Cell biology by the numbers - Exercise 1

Submit your answers in DOC, DOCX, scanned PDF, or any other readable format to course email cellbiologybythenumbers@gmail.com. Here and in the future, any added insights or suggestions might earn you a bonus 😊

1. Read the following chapter from the course book: Cell Biology by the Numbers, Introduction to Chapter 1: Why should we care about the numbers?


2. Compose a back-of-the-envelope Fermi style estimate on any question you wish (doesn’t have to be biological). Write the question and your calculation. Do not look up numbers from the web, rely on your intuition. You don’t have to get the “correct” number!

3. Read and suggest at least one property to be added with its value and a reference to the size axis. Cell Biology by the Numbers, Introduction to Chapter 1: Size and Geometry


   (a) (i) Justify that assuming a surface area of 6 μm² and a volume of 1 μm³ for a characteristic bacterial cell (e.g. E. coli) is reasonable (use the accompanying figures).

   (ii) Express this volume in femtoliters.

   (iii) Make an estimate of the mass of such a bacterium.

   (b) Try to make an estimate of the total number of bacteria inhabiting your intestine (where most of the bacteria in the body are thought to reside).

   (c) Estimate the total number of human cells in your body.

   (d) Using the above, calculate the ratio of bacteria to human cells in the body.

   (e) Compare your answers to questions (b)-(d) to the results in Sender et al. (2016) and suggest an explanation for any significant differences.

   (you can access the paper outside the institute network using the Weizmann library proxy)