PHYS 1210-02 Quiz 1

You may use a 8.5"×11" note sheet written on both sides and a calculator. You have 50 minutes.

For multiple choice questions, shade the circle (○) by the one correct answer provided. For "select all" questions, shade the boxes (□) by all correct answers. For free response questions, write your answers in the boxes provided. Show your work outside the boxes.

1. We haven't done much with the concept of mass in class this year other than to state that it is a fundamental quantity. What is the unit for mass?

   ○ a. meter   ○ b. kilogram   ○ c. second   ○ d. coulomb

2. The quantity momentum is defined as mass multiplied by velocity. In terms of the fundamental units of m, g, s, and C, what are the units of momentum?

3. Although we use SI units in this course, in the USA we customarily use a different system for many measurements, including speed. What is a speed of 45.0 miles per hour expressed in meters per second? To carry out the conversion, you should know that

1 min = 60 s	100 cm = 1 m	12 in = 1 ft
1 h = 60 min	2.54 cm = 1 in	5280 ft = 1 mi

   For credit, show the steps in the conversion.

4. Amy, a hard-working student, sits down at a bistro table with a sandwich and a cookie. Her physics teacher, Dr. Darrans, notices her and walks over to her table. After they chat for a few seconds, Dr. Darrans takes her cookie and walks away at a speed of 1.80 meters per second. Amy sits, surprised, for 4.0 seconds, then runs after Dr. Darrans at a speed of 2.70 meters per second to retrieve her cookie.

   A. How far does Dr. Darrans walk before Amy starts to run after him?

B. For how much time does Amy run before catching Dr. Darrans?

C. How far from the table are they when Amy catches Dr. Darrans?

5. The graph below is a velocity-time plot for some moving object. Four times of significance to the process, t_1, t_2, t_3, and t_4, are indicated on the axis.
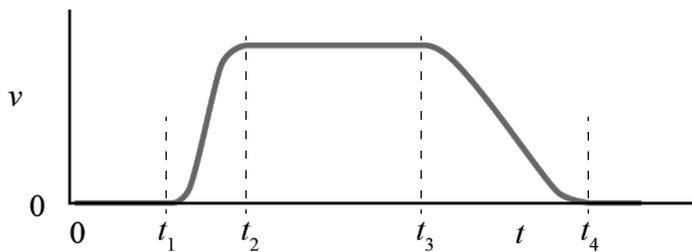

A. Describe this motion in words. Avoid words like "displacement," "velocity," "slope," or "curvature." Instead, use words like "forward," backward," "speed up," and "slow down," "decrease," "increase," and "distance." Make it the reasonable motion of some actual thing; don't just call it an "object."

B. On the axes below, sketch an acceleration-time plot consistent with velocity-time plot above. The same times are indicated on the axis for reference.

a

0

t

t_1 t_2 t_3 t_4
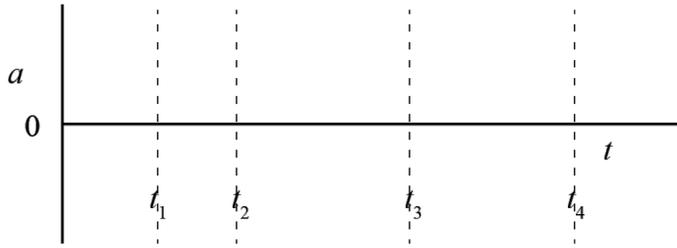
C. On the axes below, sketch a position-time plot consistent with velocity-time plot above. The same times are indicated on the axis for reference.

x

0

t

t_1 t_2 t_3 t_4
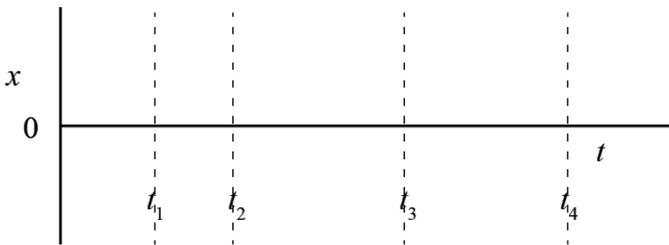
6. Arthur kicks a ball up a grassy hill. The initial speed of the ball rolling uphill is 6.50 meters per second, and it slows at a steady rate of 2.00 meters per second per second.

A. For how much time does the ball travel uphill before coming back down the hill?

B. How far up the hill does the ball travel before reversing direction?

C. When the ball rolls back down the hill, it speeds up at a rate of 1.30 meters per second per second. How fast is it traveling (what is its speed) when the ball rolls back down to where Arthur kicked it?

7. Vector $\vec{A}$ has magnitude 2.00 in the direction 25° counterclockwise of the +x axis. Vector $\vec{B}$ has magnitude 3.50 in the direction 120° counterclockwise of the +x axis.

   A. Express vector $\vec{A}$ in terms of its x and y components.

   B. Express vector $\vec{B}$ in terms of its x and y components.

   C. Tell me the vector sum $\vec{A} + \vec{B}$, either as x and y components or as magnitude and direction.

   D. Tell me the difference $\vec{B} - 2\vec{A}$, either as x and y components or as magnitude and direction.

   E. Tell me the dot product $\vec{A} \cdot \vec{B}$.

   F. Tell me the cross product $\vec{A} \times \vec{B}$.