

# Take Home Exam 0I: Surface to Volume Ratio

**Assigned: 08/22/2022**

Due (as pdf by email) 08/24/2022 (two days)

- you will receive a simple letter grade for your report

- You may submit your answers in one of two ways:

- 1) For typed answers: as a .docx file (as is) or converted into a pdf file. (DO NOT SEND GOOGLE DOC)

For handwritten answers: Please scan as images, and group together into one pdf file. Or you may hand them manually to my office (ECME-212)

## HW 01.1

In this problem you are asked to calculate the (approximate) ratio of the number of molecules of water residing on the surface, versus within the bulk for a spherical droplet of water with a radius of 10 nm.

Hints:

- Calculate the effective volume of one water molecule (it would be equal to the volume of one mole of water - equal to the molecular weight divided by the density of water - divided by the Avogadro's number.

- Let us call the volume per molecule calculated above as  $\Omega$  (it will have units of  $\text{m}^3$  or  $\text{nm}^3$ )

- From dimensional analysis the footprint of one molecule will be  $\Omega^{2/3}$ .

Now from the surface to volume ratio you will be able to calculate the ratio as requested.