

To the Microscopic World

微小な世界へ

■Purpose of Exhibition

This visual exhibition is an invitation to the world of atoms and molecules. Different magnification still images of microscopic worlds are displayed when you handle the slide bar on the screen. Let's see the microscopic world, starting from one side from one meter long and changing size by one tenth each time.



■Additional Knowledge

Table(1)

1m	1m	human being
100mm	$10^{(-1)} \text{ m}$	apple
10mm	$10^{(-2)} \text{ m}$	fly
1mm	$10^{(-3)} \text{ m}$	flea
100 μm	$10^{(-4)} \text{ m}$	hairbreadth
10 μm	$10^{(-5)} \text{ m}$	red blood cell
1 μm	$10^{(-6)} \text{ m}$	bacterium

Table(2)

100nm	$10^{(-7)} \text{ m}$	virus
10nm	$10^{(-8)} \text{ m}$	polymer
1nm	$10^{(-9)} \text{ m}$	molecule
100 μm	$10^{(-10)} \text{ m}$	atom
10 μm	$10^{(-11)} \text{ m}$	
1 μm	$10^{(-12)} \text{ m}$	
100fm	$10^{(-13)} \text{ m}$	
10fm	$10^{(-14)} \text{ m}$	
1fm	$10^{(-15)} \text{ m}$	nucleus

[What is 10^{-9}]*Note

In the image, when coming around 10^{-9} m you can find atoms and molecules.

What is this 10^{-9} ? It is called "10 to the minus ninth power" and means one billionth.

Let's think of nine digits "0" behind the denominator "1". It is "0.000000001". We use " 10^{-9} " because it is too long to write a decimal point. It is a scientific word and might be unfamiliar to you. Hundredth ($1/100$) is written like " 10^{-2} " (10 to the power of minus 2). If there is no "-" (minus sign inside parentheses) such as " 10^9 ", it means a billion (1,000,000,000).

["Nano"]

"Nano (n)" is the SI (International System of Units) prefix meaning billionth. For example, one nanometer is one billionth of a meter.

1nm (nano meter) = 0.000000001 m = " 10^{-9} m " The unit of nanometer is useful when you think of the world of atoms and molecules. Most molecules range in size from 0.1nm to 10 nm, however, there are some molecules whose size is over 100 nm, like protein molecules. We often hear the word "nano" such as in "Nanotechnology" and "Carbon nanotube". Handling and controlling the nanometer-sized atom and molecule freely enable us to create new characteristics and phenomenal substances.

This technology is "nanotechnology".

A carbon nanotube is a long and thin cylindrical molecule which consists of only carbon.

The diameter is from 0.5 nm to 100 nm and the length is over 10 micron (10^{-5} m). Some of them are over 1mm. The characteristic of carbon nanotube is to be elongated and strong. There are two types, "conductor" and "semiconductor" according to the difference of structure. It is considered the ultimate conductor.

Note: 10^{-9} means 10 to the minus ninth power.

Article by Keiko Ishida, Curator