

Length scales in Nature

1 mm



Grain of sugar, small insects, etc

1 km



Brooklyn bridge

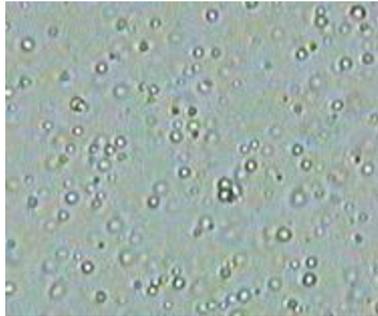
10^{-3} m

1 m

10^3 m

1 micron (1 μ m)

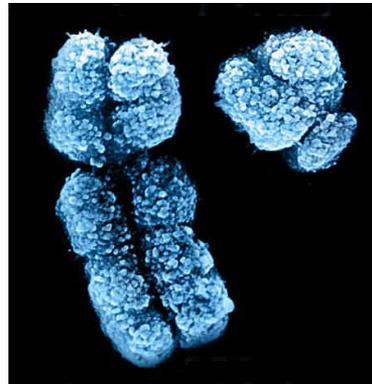
Particles in smoke, milk, etc
(1-20 μ m)



Bacteria
(1-10 μ m)



Human Chromosome
(2 - 10 μ m)



1000 km



10⁻⁶

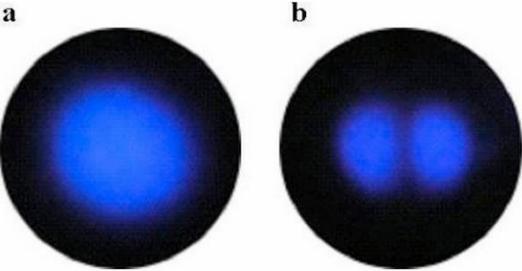
10⁻³

1 m

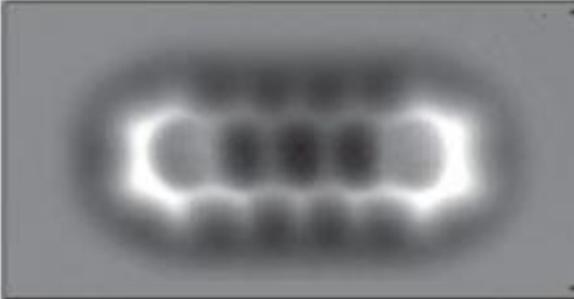
10³

10⁶

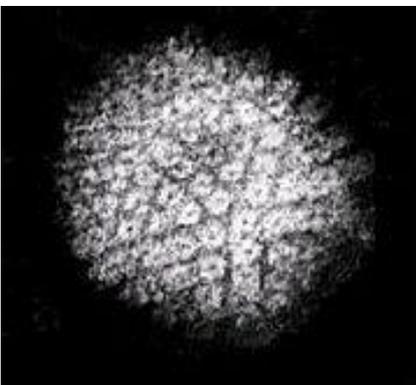
**1 nanometer = 10 Angstrom
(1 nm = 10 Å)**



Atom (1 Å)

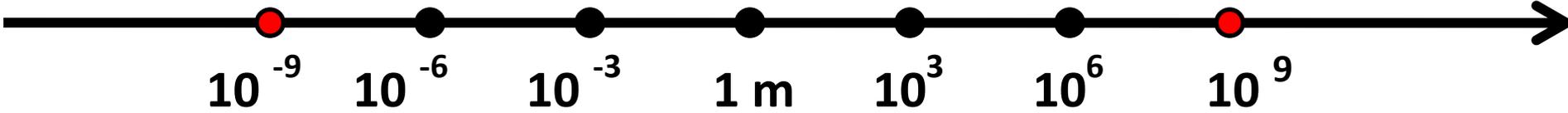


**Molecule
(1nm)**



Virus (>10 nm)

**1,000,000 km
(3 light seconds)**



Homework 1

Problem 0.

Watch the video about the Scales of Universe:

<https://www.youtube.com/watch?v=44cv416bKP4&t=575s>

This is a modern remake of a classical documentary called “Powers of Ten” (you can google and watch that one as well or instead). 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.

Radius of observable Universe is about 50 billion light years. Use scientific notations to express this in meters. Note that light year is the distance travelled by light in 1 year, and speed of light is 300,000 km /s. Get the approximate number, do not need to be exact.