

- RTFQ: Read the Full Question.
  - Really. This is probably the number one piece of advice you will hear from people who have graded AP<sup>®</sup> Physics exams.
- ATFQ: Answer the Full Question.
  - Clearly related to “read the full question”. Once you have read the full question, answer the full question which has been asked.
- Keep it simple.
  - The more you write, the better the chances you say something incorrect. Do not go on and on about whatever you are trying to say. Simply say it and move on to the next question.
    - Write this: “The net force acting on the mass is constant; therefore, the acceleration of the mass is constant.”
    - Not this: “Since the net force acting on the mass does not change and remains the same throughout the motion, the mass experiences the same overall net force during the entire time interval. Because the net force is constant, the acceleration of the mass must also remain unchanged, meaning that the acceleration does not vary with time. Therefore, as long as the net force continues to be constant, the mass will continue to accelerate at a constant rate, which shows that the acceleration of the mass is constant.”
- Know how slopes and areas of graphs relate to equations.
  - Please see my other “Exam Tips & Strategies” in this Ultimate Exam Slayer for more on this.
- Do not copy the prompt. It’s a waste of everyone’s time.
  - Example Prompt: “Explain how the normal force changes to cause the elevator to accelerate.”
    - Do not write: “The normal force changes to cause the elevator to accelerate, because the normal force must increase so that the net force is upward. This causes the elevator to accelerate upward.”
    - Simply write: “The normal force must increase so that the net force is upward. This causes the elevator to accelerate upward.”
- Show every step of your derivations.
  - Start with an equation from the exam reference table.
  - Show every step from there to your final answer.
- Make it clear what your final answer is.
  - A box. A circle. An arrow. Underline. An asterisk and the phrase “final answer”. Anything.
- Always include units on your number answers.
  - Even if the question does not ask you to.

- You do not need to simplify a final equation answer.

- For example:  $v = \sqrt{\frac{gR^2}{2}}$  &  $v = \frac{R}{2}\sqrt{2g}$  are both equivalent.
  - There is no need to simplify the first equation into the second.
  - In fact, if you make a mistake while simplifying, you risk the chance of not earning the point.

- If the question asks, “What happens to A when B decreases?” ...
  - Clearly state what happens to A.
    - “When B decreases, A also decreases.” Or the like.
    - Never just say “A changes”. How does A change?
    - See “Answer the Full Question” from above.
- Write legibly.
  - As graders we try really hard to give you points; however, if we cannot read what you wrote, you cannot earn the points.
  - Write larger if you need to and use extra blank sheets of paper.
- If multiple, similar variables are involved in a problem, define them clearly and keep them straight throughout the problem.
  - $\Delta x_1$  and  $\Delta x_2$  with  $a_1$  and  $a_2$  for example.
- Make sure your subscripts are clearly written as subscripts.
  - For example:  $F_{ad}\cos\theta$  is not the same as  $Fad\cos\theta$
- Do not erase anything.
  - Erasing takes too much time and it’s difficult to read anything you wrote over something which was erased.
  - Instead, draw a box around it, cross it off, and write “ignore this”.
    - Warning! Anything you cross off cannot be graded!
  - If you need extra paper, ask for it.
- If you know you are going to need extra paper for the free-response questions, or even think you might, ask for it before the start of the entire exam.
  - And identify on the extra paper which free-response question, and which part of the free-response question, you are answering.
- Never, ever write out two different solutions.
  - “Also, you could solve it this way ...” is never a good idea.
  - If one of your two solutions is incorrect, you cannot get points for your correct solution.
- Respond in the correct space in the booklet.
  - Each question has specific pages.
  - Each part of a question has specific sections.
  - You have to answer in the correct location.

- Be clear with your words.
  - Do not ever write “the equation”, instead specify the equation.
  - Do not write “the force”, instead specify which force.
  - Do not ever write “it”.
- Do not draw pictures in graphs.
  - Sometimes students would draw parts of the problem’s figure in the graph.
    - Do not do this.
- You can draw graphs in solutions.
  - Yes, if a graph will help you answer the question. draw one.
    - Be sure to include axes labels.
- Pencil is fine. Pen is fine.
  - Just make sure what you are writing is dark.
- Do not use colors.
  - The free-response question booklets are scanned in greyscale.
    - The grader will not be able to see the colors.
- Do not draw a new horizontal line as an axis and label it zero.
  - If you need to draw a horizontal line which represents zero, draw that horizontal line on the horizontal axis which is already there.
- Make your procedures bulleted lists and start with command verbs, for example:
  - 1) **Construct** a simple pendulum by attaching a small, dense mass to a light string and suspending it from a fixed support.
  - 2) **Measure** the length of the pendulum from the center of suspension to the center of mass of the bob using a meterstick.
  - 3) **Displace** the pendulum by a small angle and release it from rest without pushing.
  - 4) **Measure** the time for multiple oscillations using a stopwatch and calculate the period by dividing the total time by the number of oscillations.
  - 5) **Repeat** the timing measurement several times for the same length and average the results to reduce uncertainty.
  - 6) **Change** the length of the pendulum and repeat the timing procedure for several different lengths to reduce uncertainty.
    - a. I bolded the **command verbs** above to identify them here in these lecture notes; however, you do not need to do so in your procedure.
    - b. A command verb, which is also sometimes called an imperative verb, is a word that instructs someone to perform a specific action, usually appearing at the beginning of a sentence.
- Always include at least one step in your procedure to “reduce uncertainty”.
  - See step 5 and 6 in the example procedure.

- Be careful with repeated variables.
  - P for power, p for momentum,  $\rho$  for density.
  - h for height, h for depth.
  - f for frequency, f for final.
  - m for mass, m for meters.
  - s for seconds, s for arc length.
  - t for time, T for period.
    - But please do not use T for the force of tension because you should be using  $F_T$  instead, right?
- Make sure your units play well together.
  - kg and g should not be in the same equation.
  - cm and m should not be in the same equation, etc.
  - Be careful to know the units of known constants and givens:
    - $g \rightarrow \text{m/s}^2$
    - $G \rightarrow \text{m}^3/(\text{kg}\cdot\text{s}^2)$
    - $k \rightarrow \text{N/m}$  and remember a newton is a  $(\text{kg}\cdot\text{m})/\text{s}^2$
- Practice, practice, practice.
  - Just like any other sport, and yes, physics is a sport, you need to practice the sport of physics.
  - Practice physics with friends.