Studying Math and Science

Before we turn to any specifics, there are three general commandments with regard to Math and Science classes:

First, attend all classes and laboratories in your math and sciences courses. These tend to be building-block classes; if you miss something significant or do not comprehend a fundamental point at a fairly early stage, you will find it very difficult to build on your knowledge and keep up in the class. (Also in many laboratory classes, a single absence or two can result in severe academic penalties.)

Secondly, make sure you do all the homework carefully and regularly. In fact, you should do some optional items related to your problem sets. You must not treat a math or science class as if it were an audited course, even if it were offered on a pass/fail basis.

Thirdly, do not cram in math and science classes. While cramming is a bad tactic in almost all courses, it is particularly ill-suited for classes in the natural, biological, and physical sciences.

I. Background
   a) Check with an advisor. Ask what are the necessary background courses?
   b) If you have taken a placement test and are put in a course that seems far too easy or difficult, check with the instructor.
   c) If you have a weak background
      1) attack difficulty as it arises
      2) diagnose or have diagnosed your areas of competence
   d) Here are some fundamental areas of difficulty in arithmetic: decimals, fractions, ratio, proportions, and percentages. In algebra check on your control of factoring, word problems, quadratic equations, evaluation of expressions, and literal equations. In trigonometry look at your command of identities and logarithms.

II. Lecture Notes
   a) Try to read in advance because you want to listen to the lecturer and to follow his/ her line of reasoning. By this means you will not duplicate work.
   b) Keep notes to a cogent but relative minimum; record ideas and concepts, not words and minutiae.
   c) If you are lost in class, ask questions. Do this in a timely fashion (perhaps after class, during office hours, or at special review sections.) Make sure your questions are specific, however.
   d) After class, complete your notes and be sure you understand the lecture.
III. Textbook reading
   a) Keep up with the daily reading. Math and Science are cumulative subjects. Rely on previous knowledge.
   b) Clear up any confusion as soon as it arises. You cannot apply your knowledge until fundamental concepts are mastered. A solid base of information is required at the outset.
   c) Visualize the text while reading.
   d) Master principles, concepts, formulas, and technical terms. Use 3x5 cards (borrowed from Pauk’s *How to Study in College*).

1. Principle/Concept:
   - Principle
   - Define:
   - Formula:
   - Example:

2. Formula:
   - Formula:
   - Formula: Diagram
   - Derivation

3. Technical Terms:
   - Terms: Diagram
   - Define: (include function, location, structure)
   - Example:

   c) Make sure that you understand principles or formulas on 3x5 cards. Rote memorization of too many formulas=forgetting. Formulas are convenience tools.

IV. Problem Solving
   a) Work as many problems as possible, practice=experience=good judgment.
   b) Complex problems are usually made up of many simple parts. Practice, and concentrate on a sequence of parts.
   c) Estimate an answer before solving, then check your work (alternate method or substitution).

V. Problem Solving Techniques
   a) Set up a problem, write givens, stated or implied relationship or principles, what is to be found or proven.
   b) Draw a diagram.
   c) Substitute numbers.
d) Use shortcuts.
   1) Factor out common factors.
   2) Use as much mental arithmetic as possible: e.g. to multiply a 2-digit
      by a 1-digit number such as 23x4 (20+3) (4) + (4) + 80 + 12 = 92
   3) Learn to use a calculator with all appropriate functions.

VI. Reviewing for exams:
   a) Keep up with daily work.
   b) Review 3x5 cards.
   c) Categorize information on sheets of paper (e.g. alcohols, ethers, etc.).
   d) Work problems.
   e) Work assorted problems under time pressure.