How Many Viruses Fit On A Pin?

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Purpose: To determine how many viruses could fit on the head of a pin.

Background: For a long time, people did not know that viruses caused sickness because the virus particles were too small to be seen with a microscope. As we developed stronger and stronger microscopes, we began to see the unusual shapes now known to be viruses. So just how small are they? You are about to discover the answer in this lab.

Materials: Roll of adding machine tape, ruler, and pencil.

Procedure:

1. Examine the head of a straight pin. Write a prediction about the number of viruses that could fit on the pinhead. My prediction is _____ viruses will be on the head of the pin.

2. Assume that the pinhead has a diameter of about 1mm. If the pinhead were enlarged 10,000 times, its diameter would measure 10 m. Create a model of the pinhead by cutting a 10m length of adding machine tape (you may need to use the floor). The strip of paper represents the diameter of the enlarged pinhead.

3. Lay the strips of paper on the floor to make a circle. Calculate the area of the enlarged pinhead using this formula Area = ? x radius^2 Remember you find the radius by dividing the diameter by 2.
Calculations

4.A virus particle may measure 200nm on each side (1nm equals a billionth of a meter). If the virus were enlarged 10,000 times, each side would measure 0.002 m. Cut out a blue square 0.002 m by 0.002 m to serve as a model for a virus. How many mm is 0.002 m? _____.
Calculations

5. Next, find the area in meters of one virus particle at the enlarged size. Remember that the area of a square equals side x side. Area of the virus particle is _____
Calculations

6. Now divide the area of the pinhead that you calculated in Step 3 by the area of one virus particle to find out how many viruses could fit on the pinhead. How many _____
Calculations

7. If a bacteria measures1000mm on each side, it would be 0.01m in this model. Cut out a yellow square to serve as a model for a bacteria cell. How many mm is 0.01m _____? Calculations:

8. Now divide the area of the pinhead that you calculated in Step 3 by the area of one bacteria cell to find out how many bacteria could fit on the pinhead. _____ Calculations

9. Human blood cells would measure 0.7 millimeters. In this model the blood cell would be .7m on a side. How many mm is .7m? _____ Calculations
Cut out a red square to represent the blood cell.

10 Now divide the area of the pinhead that you calculated in Step by the area of one blood cell to find out how many blood cells could fit on the pinhead. _____ Calculations

Analyze and Conclude:

1. Approximately how many viruses can fit on the head of a pin?

2. What was the smallest particle that you calculated?

3. In general, which are larger, viruses or bacteria?

4. Why can viruses and bacteria attack blood cells?

5. Some viruses can hide in blood cells. How is this possible?

6. Atoms are less than 1/1,000,000,000 of an m. Are they smaller or larger than a virus?

7. So – is a virus made of atoms or can an atom be made of a virus? Why?

8. FIND OUT – are all viruses the same shape and size? Cite your evidence.

9. Would you be able to see a virus on the microscopes in this classroom? Why/why not?