BCHM485 Spring 2020

Dear BCHM485 students,

As the beginning of the spring semester quickly approaches, I would like to welcome you all to the Physical Biochemistry course. Physical (Bio)Chemistry is a rigorous quantitative discipline built upon a strong mathematical and physical foundation. I realize that some of you might not have had an opportunity to practice you calculus skills recently. Therefore, I urge you to take advantage of the remaining three weeks before the class starts and refresh your memory and skills in Math and Physics. Below is a brief list of the topics you have to know. **This material will not be covered in the course.** Instead, it will be assumed that you are familiar with these topics, and many results and derivations will rely on your knowledge of them. You can look them up in any math/calculus and physics textbooks. In particular, you can find a brief summary of the **minimal Math** required for the course in the Appendix "Math Supplement" at the end of the textbook that we will use for this course:

Thomas Engel, **Quantum Chemistry & Spectroscopy,** Third Edition, Pearson, Benjamin-Cummings Pub Co. → Appendix A

Please keep in mind that this appendix is no substitute for a rigorous textbook in Math; it rather provides guidelines to what you **must** know.
Furthermore, I urge you to refresh your knowledge of selected topics in **Physics** (listed below), which are not covered in the Appendix.

Please take advantage of the remaining time before the Spring semester starts to prepare yourself for this class, in order to make it an enjoyable learning experience for all of you.

See you in class soon

David Fushman

Topics in Math:
Functions: trigonometric functions and their relationships; exponentials and logarithms.
Complex numbers and complex functions.
Vectors: definition, addition and multiplication (dot- and cross-products).
Differential calculus. Partial derivatives.
Series expansions of functions. Power series and Taylor expansion.
Integral calculus. Definite and indefinite integrals. Multiple integrals, spherical coordinates.
Differential equations: ordinary differential equations, partial differential equations.
Combinatorial functions: factorials, permutations, combinations.
Matrix algebra: matrices and determinants, matrix addition and multiplication, eigenvalues and eigenvectors, eigenvalue equation.

Topics in Physics:
Kinetic & potential energy.
Classical mechanics: Newton's laws, trajectory of a particle in terms of coordinates, momentum, and energy, rotational motion, vibrational motion, the harmonic oscillator, Hook's law.
Electrostatics: the Coulomb interaction, dipole moment.
Waves: general properties of waves, the electromagnetic field, electromagnetic radiation.