Chemistry Unit 5 – The Mole

To help you better visualize the enormous size of Avogadro's number, 6.02×10^{23}, consider the following analogies:

1. If we had a mole of rice grains, all the land area of the earth would be covered with rice to a depth of about 75 meters!

2. One mole of rice grains is more grain than the number of **all** grain grown since the beginning of time.

3. One mole of marshmallows (standard 1 in³ size) would cover the United States to a depth of 650 miles.

4. If the Mount St. Helens eruption had released a mole of particles the size of sand grains, the entire state of Washington would have been buried to a depth equal to the height of a 10-story building.

5. A mole of basketballs would just about fit perfectly into a ball bag the size of the earth.

Your turn

Show your solutions to the following questions on the back of this sheet. Multiply by factors and show the cancellation of units. Keep 2 sf's in your answers.

6. Assuming that each human being has 60 trillion body cells (6×10^{13}) and that the earth's population is 6 billion (6×10^9), calculate the total number of living human body cells on this planet. Is this number smaller or larger than a mole? Divide the larger value by the smaller to determine the relative size of the two values.

7. One of the fastest supercomputers can perform about 12 teraflops (1 teraflop is 10^{12} calculations per second). Determine how many seconds it would take this computer to count a mole of things. Convert this figure into years.

8. If you started counting when you first learned how to count and then counted by ones, eight hours a day, 5 days a week for 50 weeks a year, you would be judged a 'good counter' if you could reach 4 billion by the time you retired at age 65. If every human on earth (about 6×10^9) were to count this way until retirement, what fraction of a mole would they count?