

Length scales in Nature

1 mm



Grain of sugar, small insects, etc

1 km



Brooklyn bridge

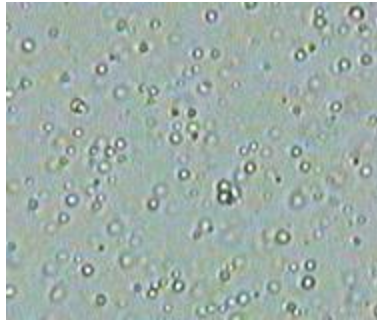
10^{-3} m

1 m

10^3 m

1 micron (1 μ m)

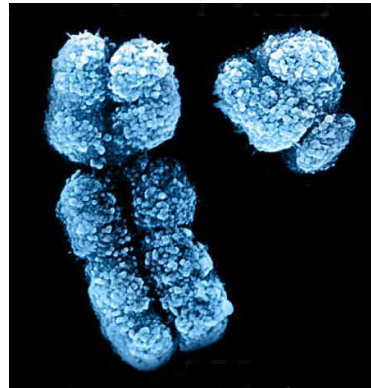
Particles in smoke, milk, etc
(1-20 μ m)



Bacteria
(1-10 μ m)



Human Chromosome
(2 - 10 μ m)



1000 km



10⁻⁶

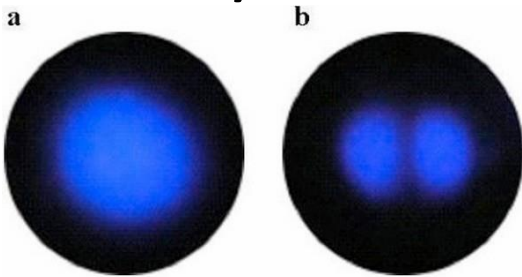
10⁻³

1 m

10³

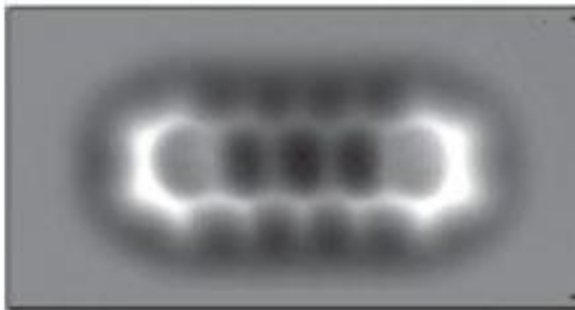
10⁶

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

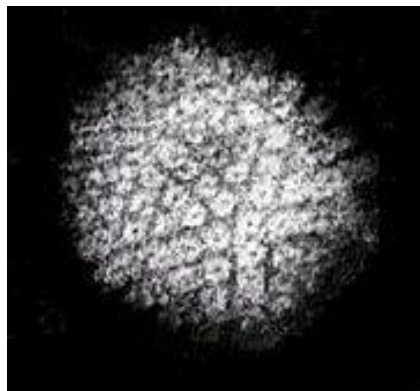


Atom (1 Å)

**Molecule
(1nm)**



Virus (>10 nm)



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



10^{-9}

10^{-6}

10^{-3}

1 m

10^3

10^6

10^9

Homework

Problem 1.

Our Universe is about 13 billion years old, and this limits the distance at which things can be observed: a faraway object can only be seen if the light from it could travel to us over the age of the Universe. This distance, known as the Radius of observable Universe, is about 50 billion light years (it is not 13 bln light years, due to effects of Einstein's theory of relativity).

Express the Radius of observable Universe in meters. Note that light year is the distance travelled by light in 1 year, and speed of light is 300,000 km /s. Give the approximate answer in scientific notations, you do not need to be exact.

Problem 2.

Estimate the number of cells in your body, if a typical human cell is about 10 micron in size. Hint: you can evaluate your body's volume if you know your mass.