Masks Against COVID-19 – Student Instructions

Test Face Masks

There are many different types of masks available, but some are more effective than others. To test the **efficacy** of mask materials, you will try to extinguish a candle flame while wearing masks made from different materials.

Tools of the Trade

- Several different masks and/or fabrics
- Candle
- Matches or lighter
- Ruler

SAFETY FIRST!
Since this experiment involves open flame, make sure that you have adult permission or supervision before beginning.

Here are some suggestions for face masks/materials that you might have at home:

- Surgical mask
- KN95 or N95 mask
- Cloth face mask
- T-shirt
- Bandana
- Neck gaiter
- Cotton fabric
- Polyester fabric

Consider trying a single layer of cloth, then folding it to make double or triple layer masks to see how the number of layers affects the results. Try using a variety of materials to capture the full spectrum of effectiveness and to see if your predictions are correct.

Test Your Mask Materials

1. Place a candle 6 inches (15 centimeters) from the edge of a table or counter. Make sure the area around and above the candle is clear of any flammable materials. Light the candle.
2. Without a face mask, perform these 3 tasks in front of the candle:
   a. Read a paragraph from a book. (Make sure to keep the book clear of the flame!)
   b. Sing a verse of a song. ("Twinkle, Twinkle, Little Star," "Happy Birthday," etc.)
   c. Purse your lips and try to blow the candle out.
3. Record your results in the data table. Relight the candle in between tasks if it goes out.
4. Put on one of your face masks, repeat the tasks, and record results in the table.
5. Switch to a different face mask and repeat until you have tested all materials.
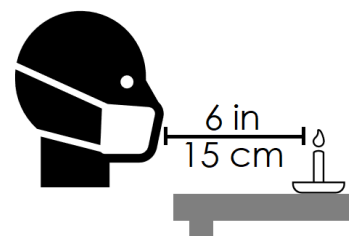
BONUS EXPERIMENT: If you have access to a pulse oximeter device, measure your oxygen saturation levels while wearing each of the different mask types.

Design a Better Face Mask

Beyond choosing a material that effectively blocks respiratory droplets, other factors contribute to the effectiveness of a mask. A good fit is important not only for sealing in respiratory droplets, but also because people don't like wearing masks that are uncomfortable. An effective mask that doesn't get worn is useless!

Here are some additional things you might want to consider when designing your face mask:

- Does the mask completely cover your nose and mouth?
- How tightly does the mask fit against the sides of your face?
- How does the mask fit over the bridge of your nose?
- When you talk, does the mask stay in place or slip down off your nose?
- Does the mask hurt your ears after a long period of wearing it?
- Do your glasses fog up when you are wearing this mask?

Suggested Resources:

- CDC guide to masks: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html

- Watch this video guide from the World Health Organization about how to find a mask that fits your face the best. https://youtu.be/aNUPVdJHeAQ

- FDA guide to masks: https://www.fda.gov/medical-devices/coronavirus-covid-19-and-medical-devices/face-masks-including-surgical-masks-and-respirators-covid-19

Design Your Face Mask

Select your face mask material. You can start from scratch with cloth or try to improve the design of an existing disposable mask to improve comfort and fit. Draw a diagram of your face mask. Label the materials used and any special features you will be adding for comfort or fit.

Test Your Face Mask

1. Perform the candle test with your mask to ensure that you cannot blow out the candle.
2. Check the fit of your mask. Look for gaps around the nose, chin, or sides of the face. Blow out air and feel for significant leaks around the edges.
3. Evaluate the comfort of the mask. Is it scratchy, tight, or otherwise uncomfortable?
4. Redesign your prototype if needed. Make sure it conforms to CDC guidelines before wearing it out in public. No mask is perfect against **coronavirus** but wearing one will significantly reduce your risk of catching or transmitting the virus.

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