what the function's output should look like.

$$\%\ composition = \frac{Total\ mass\ of\ element\ in\ compound}{Molar\ mass\ of\ compound} \times 100$$

(3) Create functions to calculate areas, surface areas, and volumes of shapes (yay geometry!) for the given shapes; I will also provide a table of the varying geometric formulas. Every formula that is there in the table below requires an `R` function. A bonus is that `R` has a function for the number $\pi$.

| Areas | Rectangle | Parallel-ogram | Trapezoid | Triangle | Circle | Ellipse |
|---|---|---|---|---|---|---|
| formula | $ab$ | $bh$ | $\frac{1}{2}h(b_1+b_2)$ | $\frac{1}{2}bh$ | $\pi r^2$ | $\pi r_1 r_2$ |
| Surface Areas | Rectangular Prism | Sphere | Cylinder | Cone | Pyramid | Ellipsoid |
| formula | $2ab+2ac+2bc$ | $4\pi r^2$ | $2\pi r(r+h)$ | $\pi r(\sqrt{r^2+h^2}+r$ | $b(2\sqrt{h^2+(b/2)^2}+b$ | $Nope$ |
| Volumes | Rectangular Prism | Sphere | Cylinder | Cone | Pyramid | Ellipsoid |
| formula | $abc$ | $4\pi r^3/3$ | $\pi r^2 h$ | $\pi r^2 h/3$ | $b^2 h/3$ | $4\pi r_1 r_2 r_3/3$ |

Defining terms:

Rectangle side lengths: $a, b$
Parallellogram: base $b$, height $h$
Trapezopid: long base $b_1$, short base $b_2$, height $h$
Triangle: base $b$, height $h$
Circle: radius $r$
Ellipse: long radius $r_1$, short radius $r_2$
Rectangular prism: sides $a, b, c$
Sphere: radius $r$
Cylinder: base radius $r$, height $h$
Cone: base radius $r$, height $h$
Pyramid: base side $b$, height $h$
Ellipsoid: long radius $r_1$, first short radius $r_2$, second short radius $r_3$