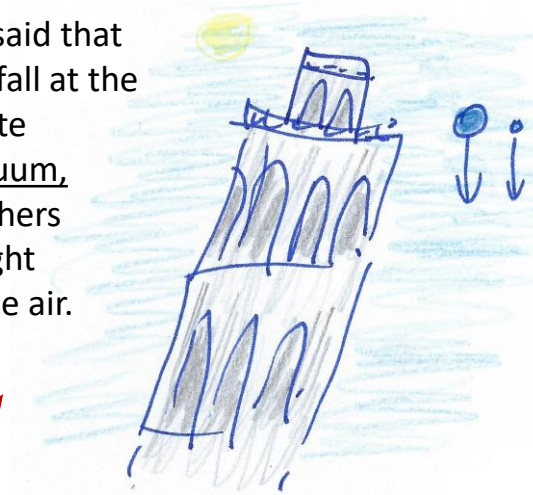
Answering Questions about COVID-19 Physics

1

Galileo said that objects fall at the same rate <u>in a vacuum,</u> but feathers get caught up by the air.

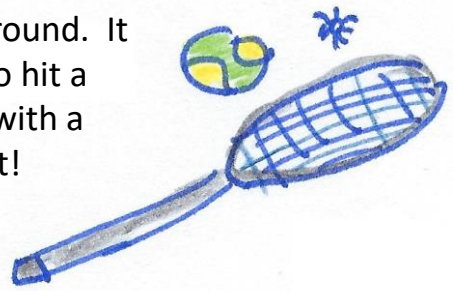


2

Big droplets are like projectiles, and are not affected (much) by the air.

3

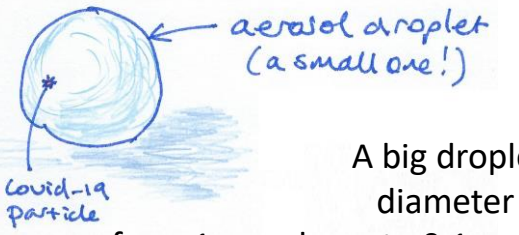
But aerosol droplets are so small that the air wafts them around. It is like trying to hit a piece of fluff with a tennis racquet!



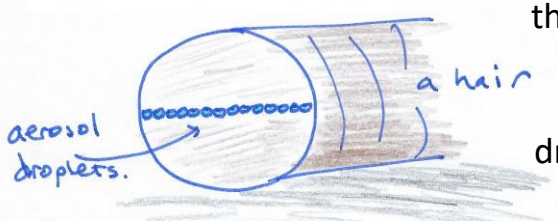
4

How big are droplets, aerosols, and COVID-19 viruses?

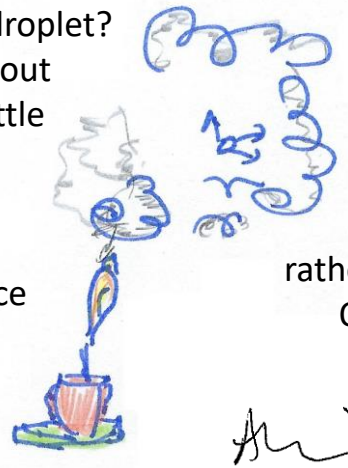
The diameter of a COVID-19 virus particle is about 0.125 µm. A small aerosol droplet would easily contain 50 virus particles: enough to make you ill.



A big droplet diameter is from 1 mm down to 0.1 mm: this is the diameter of a human hair. An aerosol droplet diameter is 1 – 10 µm.



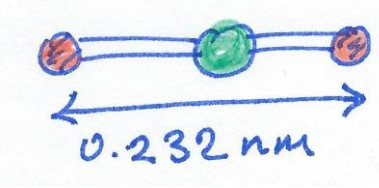
So what is the distinction between a big droplet and an aerosol droplet? A physicist might talk about <u>Turbulence</u>: this is the little eddies that you see in cigarette smoke, or in the smoke of a candle. You can create turbulence by movement or heat, and it will waft aerosol droplets around.



5

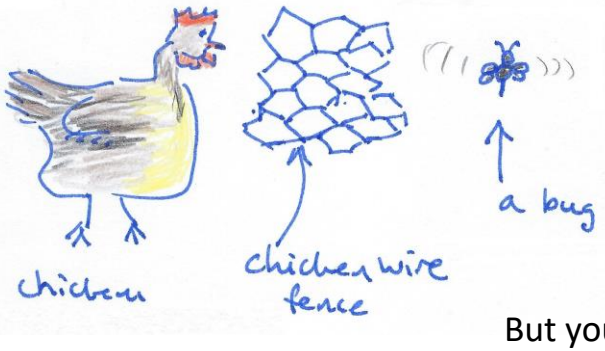
A CO_2 molecule is about 5000 times smaller than a small aerosol droplet. It doesn't compare well with aerosol droplets, but it does give a good indication of the ventilation in a room. If exhaled air is being flushed quickly, then one can expect aerosols to be flushed quickly too.

Why are people talking about Carbon Dioxide?



6

How do basic face coverings work?



If you are asking this question, then your mental picture of the mask is like a chicken wire fence keeping out a bug. But your face covering has comparatively more fibre, smaller gaps, and more thickness than chicken wire. It is more helpful to think of it like the bag in a vacuum cleaner! It works by slowing down the flow of air and spreading it over a wider area. This slows down the aerosols and reduces the turbulence, so that they behave more like big droplets, and get trapped on the fibres, rather than wiggling around them. Oxygen and CO_2 molecules get through because they are much smaller.