



STEM Summer Study Guide and Tips for College

Welcome to Drake University! This guide is to help you prepare mentally and strategically the changes and expectations between high school and college education.

What to Expect in a College Level Course

High School Courses & Expectations	College Courses & Expectations
Teachers approach you if you need assistance.	Professors expect you to contact them if you need assistance.
Teachers impart facts to be memorized and recalled.	Professors expect you to think about and synthesize seemingly unrelated topics.
Hard work almost always earns a good grade; you can improve your grade by spending more time studying.	Hard work only earns a good grade if it leads to mastery (applying what you have learned to new problems or situations); improving your grade usually requires changing <i>HOW</i> you study.
Make-up assignments and extra credit are usually available.	Make-ups and extra credit are rarely, if even, an option (though extenuating circumstances will be considered fairly).
You likely study little outside of class/school day.	You need to study at least two to three hours outside of class for each hour in class.

Note-Taking Tips & Methods

- Take handwritten notes in class and while reading (studies suggest that handwritten notes stimulate the brain more than typing notes). If a template of class notes is provided, print it and bring it to class to add your own notes.
- Be brief. Do not record lines or lectures word for word.
- Pay attention to how your instructors begin and end class. Identify statements like, “Today, we’ll discuss,” or “Next time we’ll consider.” The instructor is identifying for you the topics he/she considers important.
- Make sure notes are legible and coherent (imagine you are taking notes for a friend).
- Find a note-taking format that works for you. Consider the Cornell Method, Outlining Method, Boxing Method, and/or Mapping Method.
- Check out this blog for examples, advantages and challenges for using different formats: <https://medium.goodnotes.com/the-best-note-taking-methods-for-college-students-451f412e264e>

Reading Textbooks Tips

- Read **before** you go to lecture. You will be better prepared to ask questions, process new information, and stay on track with the pace of the lecture. Skim the chapter outline before the lecture. Think about what you know and make connections to prior learning.
- Be focused. Just like listening, reading is active and requires your participation. Put your phone away! If possible, find a non-distraction area where you can focus.
- Do not sit down and expect to read the whole chapter in one sitting. Break it up in to smaller, more focused chunks. Read two or three sections, then work on any problems presented with your text. Give yourself time to analyze and understand each concept before moving on.
- List the headings of your text on a piece of paper, asking yourself why the author(s) organized information in this way – is the information organized sequentially or can something not happen without another step taking place? What are causes and effects of an action?

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- As you read, take notes, highlight, and place sticky notes marking important information.
- Slow down when you reach difficult sections and reread paragraphs when you need greater clarity. When you finish reading, ask yourself: What is my big takeaway? What questions do I have? What argument is the author making? What information/evidence does the author provide?
- Follow the solutions provided and then work the problems in the text that don't have the full solution and see if you can get the answer. If you can, move forward with your reading. If you can't, go back and reread the section you just read and follow the worked example again.
- After reading a few sections, go the end of the chapter and work the problems related to the sections you just read -- notice that the problems fall under headings that are similar or identical to the section headers -- so it is easy to know what problems to do. If you can work those problems without looking back in the chapter, great. If not, go back and reread the relevant material in the section that the problem relates to. Then try the problem again.
- Ultimately, after reading/studying the chapter and working the recommended problems at the end of the chapter once, **REWORK** all of the problems, only this time, try not to look back in the chapter or at your previous work. Also try to solve them more quickly than you did the first time. Redoing the problems multiple times requires time and effort, but will lead to mastery of the material.
- Remember, that the goal is to take the time to **STUDY** the problems and the solutions to them that are presented **WITHIN** the text.

Other general expectations

- Check your email once a day, at the very least. This includes your junk and clutter files, where sometimes important messages end up. Dedicate some time to read all emails you receive and respond in a timely manner – yes, some of them may not directly refer to you, but how would you know without reading them?
- Connect with faculty and advisors. Attend office hours, send questions or comments, and be engaged outside of class whenever you have concerns. Faculty don't bite – they teach because they want to engage.
- Utilize campus tools and resources, which will be introduced to you during Orientation, Welcome Weekend, and your Bulldog Foundation courses. Ask if you need help orienting yourself to them. There are ways to help you when you need it, but you must take action to get that help.
- Connect with other students in your classes. Make an effort to find some colleagues (not necessarily friends) that you can study with, share ideas, and be “accountabili-buddies.” These other students will be great resources for you to reinforce what you have learned in classes.

STEM Summer Program

If you are registered for BIO 12 and/or CHEM 1 this fall, we strongly encourage you to participate in a free Blackboard course titled STEM Summer Program, starting in mid-July, which will help you prepare to be more successful in our science courses. This Blackboard course, which you will automatically be registered for, contains short recorded videos by faculty from the Biology and Chemistry Departments as well as modules with quizzes/exam type of questions that you can solve at your own pace. Recorded videos will introduce you to specific content from biology and chemistry, and problem-solving and critical thinking skills. In addition, you will have access to modules that will assist you with skills for reading textbooks, taking lecture notes, time management, etc.

STEM Summer Study Guide For Biology & Chemistry Courses

Preparing for CHEM 001: General Chemistry I

Required Textbook (Online):

<https://openstax.org/details/books/chemistry-atoms-first-2e>

Prep for the course: Review Chapter 1: Essential Ideas

- Use the note-taking and reading tips to read Chapter 1
- Complete end-of-chapter problems (without using your notes or looking back at the chapter content). Prepare for the end-of-chapter problems as if it were your first exam. Check your answers at the end of the book. Review chapter content and practice problems until proficient.
- Students will be expected to be conversant in the following topics after reading Chapter 1 and prior to entering CHEM 001:
 - Scientific notation
 - Measurement, accuracy and precision
 - States of matter and mixtures
 - Chemical and physical change
 - Significant figure arithmetic
 - Metric (SI) prefixes
 - A passing familiarity with moles (the unit)
 - Familiarity and fluency in arithmetic and algebra, such as symbolic manipulation of equations involving fractions, powers, roots, exponentials, and logarithms, solving algebraic equations, including quadratic equations and systems of equations, graphing functions, and solving equations to find intersections of corresponding functions.

Additional Preparation: To best prepare for general chemistry, continue reading, taking notes, and completing end-of-chapter problems for Chapter 2: Atoms, Molecules, and Ions and Chapter 3: Electronic Structure and Periodic Properties of Elements.

Strategies for Solving Quantitative Problems:

- List what you know and what you don't know. Write down every number given to you. Somewhere, the problem tells you exactly what you're looking for – find it and write it down.
- Manipulate equations, not numbers. Rearrange and solve all equations before you ever put numbers in.
- Apply rounding and/or significant figure rules when presenting your answer, not at each step.
- Always write out all units when substituting values into equations, then cross them out as they cancel.

Preparing for BIO 012: General Biology I

Required Text: Principles of Life by Hills et al., 2nd edition, Macmillan, 2013. ISBN-10: 1-4641-8983; ISBN-13: 978-1-4641-8983-8

Course Topics for the first few weeks	Chapter # (in class order)	Textbook Pages
Characteristics and hierarchy of living organisms	1	2-6
Cells: Prokaryotic & Eukaryotic Cells, Cytoskeleton, Extracellular structures, Cell Junctions	4	61-81
Atomic structure, Energy, Macromolecules: Carbohydrates & Lipids	2	18-31
Macromolecules: Nucleic acids & Proteins	3	38-58

Preparing for the first two weeks of classes: Students should be knowledgeable about the Learning Objectives for Chapter 1 and Chapter 4. Consider taking-notes, reading the text and completing the end-of-chapter problems to best prepare for BIO 012.

Sample Learning Objectives from Ch. 1 & 4:

- Describe the common aspects living organisms share
- Arrange the following organizational systems in order from least to most complex and recognize examples of each one: organism, community, landscape, atom, large molecule, biosphere, cells, tissues, organs, organ system, small molecule, population
- Know the 3 domains of life
- Describe why surface area to volume ratio is important for a cell
- Describe the cell theory
- Compare and contrast the structures in prokaryotic and eukaryotic cells, including the similarities and differences between plant and animal cells
- Know the functions of each structure
- What would be the consequence if the function of a structure was inhibited or increased?
- Describe the functions of the cytoskeleton
- Compare and contrast the structure and functions(s) of the 3 components of the eukaryotic cytoskeleton
- Describe dynamic instability
- Predict the consequences of disrupting the function of a particular cytoskeleton component (including individual proteins)
- Describe the mechanisms of cilia/flagella movement
- Describe the extracellular matrix structure, functions, and how it is attached to cells
- Compare and contrast the structures and functions of the 3 different cellular junctions in animal cells described in class. Why is each structure important?
- Describe how to monitor if tight junctions are intact between cells