Honors Physics

Review Sheet: 1-Dimensional Motion (Ch. 2)

Test format: 9 multiple choice, 4 graph questions, 5 kinematics problem solving questions.

Vocabulary/Concepts

1. Compare and contrast vectors and scalars: is a car driving around a traffic circle at 18 km/h going at a constant speed? constant velocity? constant acceleration? Y N N direction of v & a are changing
2. What is the value of acceleration and velocity at the top of a trajectory? $a = 10\ m/s^2$ down $v = 0$
3. What are the units of displacement, velocity and acceleration m m/s m/s^2
4. If velocity is negative and acceleration is positive, is the object speeding up or slowing down? SD What if velocity and acceleration are both negative? SU

Problems *Use GUESS for full credit (show re-arranged equation BEFORE you substitute, with units).*

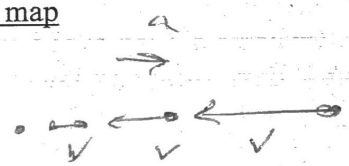
5. If an object travels west for 4 m and east for 6 m, what is the distance? What is the displacement?

10m 2m East

6. As a shuttle bus comes to a sudden stop to avoid hitting a dog, it slows down from 9 m/s West to 0 m/s West over 2.2 s. What is the acceleration (magnitude and direction)? $a = \frac{v_f - v_i}{t} = \frac{0 - 9\ m/s}{2.2\ s}$

$= \boxed{4.1\ m/s^2\ E}$

Motion map



7. The brakes of your car are capable of creating an acceleration of 5.92 m/s/s South. Let's say you are speeding recklessly down I-26 and you suddenly see a state trooper. YIKES! If it takes 4.0 seconds to bring your car back down to the speed limit, 28.8 m/s North, what was your initial velocity (magnitude and direction) before you pressed the brakes? $a = -5.92\ m/s^2$

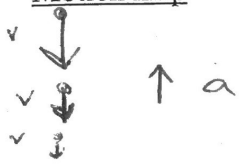
$v_f = v_i + at$

$v_i = v_f - at$

$= 28.8\ m/s - (-5.92\ m/s^2)(4s)$

$= \boxed{52.5\ m/s\ N}$

Motion map



8. A bouncy ball is dropped from the tenth floor of a building, 28 m above the ground. Determine the time it takes for the ball to reach the ground. (An object that is dropped has a $v_i = 0$.)

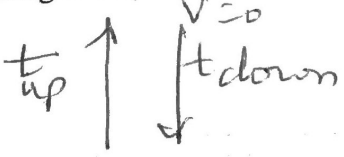
$\Delta y = v_{y_i} t + \frac{1}{2} a t^2$

$\Delta y = \frac{1}{2} a t^2$

$t = \sqrt{\frac{2\Delta y}{a}} = \sqrt{\frac{2(28\ m)}{10\ m/s^2}}$

$= 2.37\ s$

9. A basketball player jumps off the ground and reaches a height of 0.44 m above the ground. Find the hang time (total time in the air).



$t_{down} = \sqrt{\frac{2\Delta y}{a}} = .296\ s$

$t_{total} = 2 \times t_{down} = .59\ s$

or $t = \frac{v_{yf} - v_{yi}}{a}$

$= \frac{-24\ m/s - 24\ m/s}{a}$

$= 4.8\ s$

10. A baseball is thrown up into the air with a velocity of 24 m/s.
a. What is its velocity at the top? 0 m/s b. How high does it go? c. How long does it take to reach the top?
d. Calculate the total time in the air.

$\Delta y = \frac{v_f^2 - v_i^2}{2a} = \frac{0 - (24\ m/s)^2}{2(10\ m/s^2)} = 28.8\ m$

$t_{down} = \sqrt{\frac{2\Delta y}{a}} = 2.4\ s$ $t_{total} = 4.8\ s$

11. A person throws a basketball straight up with initial velocity of 3.0 m/s. It is caught by someone standing on a platform when the ball has a speed of 0.5 m/s.

$\Delta y = \frac{v_f^2 - v_i^2}{2a} = .438\ m$

a) How high is the ball when it is caught?
b) If the person catches the ball while it is rising, how long has it been in the air?
c) If the person catches the ball while it is falling, how long has it been in the air?

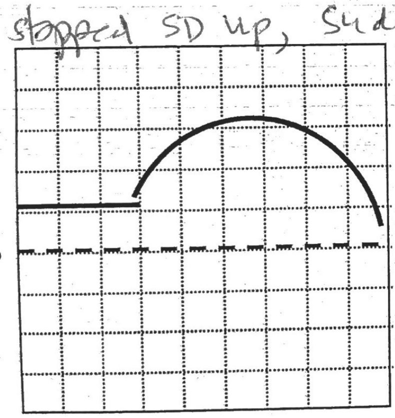
b) $t = \frac{v_f - v_i}{a} = \frac{.5\ m/s - 3\ m/s}{-10\ m/s^2} = .25\ s$

c) $t = \frac{v_f - v_i}{a} = \frac{-.5 - 3}{-10} = .35\ s$

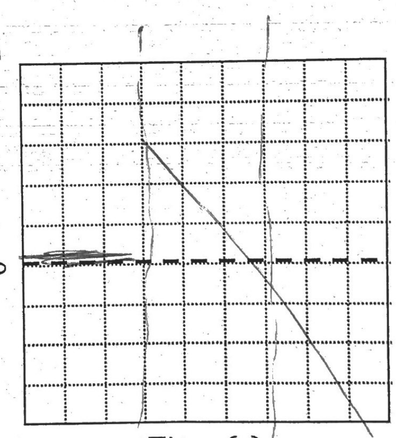
12. Describe each leg on the graph; then complete the other two graphs next to the graph.

a) x vs. t v vs. t a vs. t

stopped SD up, SU down



Time (s)



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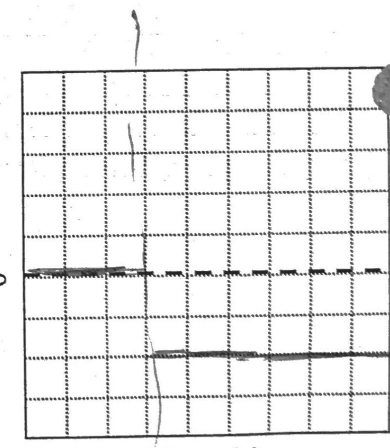
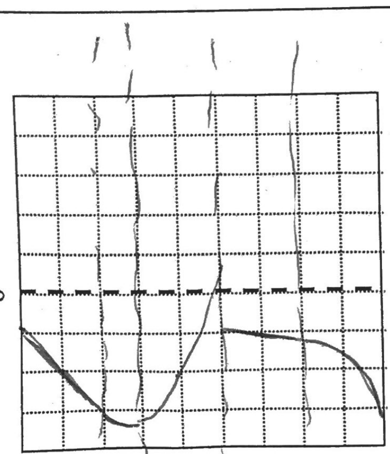


Time (s)

b)



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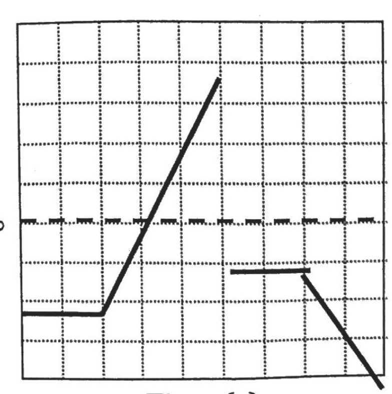

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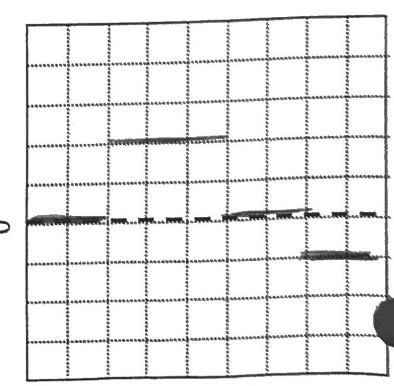

Time (s)

Constant West | SD west | SU east | Const W | SU west