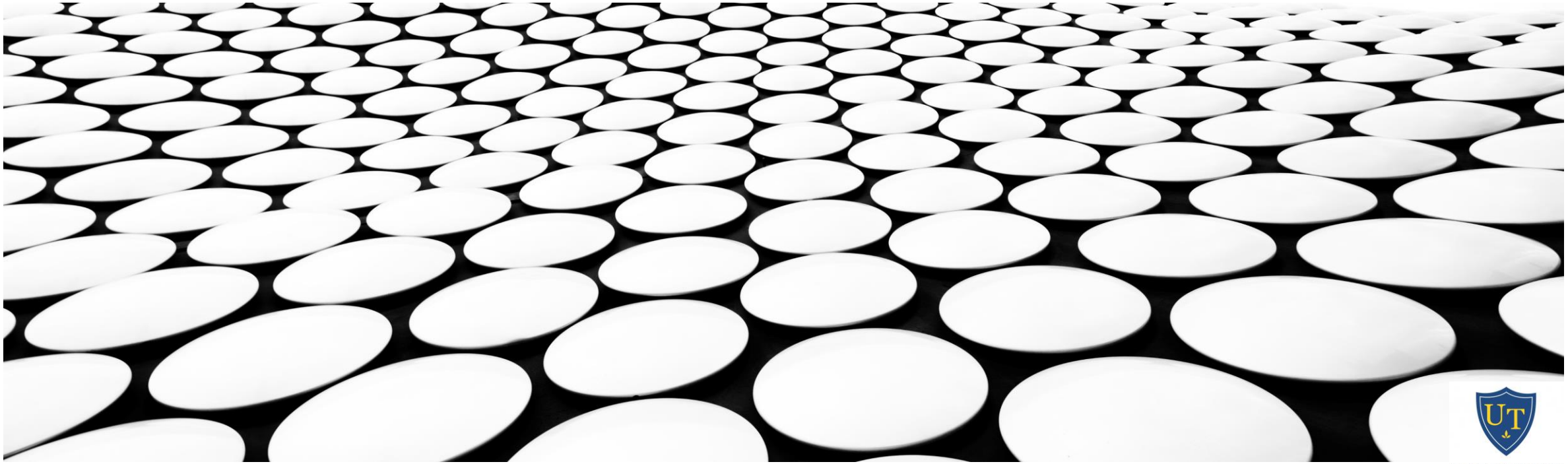
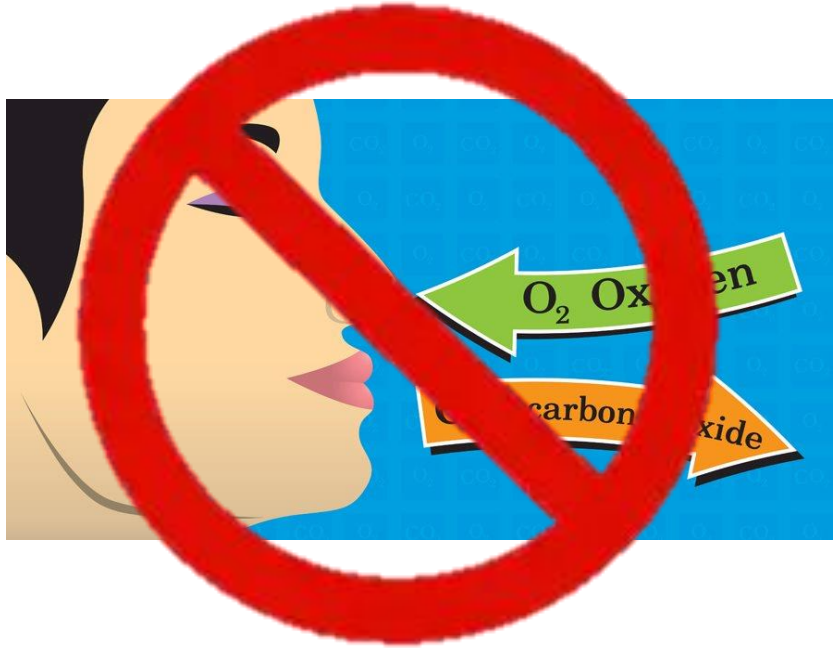
FACE MASKS

HOW DO THEY MEASURE UP



WHY WEAR A MASK

- Tiny particles come out of everyone's mouths and noses in many different ways:
  - Singing
  - Laughing
  - Yelling
  - Talking
  - Coughing
  - Sneezing
  - Breathing



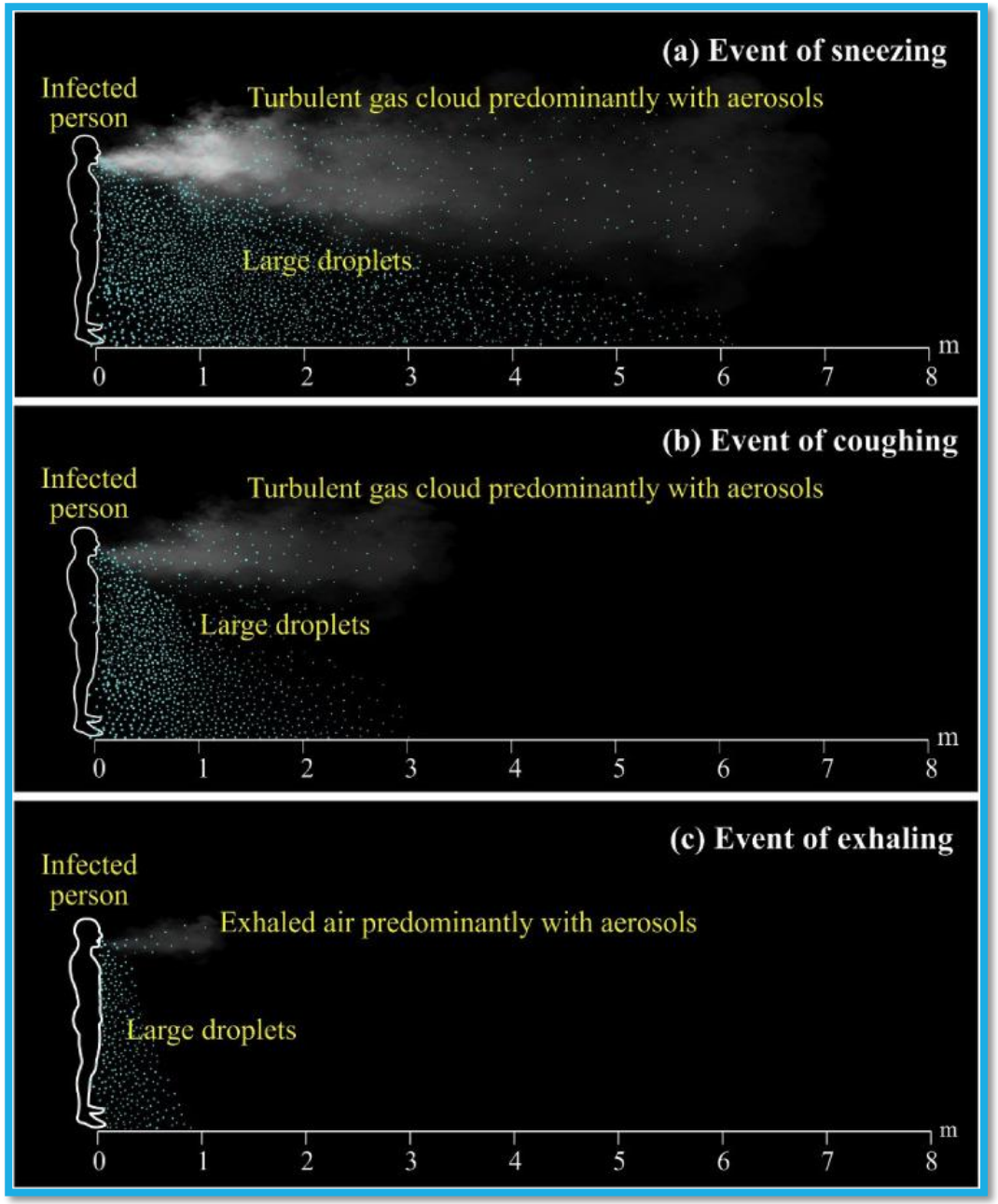
EXHALED AIR IS NOT JUST CO_2

- Gasses
  - 4% Carbon Dioxide
    - 0.04% inhaled
  - 79% Nitrogen
    - 79% inhaled
  - 16% Oxygen
    - 21% inhaled
- Water Vapor
  - Bacteria
  - Viruses

VIRUSES CLING TO PARTICLES

- Cannot “free-float” in the air
- Can stay in air for minutes to hours
- Thousands can be in one of these particles

https://www.scientificamerican.com/article/how-coronavirus-spreads-through-the-air-what-we-know-so-far1/

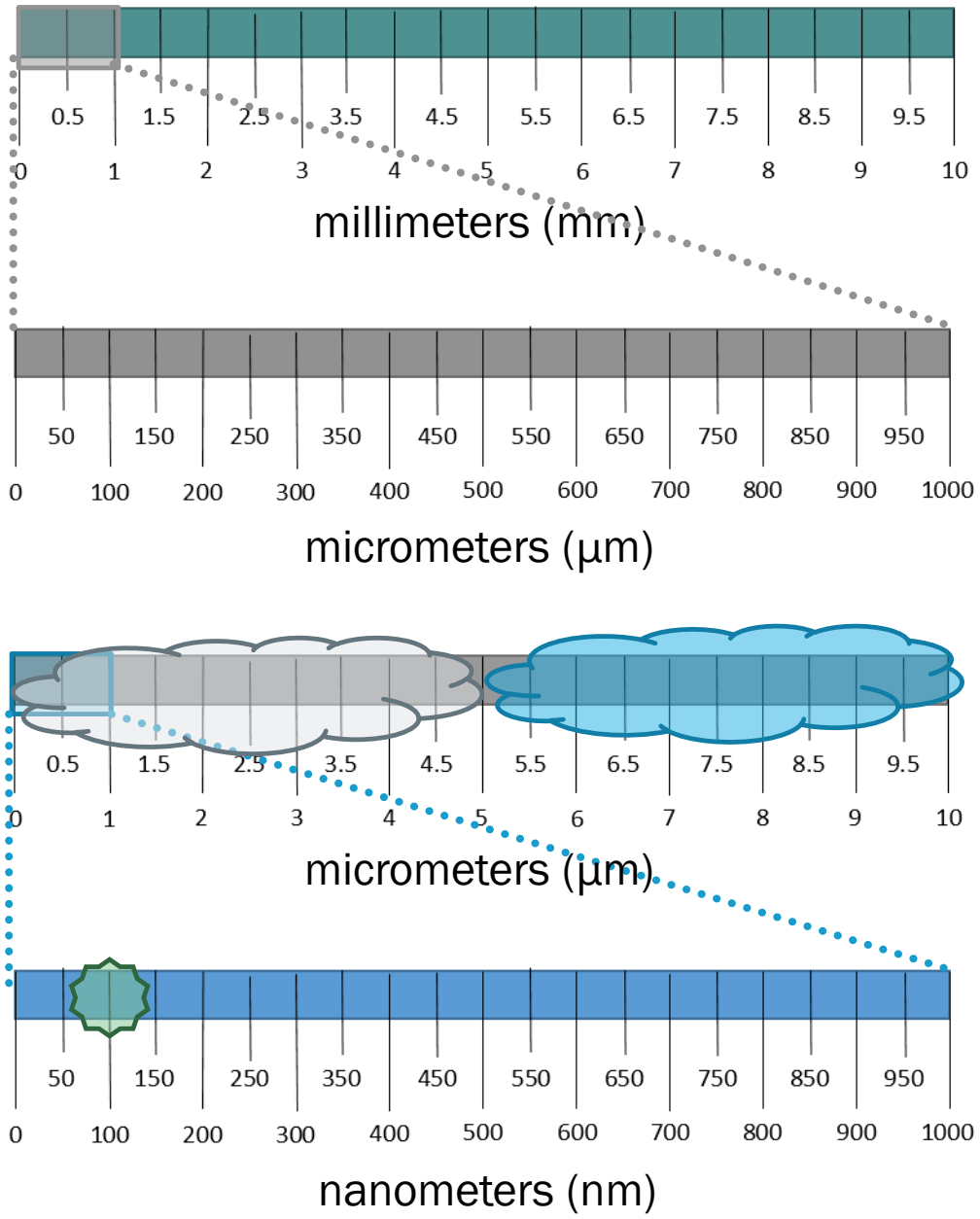


TYPES OF PARTICLES IN EXPIRATION

- Droplets
  - Sneezing, coughing, talking, chanting
  - Fall from the air relatively quickly
- Aerosols
  - Talking, laughing, singing, breathing
  - Can stay in the air for hours

1 meter ~ 1 yard ~3 feet

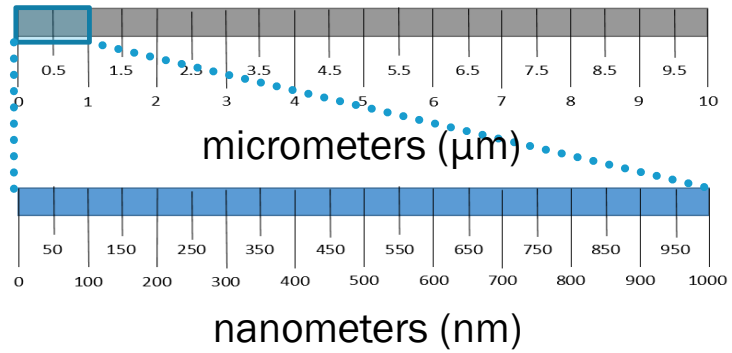
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7293495/figure/fig2/?report=objectonly



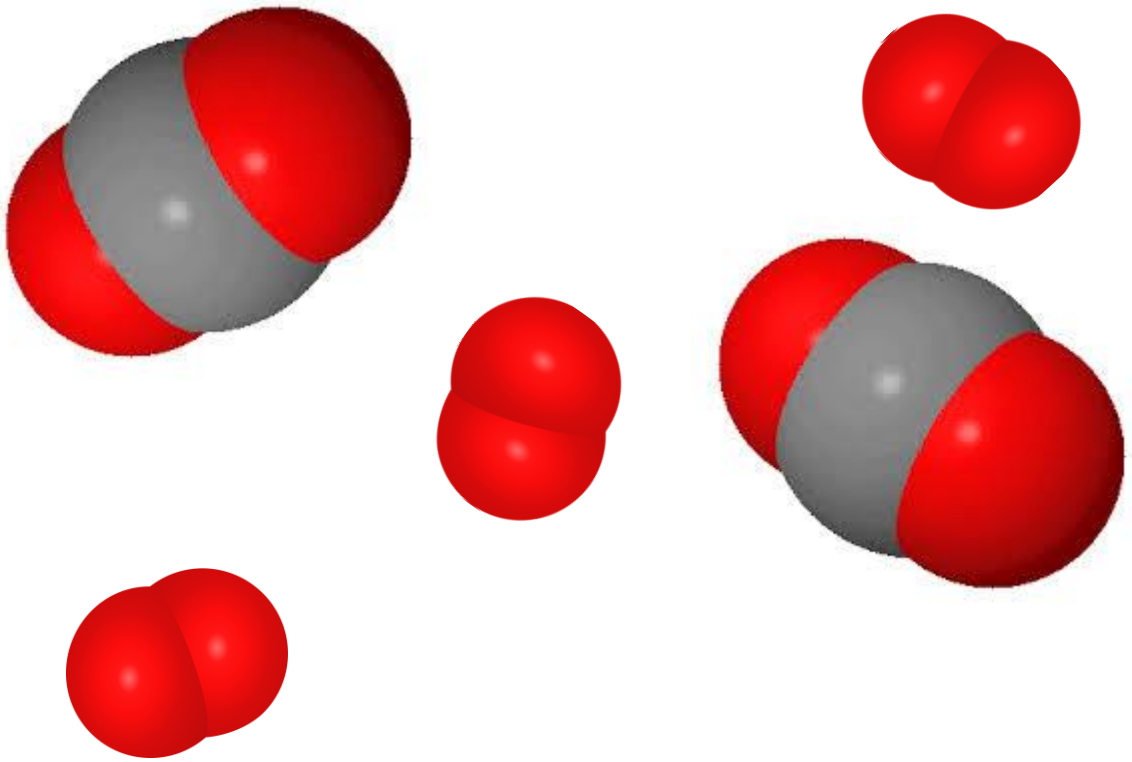
SIZING UP THE THREATS

- Covid 19: ~60-140 nanometers
  - Carried on droplets, aerosols
- Droplets: larger than 5 micrometers
- Aerosols: smaller than 5 micrometers

DEBUNKING COMMON MYTHS



- **MYTH:** "Wearing a mask is bad because you breathe in your own Carbon Dioxide/you can't get enough oxygen"
- **FACT:** Holes in an N95 mask are 300 nanometers wide (0.3 micrometers)
  - A carbon dioxide molecule measures 0.33 nanometers (0.00033 µm) in diameter.
  - An oxygen molecule measures 0.152 nanometers (0.000152 µm) in diameter.



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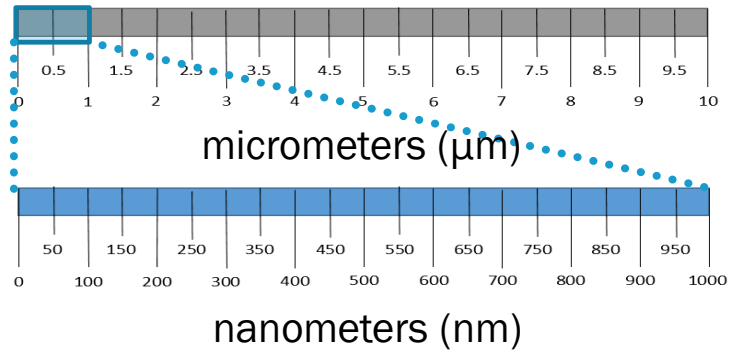
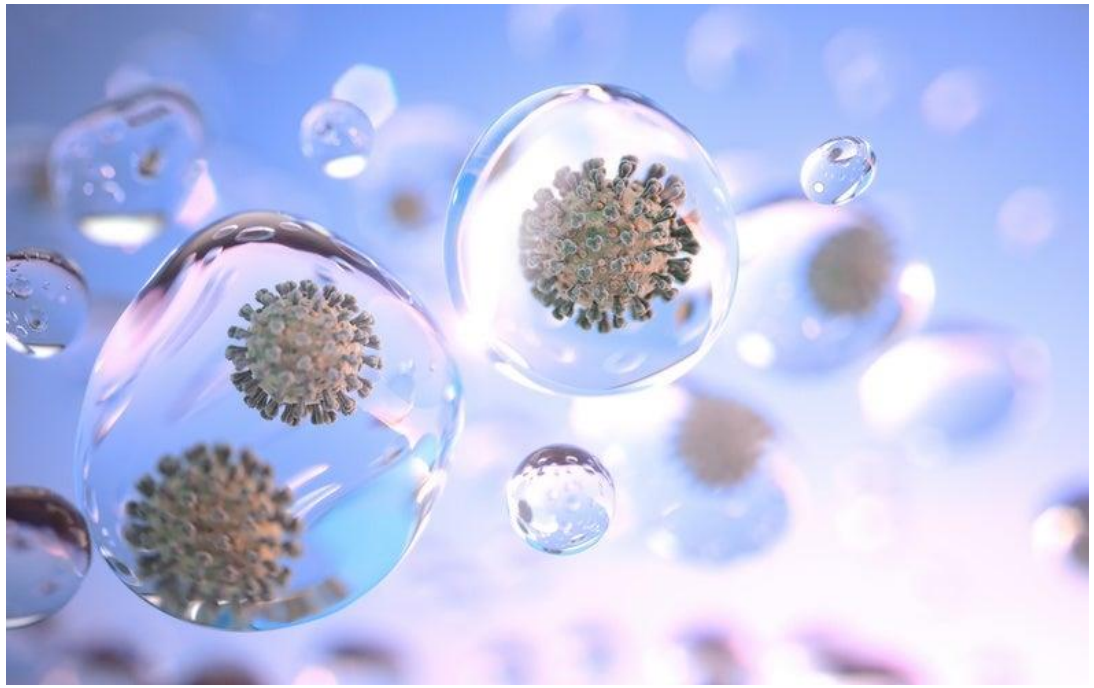


- **MYTH:** "Since the Covid-19 virus is so small, it can go through an N95 mask."
- **FACT:** The novel coronavirus cannot exist in the air on its own, it floats in the air in droplets and aerosols, which are much larger.
  - In addition, N95 masks, surgical masks, and mask filters contain charged fibers that attract small particles.



PUTTING OUR MASKS TO THE TEST

USING A SCANNING ELECTRON MICROSCOPE (SEM) TO EXPLORE THE EFFECTIVENESS OF DIFFERENT MASKS

OUR MASKS

Scarf

Spandex

OUR MASKS

Neoprene (Polyester & Spandex)

Spandex

OUR MASKS

Cotton (Front)

Cotton (Back)

OUR MASKS

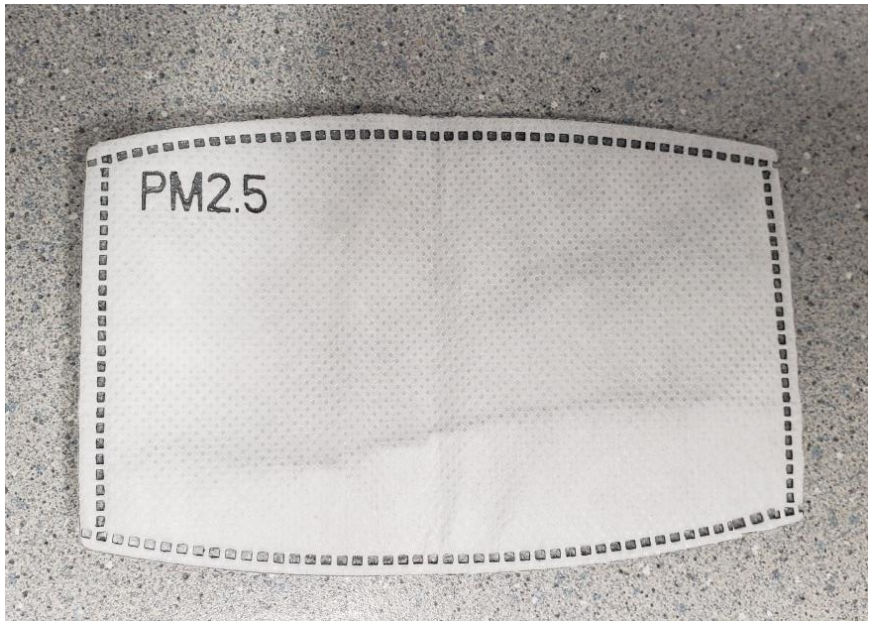
Surgical (Front)

Surgical (Back)

FILTERS

Coffee Filter

PM 2.5 Filter



PM 2.5 refers to airborne particles that are 2.5 micrometers or less in width