

Expectations - Physics Test 1 – Motion, Graphing, Freefall

1. Students should understand the concepts of distance, displacement, time, average speed, instantaneous speed, and acceleration. (*define each below*)
2. Students should be able to solve word problems involving the quantities mentioned above and understand the equations that describe the relationships between these quantities. (*list any useful equations*)
3. Students should be able to graph position versus time, speed (velocity) versus time, and acceleration versus time, and translate between these graphs. (*list key points or draw an example*)
4. Students should be able to accurately plot data, draw a best fit line, calculate the slope of a line and interpret its physical meaning. (*list key points, or an example*)
5. Students should be able to solve Fermi problems, and discuss the assumptions and estimates in the solution.
6. Students should be able to graph the relationship between unusual variables.
7. Students should be able to read a measuring tool to the correct number of significant figures, and express this number in scientific notation.
8. Students should be able to convert between units systems
9. Students should understand the process of freefall (for objects dropped, or thrown into the air) and the graphs that describe it.
Dropped graphs: Thrown up graphs:
10. Honors: students should be able to solve complex multi-step problems involving a combination of graphing and mathematical manipulation

Example problems (these should NOT be your only study tool!!!):

1. Convert the following to SI units:
 - a. 27 mi/hr
 - b. 60 mi/hr in 4 sec
 - c. 82 yards
 - d. 45 ft/min
2. A pitcher pitches a baseball at 90 miles per hour. If the pitcher's mound is 60 feet away from home plate, how long does it take for the ball to reach the batter?
3. If The batter needs .4 seconds to complete her swing, when should she start her swing?
4. While walking at a constant speed, you notice that it takes you 22 seconds to walk the length of the science building (which is approximately 200 feet long). What is you speed in ft/s, m/s, mi/hr (calculate them all)?
5. Dan is on his skateboard, going down a hill and picking up speed at a constant rate.
 - a. If he reaches 10m/s in 3 seconds, what is his acceleration?
 - b. How fast will he be going after 4 seconds?
 - c. How many meters has he traveled after 3 seconds?
 - d. Dan has placed a gigantic sponge at the bottom of the hill to safely stop him. If he hits it and stops in 1 second, what is his deceleration?
 - e. Create a graph of his motion with scales
6. Chris is sitting in a lounge chair sipping some ice tea when he accidentally falls off the edge of his 5th floor balcony and lands in the pool.
 - a. Create a set of xva graphs of his motion
 - b. What is his acceleration as he falls?
 - c. How fast will he be going after 2 seconds?
 - d. How many meters has he traveled after 3 seconds?
 - e. If it takes him 4 seconds to hit the water, how high was his balcony?
7. Seth has stolen Jim's backpack and is currently being chased by Jim. Seth covers 10m every 2.2 seconds. Jim covers 15m every 2.5s, however, Jim started running 3 seconds after Seth did. Make a graph to determine what position and time Jim will catch Seth.
8. Honors: Do numbers 77 and 78 (chapter 2) in your book.