Cell Biology by the Numbers - Exercise 2
A tale of bacteria, their DNA and your lab instruments

1) Read “Key Numbers in Biology”, Cell, 2010. Suggest one number you would like to see added to the list. A bonus if you find one that is new to BioNumbers and add it to the website with reference to primary literature.

2) Choose one vignette to read from Chapter 1 of “Cell Biology by the Numbers” textbook (you are welcome to read others if you like...), preferably one vignette that is related to your research topic or that you have previous knowledge of. Write a half-page report on what you learned from it, how you suggest to make it better and anything insightful you have to add. Bonus given to new insights and most useful suggestions.

3) Solve the following questions:
You should adhere to these guidelines on the number of significant digits in writing numbers.
For further reading, or if something isn’t clear, more information can be found in “RIGOROUS RULES FOR SLOPPY CALCULATIONS”.
(Refer to Bionumbers database for data as needed (http://bionumbers.hms.harvard.edu/).

A) You’re about to conduct an important experiment in the lab which requires growing Bacillus subtilis bacteria to an OD_{600} of 1, and your "starter" inoculation is at 7 PM in a 1 mL rich medium. Assuming you want to be an early bird and start the experiment at 7 AM the next day, how many B. subtilis cells should you take for the starter?

B) Next, you’re interested in a unique 1000 bp DNA sequence in the B. subtilis genome encoding for a small mysterious protein. To subject this DNA fragment for subsequent experiments, you need to have 10 ng of this unique double stranded DNA sequence. Is it enough to harvest all the cells you have grown overnight and extract the sequence? Do you have to amplify it by PCR to get enough copies?

C) A nanodrop instrument can measure DNA concentration according to the specific absorption of UV light by DNA at a wavelength of 260 nm. If indeed the nanodrop measurement result indicates 10 ng/uL of the DNA sequence (hooray!), how many copies of the 1000 bp long DNA sequence have you got in the 1 uL you just measured?

D) Regardless of your answer to question B, how many PCR cycles would have been needed to generate those 10 ng of the DNA sequence from a single template? Check your favorite PCR protocol to see if your answer makes sense.