

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

## How Big is a Nanometer? Student Worksheet - Day 1

**Purpose** To introduce the nanometer and its role in nanotechnology. Students will be introduced to the concept of measurement on the nanoscale and what instruments are necessary to view objects of this magnitude. Students will also learn how to convert larger metric measurements of length into nanometers.

### Question(s)

1. What is a nanometer?
2. What instruments are useful for measuring objects on the nanoscale?
3. What is nanotechnology?
4. How large or small is a nanometer?
5. What types of objects should be measured in nanometers?

**Directions** Complete each blank with the appropriate definition from the teacher presentation.

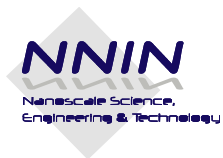
### Key Terms

**Meter** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Nanometer** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Scanning Electron Microscope (SEM)** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Transmission Electron Microscope (TEM)** \_\_\_\_\_  
\_\_\_\_\_



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Compound Microscope \_\_\_\_\_

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Nanotechnology \_\_\_\_\_

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**Directions:** Answer each question according their specified instructions. You may work in pairs.

1. Which is *longer*? Circle your choice for each one.

a) 1 meter or 1 kilometer

b) 1 millimeter or *1 meter*

c) 1 centimeter or 1 micrometer

d) 1 nanometer or 1 micrometer

2. The basic unit of length in the SI or metric system is the \_\_\_\_\_ and is represented by a lowercase \_\_\_\_\_.

3. Match the following units of length with their abbreviations.

- |                |                  |
|----------------|------------------|
| ___ kilometer  | a. cm            |
| ___ micrometer | b. nm            |
| ___ millimeter | c. $\mu\text{m}$ |
| ___ nanometer  | d. km            |
| ___ centimeter | e. mm            |

4. Complete each statement.

- a) 1 m = \_\_\_\_\_ cm  
 b) 1 m = \_\_\_\_\_ mm  
 c) 1 m = \_\_\_\_\_  $\mu\text{m}$   
 d) 1 m = \_\_\_\_\_ nm

5. Complete each statement.

- a) 1 centimeter is equal to \_\_\_\_\_ or  $10^{\text{_____}}$  of a meter.  
 b) 1 millimeter is equal to \_\_\_\_\_ or  $10^{\text{_____}}$  of a meter.  
 c) 1 micrometer is equal to \_\_\_\_\_ or  $10^{\text{_____}}$  of a meter.  
 d) 1 nanometer is equal to \_\_\_\_\_ or  $10^{\text{_____}}$  of a meter.

6. Complete the chart below.

Meter	Centimeter	Millimeter	Micrometer	Nanometer
1				
0.1				
0.01				
0.001				
0.001				

7. Based on your answers for the chart above, what do you notice? Why is this happening?

8. Which is *smaller*? Circle your choice for each one.

- a) 90 meters or 105 centimeters                      b) 12 centimeters or 102 millimeters  
 c) 4000 meters or 440,000 micrometers            d) 1200 millimeters or 1 meter

9. Using what you have learned and the above chart, determine the size of the following objects.  
*Show all your work.*

a) The head of a pin is 2 millimeters wide. What is its width in nanometers? In meters?

b) A human hair is about 120 micrometers wide. What is its width in nanometers? In centimeters?

c) DNA has a width of 2 nanometers. What is its width in centimeters? In meters?

d) An ant is 5 millimeters in width. What is its width in centimeters? In nanometers?