

Some Questions that Challenge. Grades six and above

See NO 13 for definitions of exa, peta, nano, pico, femto atto, zept etc.

Definition of **Angstrom** ÅAn **Angstrom** Å is a unit of length equal to 10^{-10} meters

1. Which is bigger a nanometer or an Angstrom? Answer: _____
2. Which is bigger a picometer or femtometer? Answer: _____
3. Which is bigger a zeptometer or attometer? Answer _____
4. Which is bigger a exameter or petameter? Answer: _____
5. True or False Å = 100 picometres Answer: _____

Order of Magnitude: The number of times we would have to multiple or divide by 10 to convert one size to the other. Comparing numbers of widely different size we use **Ratios!**

Examples: Determine the order of magnitude difference in the sizes of the radii for:

- (a) The solar system (10^{12} meter) compared with Earth (10^7 meter)
- (b) Protons (10^{-15} meter) compared with Milky Way (10^{21} meter)
- (c) Atoms (10^{-10} meter) compared with neutrons (10^{-15} meter)

Answer:

- (a) 10^{12} meter/ 10^7 meter = 10^5 Order 5 larger Solar system than Earth (b) 10^{21} meter/ 10^{-15} meter = 10^{36} Order 36 larger Milky Way than Protons
 (c) 10^{-10} meter/ 10^{-15} meter = 10^5 order 5 larger Atoms than neutrons

For each of the following pairs, determine the order of magnitude difference:

6. The radius of the sun (10^9 meters) and the radius of the Milky Way (10^{21} meters) Ans: _____
7. The radius of a hydrogen atom (10^{-11} meter) and the radius of a proton (10^{-15} meter) Ans: _____
8. How many orders of magnitude greater is a kilometer than a meter? Than a millimeter? Ans: _____
9. An ant is roughly 10^{-3} meter in length and the average human roughly one meter. How many times longer is a human than an ant? Ans: _____
10. A millimeter and a gigameter Ans: _____