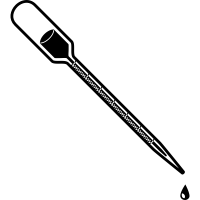
**Lab Activity Handout**

**Problem**: Which nanoparticle will bleach (or “photo-sanitize”) water the fastest after UV light exposure: titanium dioxide, zinc oxide, or magnesium oxide?

**Hypothesis**: I predict that\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Materials**:

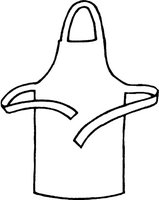
    

**SAFETY**

**Equipment**

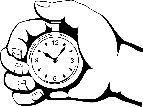
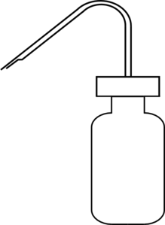


\_\_\_\_\_\_\_\_\_\_\_



\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_

   ZnO\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ MgO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

TiO2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Procedure**:

1. Collect all \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; designate responsibilities to each lab group member, if needed.
2. Obtain \_\_\_\_\_\_ plastic cups with lids and pour \_\_\_\_\_\_\_\_ ml of distilled water into each cup.
3. Pour \_\_\_\_\_\_\_ml of methyl \_\_\_\_\_\_\_\_\_\_\_ into the 4 cups with water.
4. Pour \_\_\_\_\_\_\_ml of methylene \_\_\_\_\_\_\_\_\_\_\_ into the other 4 cups with water.
5. Label the four methyl orange cups as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_, & “CONTROL.”
6. Label the four methylene blue cups as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_, & “CONTROL.”
7. Use a \_\_\_\_\_\_\_\_\_\_\_\_\_ to place \_\_\_\_\_\_\_ drops of each sample oxide as labeled on your cups & be sure to \_\_\_\_\_\_\_\_\_\_\_ your solution well.
8. Take a \_\_\_\_\_\_\_\_\_\_\_\_\_ of your methyl orange and methylene blue labeled cups with your phone (before light exposure) and be ready to take your cups outside for UV light exposure.
9. Using a stopwatch, record the time in \_\_\_\_\_\_\_\_\_\_\_\_ it takes for each sample to bleach (do not run longer than 10 min). Take another picture of the cups (after light exposure).

Data Table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| COMPLETE BLEACHING AFTER UV EXPOSURE in seconds | | | | |
| Sample solutions | CONTROL | Titanium Dioxide | Magnesium Oxide | Zinc Oxide |
| Methylene blue |  |  |  |  |
| Methyl orange |  |  |  |  |

Illustration: (students color in their results using their picture before & after light exposure.)

**Samples before UV light exposure**

Methylene Blue Samples Methyl Orange Samples

c

c

c

c

c

c

**Samples after UV light exposure**

Methylene Blue Samples Methyl Orange Samples

c

c

c

c

c

c

Conclusion: