Does Size Matter?

Comparative sizes in biology

Microbes

Microbes are so small that most can only be seen using a microscope or a hand lens. The smallest, viruses, are not considered living organisms as they consist only of a protein coat surrounding genetic material (RNA or DNA) and can only multiply inside a host cell. For that reason, it is difficult to imagine their sizes compared with other biological organisms, even when they themselves are very small.

Knowing the size of a virus is important, particularly if it causes disease and can spread through the air in droplets of fluid breathed out. The virus causing Covid-19 has a diameter around 95 nm (nanometres) and the droplets are 5-10 µm (micrometres) - see Scientific Measurements on page 2 for more information on these sizes. To stop inhaling this virus, a face mask must be able to filter out droplets/viruses as small as these dimensions. Also, if someone inhales such contaminated respiratory droplets, s/he can be exposed to hundreds or thousands of virus particles which increase the probability of infection.

Whereas most bacteria are around 2 micrometres (0.0002 cm) in length, a recent discovery has been made of one which is thousands of times bigger - 1 cm long. *Thiomargarita magnifica* lives in salt water attached to fallen leaves and branches and has a more complex internal structure than other bacteria.

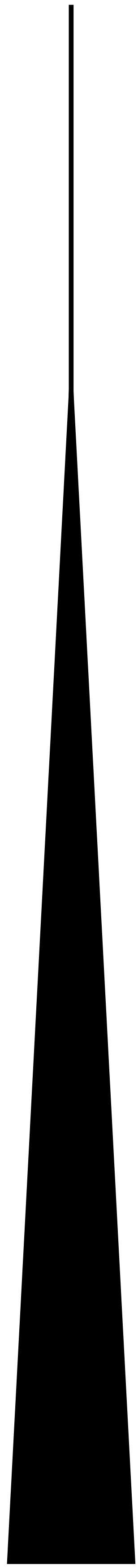
The smallest structures are RNA viruses

Name	**Genetic material**	**Size**
Rhino virus, **polio** virus	single-stranded RNA	0.03 µm
Influenza virus	single-stranded RNA	0.10 µm
Smallpox virus	double-stranded DNA	0.30 µm
Staphylococcus bacterium (on skin and boils)	double-stranded DNA	1.00 µm
Lactobaccilus bacterium in milk, gut, mouth (probiotic)	DNA	2.00 µm
Escherichia coli bacterium (*E. coli)* (in intestines)	DNA	2.00 µm
Human red blood cell (diameter)	DNA (when immature)	8.00 µm
Saccharomyces cerevisiae Yeast cell	DNA	10.00 µm
Human skin cell	DNA	30.00 µm
Human sperm cell	DNA	60.00 µm
Human hair (diameter)	DNA	80.00 µm
Pollen grain	DNA	90.00 µm
Human egg cell	DNA	130.00 µm
Paramecium (Protista)	DNA	250.00 µm
Amoeba proteus (Protista)	DNA	0.05 mm
Frog egg cell	DNA	1.00 mm
Thiomargarita magnifica bacterium	DNA	1.00 cm

E: microbe@misac.org.uk. W: *www.misac.org.uk.*

Scientific Measurements

1. 1000 nanometres (nm) = 1 micrometre (**µm**)
2. 1000 micrometres (µm) = 1 millimetre (**mm**)
3. 1000 millimetres (mm) = 1 metre (**m**)



nm = nanometre (nano means dwarf)

10^{-9}
nm = 1 billionth of a metre
or 1/1,000,000,000 of a metre
or 0.000 000 001 of a metre

1000 nanometres in a micrometre
1000 000 nanometres in a millimetre
1000 000 000 nanometres in a metre (9 zeros; 10^{-9})

µm = micrometre (micrometre means small)

10^{-6}
µm =1 millionth of a metre
or 1/1,000,000 of a metre
or 0.000 001 of a metre

1000 micrometres in a millimetre
1000 000 micrometres in a metre (6 zeros; 10^{-6})

mm = millimetre (milli means thousand)

10^{-3}
mm = 1 thousandth of a metre
or 1/1,000 metre
or 0.001 of a metre

1000 millimetres in a metre (3 zeros; 10^{-3})

m = metre

m