A Scale Model of Aerosol Sizes

Table of particle sizes

Type	Size
Atmospheric aerosol	0.015 microns
Volcanic aerosol	0.5 microns
Gasolene engine ash	20 nanometers
Diesel ash (small)	50 nanometers
Diesel ash (large)	0.4 microns
Smallpox virus	300 nanometers
E Coli bacterium	2.0 microns
Common cold virus	30 nanometers
Smog (small)	8 nanometers
Smog (large)	200 nanometers

An aerosol, or 'aero-solution', is a microscopic particle made from numerous atoms and molecules stuck together. They are usually produced from chemical reactions, and the burning of organic materials like wood and hydrocarbon fuels.

The table to the left shows some common aerosol sizes along with the sizes of other objects you may know about.

Problem 1 – if 1 micron=1000 nanometers, order the particles by increasing size.

Problem 2 - Create a scaled model showing the relative sizes of each type of particle so that 1 nanometer = 1 millimeter in your model.

Problem 3 – A red blood cell has a diameter of 10 microns. How many volcanic aerosol particles can you place side-by-side to span this diameter?

Problem 4 – How many atmospheric aerosol particles would span the width of an e. coli bacterium?

Problem 5 – Suppose that an aerosol particle were shaped like a cube. How many atmospheric aerosol particles could you fit inside the volume of a single large particle of smog?

Problem 1 – if 1 micron=1000 nanometers, order the particles by increasing size.

Type	Size (nanometers)	Scaled Size
Smog (small)	8	8 mm
Atmospheric aerosol	15	15 mm
Gasolene engine ash	20	20 mm
Common cold virus	30	30 mm
Diesel ash (small)	50	50 mm
Smog (large)	200	20 cm
Smallpox virus	300	30 cm
Diesel ash (large)	400	40 cm
Volcanic aerosol	500	50 cm
E Coli bacterium	2000	2 meters

Problem 2 - Create a scaled model showing the relative sizes of each type of particle so that 1 nanometer = 1 millimeter in your model. Answer: See table above. Students can draw circles for the objects less than 1 meter in diameter.

Problem 3 – A red blood cell has a diameter of 10 microns. How many volcanic aerosol particles can you place side-by-side to span this diameter?

Answer: 10 microns / 0.5 microns = **20 volcanic aerosol particles**.

Problem 4 – How many atmospheric aerosol particles would span the width of an e. coli bacterium?

Answer: 2000 nanometers / 15 nanometers = **133 aerosol particles**.

Problem 5 – Suppose that an aerosol particle were shaped like a cube. How many atmospheric aerosol particles could you fit inside the volume of a single large particle of smog?

Answer: (Size of smog particle / size of aerosol)^3 = (200/15)^3 = **2370 particles**!