

미시거시 2018-2학기 과제 1

due date: 2018.10.01 (Mon)

1. Determine the length of the row that is obtained when the atoms in a 1 mm^3 grain of table salt are placed one next to the other.

Data

- Density of salt: $d(\text{NaCl}) = 2.165 \text{ g/cm}^3$
- Ionic radius of sodium: $r(\text{Na}) = 0.97 \text{ \AA} = 0.97 \times 10^{-10} \text{ m}$
- Ionic radius of chlorine: $r(\text{Cl}) = 1.81 \text{ \AA} = 1.81 \times 10^{-10} \text{ m}$
- Atomic weight of sodium: $M(\text{Na}) = 22.9898 \text{ g}$
- Atomic weight of chlorine: $M(\text{Cl}) = 35.453 \text{ g}$
- Avogadro's number: $N_A = 6.02252 \times 10^{23}$

2. Make an order-of-magnitude estimate for the average number of rubber molecules torn away from a shoe on each step.

Hints:

- For simplicity, let us assume the basic unit of the rubber molecule is *cis*-1,4 polymer, which consists of natural rubber. <https://www.britannica.com/science/polyisoprene#ref1049238>
- First, measure the amount of shoe rubber worn out after some period. Justify why it is difficult to measure the change just after one step.
- Estimate how many steps you took during that period.
- Describe explicitly why and how you measure and estimate the quantities and what assumptions you made behind such estimates.