Physics-specific techniques

1. Physics is not about memorization, but about finding connections and applying general laws to new situations. It is more like solving Sudoku than crossword puzzles. Logic will get you farther than recall.

2. Look for the "physics" (conservation of energy, constant acceleration, point charge electric field, …) rather than the "equation."

3. Just because an equation contains the "right letters," it's not necessarily applicable to a particular situation. Make sure you know what each symbol represents in each equation – many symbols represent different quantities in different contexts. Make sure you know the conditions under which an equation is applicable (constant acceleration only, in the absence of external forces, when force is due to a point charge, …).

4. Follow good problem-solving strategies (drawing picture, thinking about the physics, writing out all steps, reflecting on reasonableness of answer) even when exercise seems "obvious." The more you apply good techniques, the easier it will be to draw on them when confronting a trickier problem, where they can guide you to a solution.

5. Don't be afraid to make mistakes. Learning occurs when you realize the limits of your own understanding, and then modify that understanding to accommodate new information/situations. Volunteer answers in class, even if you're not sure. Explain your reasoning, so you can find where your reasoning applies and perhaps where you need to account for something new. See *Scientific American article* http://www.scientificamerican.com/article.cfm?id=getting-it-wrong

6. Start early on assignments. If you wait until the last night, you'll waste a lot of time on inefficiency. Often, a problem that stumps you one day could fall into place the next, after you've allowed some time for cogitation.

7. The explanation and work matter more than the final answer. In the workplace, if you can't justify your result in a manner that others (with perhaps less expertise and specific knowledge) can understand, your boss will never accept your proposal. You'll be less likely to make careless errors and more likely to earn partial credit if you show all work carefully also!

8. Study your returned work carefully. If solutions are available, check your work and see how the professor approached each problem, taking notes on your paper. It is best to do this as soon as work is returned, so you can modify your thinking while the information is still fresh in your mind. Then use your modified/corrected/updated solutions to study for exams.

9. If your math skills are rusty, seek help and strengthen them!

10. Do NOT plug in any numbers (except perhaps zero) until the end. This makes the work clearer, lessens the probability for errors, and allows you to re-use a result on a similar problem.

Resources

- http://www.oberlin.edu/physics/dstyer/SolvingProblems.html - Physics problem-solving tips
- http://www.youtube.com/playlist?list=PL85708E6EA236E3DB – Study tip videos
- http://thinktank.arizona.edu/information/resources - Lots of study resources
- http://www.scientificamerican.com/article.cfm?id=getting-it-wrong – Research showing that learning occurs when you first make prediction
- http://www.writing.engr.psu.edu/ - writing in science and engineering