Length scales in Nature

1 mm

Grain of sugar, small insects, etc

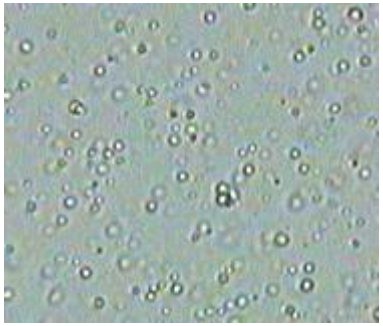
1 km

Brooklyn bridge

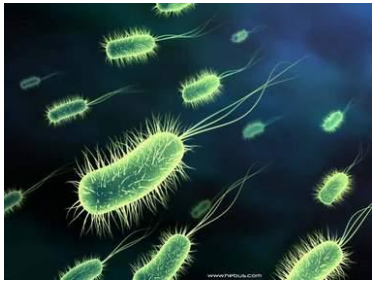
10^{-3} m 1 m 10^{3} m

1 micron (1μm)

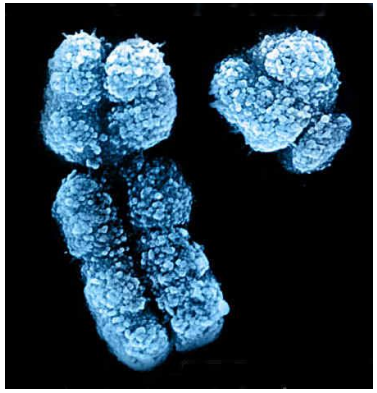
Particles in smoke, milk, etc
(1-20 μm)



Bacteria
(1-10 μm)



Human Chromosome
(2 -10 μm)



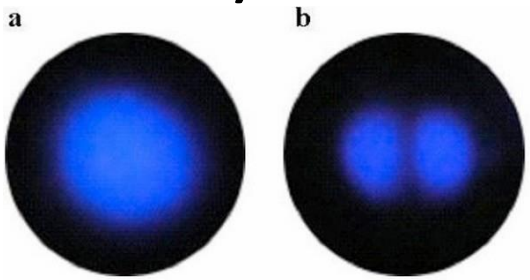
1000 km

10^{-6} 10^{-3} 1 m 10^{3} 10^{6}

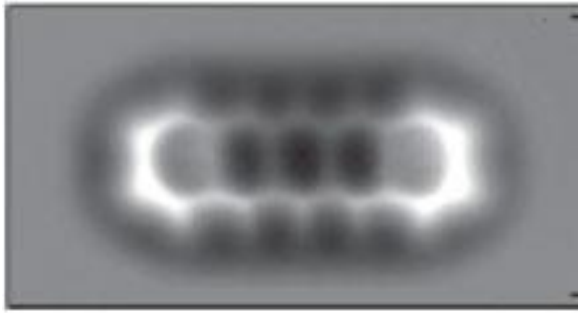
1 nanometer = 10 Angstrom
(1 nm =10 Å)

1,000,000 km
(3 light seconds)

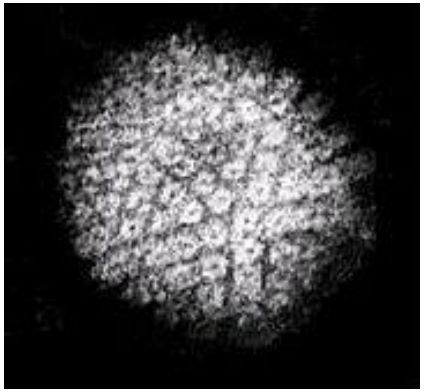
Atom (1 Å)

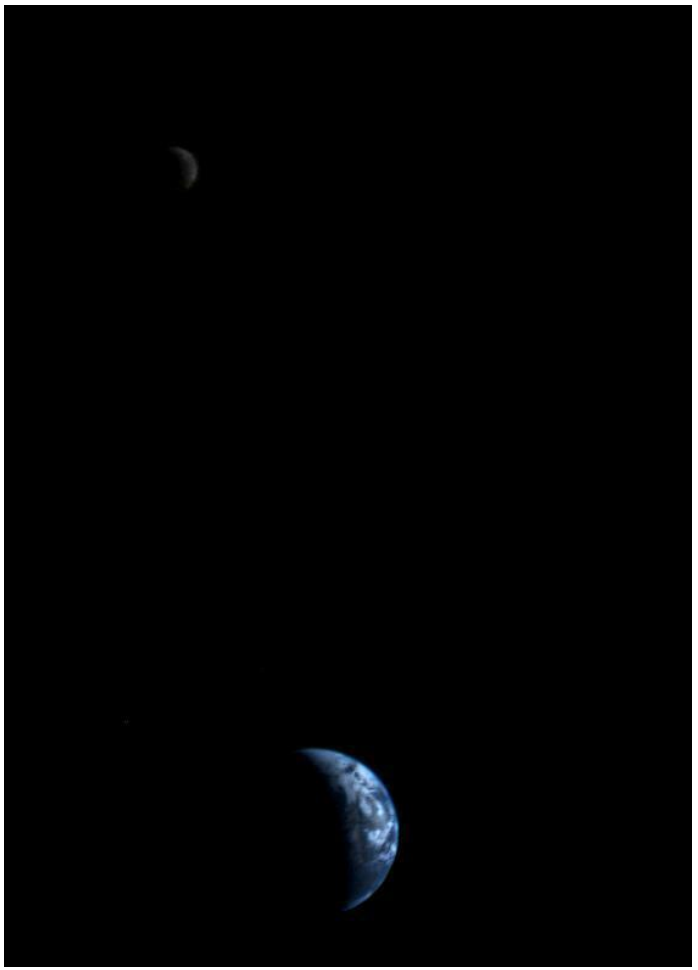


Molecule
(1nm)



Virus (>10 nm)





10^{-9} 10^{-6} 10^{-3} 1 m 10^{3} 10^{6} 10^{9}

Homework 1

Problem 0.
Watch the classic documentary called “Powers of Ten”
https://www.youtube.com/watch?v=0fKBhvDjuy0 (you can also easily google it)
Please go through length scales of various objects.
In addition to the classroom presentation, you might want to use this website:
http://micro.magnet.fsu.edu/primer/java/scienceopticsu/powersof10/

Problem 1.

Estimate the number of atom in a grain of salt. Assume the grain to be a cube 1x1x1 mm, and each atom to be a cubic brick.

Problem 2.

Estimate the number of cells in your body, if a typical human cell is about 10 micron in size. Hint: if you know your weight, you can easily find your volume: density of human body is close to that of water, 1000 kg/m^3.