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AP® Physics 1 Study Guide: Tips, Strategies, and Common Mistakes To Avoid

Use this study guide to review some of the most difficult concepts on the AP Physics 1 exam and some common mistakes to avoid with your students. As you go through the study guide with your class, you can remind students to be mindful of these misconceptions as they prepare.

Instructions:

1. You can either present this guide on a screen and go through each topic with your students or you can share this document with your students and encourage them to use it for self-studying.
2. Click on the links in each topic to review and discuss all the difficult concepts that could show up on the exam.
3. The list has been ordered unit by unit, so it is meant to promote step-by-step exam review in an organized manner.
4. When clicking on the links, each concept can be used as the topic for a mini-lecture, where the content can be reviewed with students. This is the time to allow students to ask last-minute questions if they are still struggling with any of these challenging concepts.
5. Once you have gone through these topics, you can assign practice questions to your students using our Learning Tools for AP Courses or another quality resource that allows them to apply what they have learned to exam-like questions with detailed answer explanations and performance data.

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AP® Physics 1: Most Difficult Concepts

Unit 1: Kinematics

Linear kinematics and graphical representations

- Students struggle to understand the difference between velocity and acceleration
- Understanding and utilizing plots of position, velocity, or acceleration versus time can be difficult as they are easy to confuse

Unit 2: Dynamics

Systems, Newton's laws of motion, and forces

- Here, it can be difficult to master how to group interacting objects into systems
- As an invisible force that acts at a distance, students can struggle to conceptualize the gravitational field
- The difficulty here lies in the number of contact forces, such as normal forces, that can appear in a single scenario and how to organize them on diagrams
- Students confuse Newton's three laws and have a hard time remembering when to apply them
- The first law implies that the velocity vector of an object or system is constant in the absence of an external force
- However, the second law states that if an external net force does exist, then the object will accelerate at a rate proportional to the force and inversely proportional to its mass
- Lastly, Newton's third law of motion describes how all forces come in pairs that are equal and opposite on each interacting object
- On top of the need to keep track of and understand numerous types of forces, students must also be able to label free-body diagrams
- Lastly, students struggle with applying free-body diagrams and applying Newton's second law of motion

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Unit 3: Circular Motion and Gravitation

Vectors, gravitational fields, and centripetal forces

- Some of the more difficult mathematical concepts are needed to understand how to breakdown vectors into vector components
- The difficulty here is that students have not been to other planets, and it's hard to visualize any gravitational force besides that of Earth
- Having to keep track of two different classifications of mass is not something that students are familiar with
- A lot of students enter physics with a preconceived notion of what centripetal force and centrifugal force are
- Objects traveling in circular motion experience a net force that acts in an unusual way, and this concept can be hard to grasp

Unit 4: Energy

Work and energy conservation

- Visualizing systems of objects and the flow of energy into and out of them is difficult
- Here, it's tricky to keep track of the relationship between forces and the energy (or work) generated by those forces
- Students often have difficulty comprehending energy conservation and when to apply it

Unit 5: Momentum

Impulse and conservation of momentum

- Similar to energy, the concept of momentum can be hard to visualize
- Students often have trouble when trying to interpret graphs of force versus time and graphs of momentum versus time
- Understanding when a system of objects is open or closed with respect to total momentum is also a difficult concept they need to master
- When to apply the momentum conservation is another tricky concept

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Unit 6: Simple Harmonic Motion

Period and energy in simple harmonic motion

- Students have difficulty comprehending why certain quantities affect the period of an oscillator and not others
- As an intangible concept, understanding how energy changes and transfers during repetitive motion is hard

Unit 7: Torque and Rotational Motion

Kinematics, Newton's laws of motion, energy, and momentum for rotational systems

- The difficulty students have here has to do with visualizing rotational displacement, velocity, and acceleration
- The idea of a rotational force, or torque, can be very confusing when students work through rotational motion problems
- Students must grapple with the abstract idea of angular momentum
- Lastly, there are many difficulties associated with relating systems and conservation laws when dealing with rotational momentum

If you've had the chance to finish this study guide with your students, have them try their hand at one of UWorld's AP Physics 1 sample questions that tests one of the challenging concepts mentioned above.

We hope this study guide has helped to make reviewing for AP Physics 1 with your class a bit easier. We wish your students the best of luck in their studies. Please feel free to contact us with any questions, and we will be more than happy to answer them.

Regards,
UWorld's AP Science Team