Name _____

Hour _____

AP Physics: Chapter 1
Introduction to Physics

Question A:

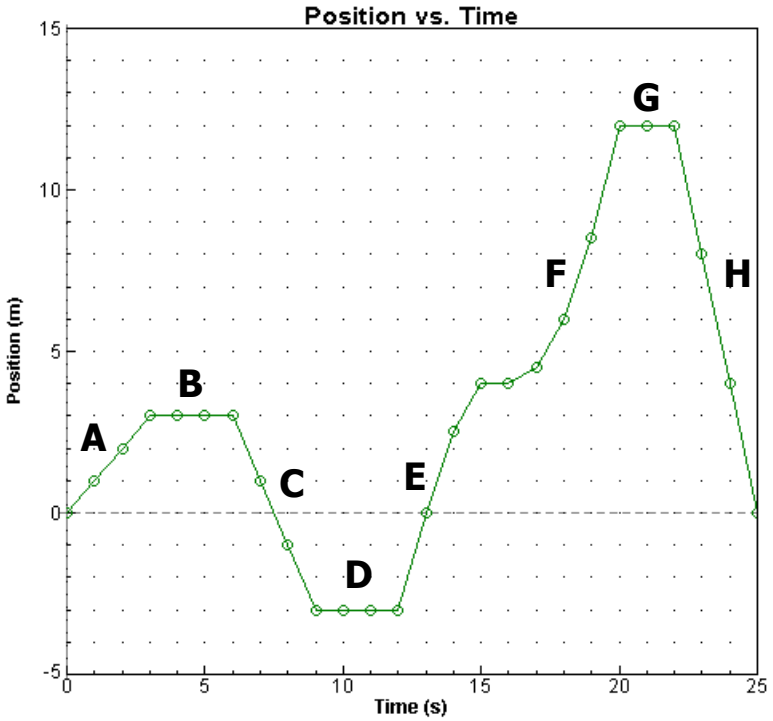
The equation for the moment of inertia of a cylinder is: $r^2 = \frac{2 \cdot I}{m}$, where *r* is radius in meters, *m* is mass in kilograms, and *I* is inertia. What units are used to represent *I*?

Question B:

Farmer Joe emptied 685 bushels of grain from his grain truck in 32 minutes. How fast did he empty in his truck? Answer in units of gallons/second. (Hint: 1 bushel = 8 gallons.)

AP Physics: Chapter 2
Graphs of Motion

The Position vs. Time graph below shows the motion of an object as it moves along a straight-line path. The graph is divided into time intervals, labeled by A, B, C, etc. Use the graph to answer Questions #A - C below. Show your work and/or explain your answers in the spaces provided.



Question A:

During which time interval(s) is the object's velocity . . .

a) positive?
b) negative?
c) zero?
d) During which time interval(s) is the object accelerating? How can you tell?

Question B:

a) What is the *displacement* of the object after . . . 5 seconds? . . . 10 seconds? . . . 25 seconds?
b) What is the total *distance* traveled by the object after . . . 5 seconds? . . . 10 seconds? . . . 25 seconds?

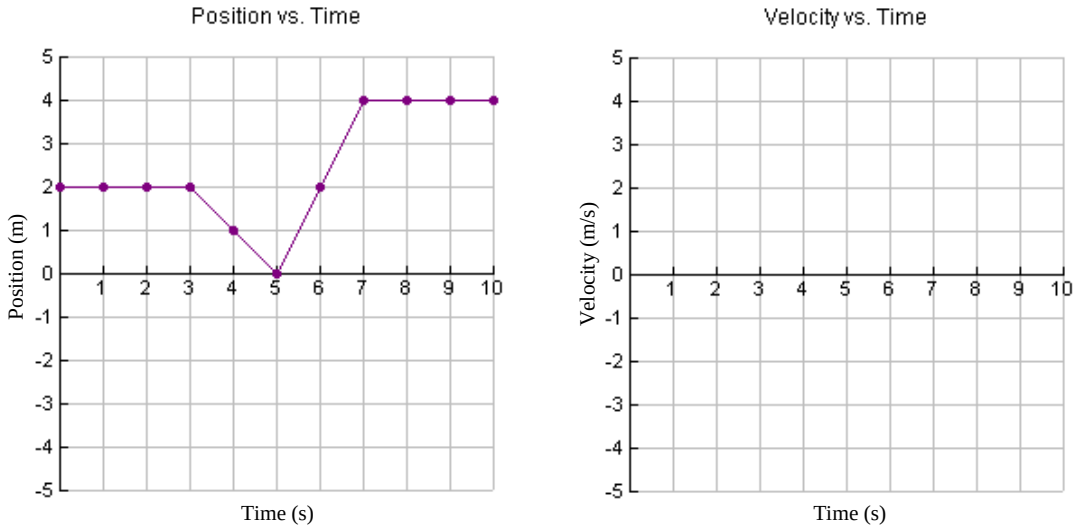
Question C:

What is the average *velocity* of the object for

a) Section C?
b) Sections A & B combined?
c) the entire 25 second time period?

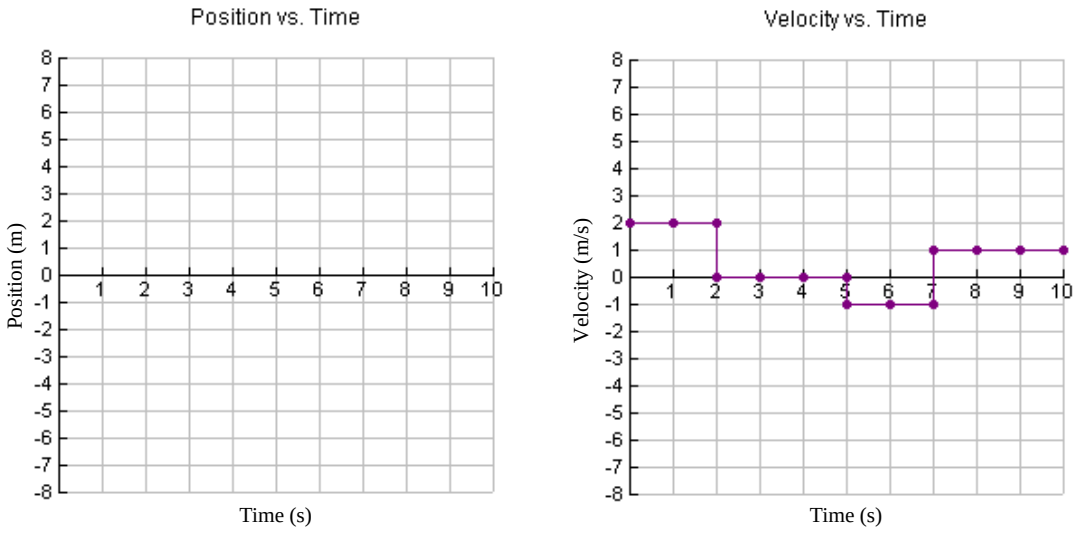
Question D:

Complete the missing Velocity-Time graph for the situation below. Assume all unknown initial position and velocity values are zero.



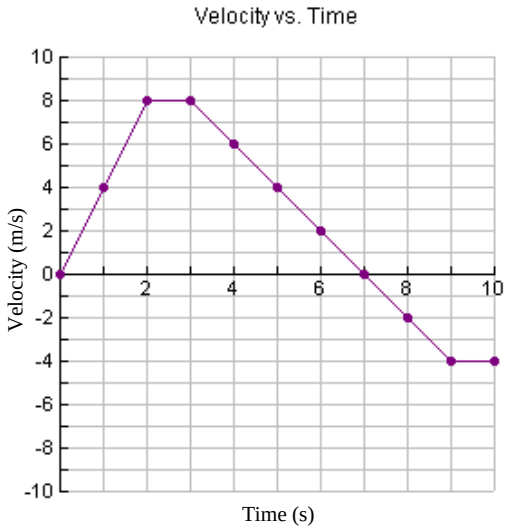
Question E:

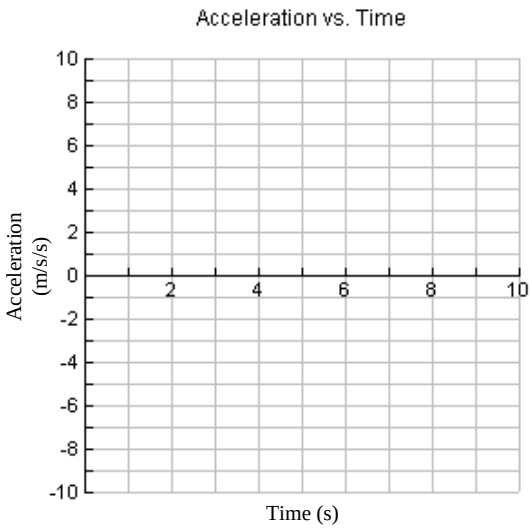
Complete the missing Position-Time graph for the situation below. Assume all unknown initial position and velocity values are zero.



Question F:

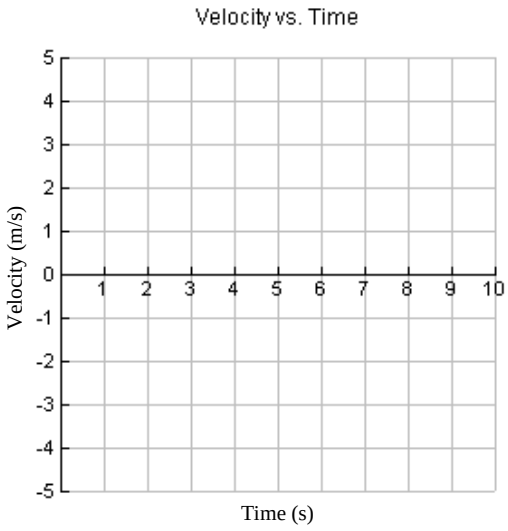
Complete the missing Acceleration-Time graph for the situation below. Assume all unknown initial velocity and acceleration values are zero.

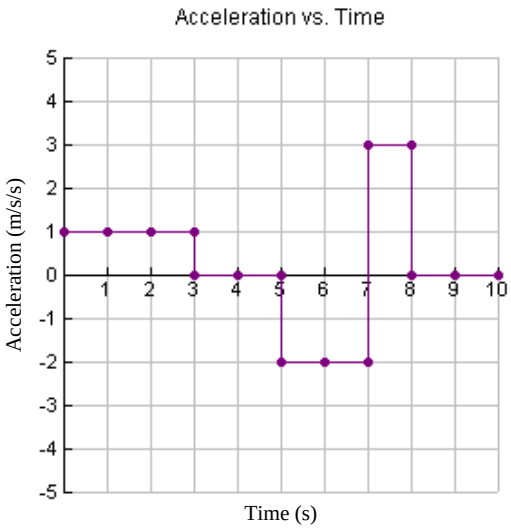




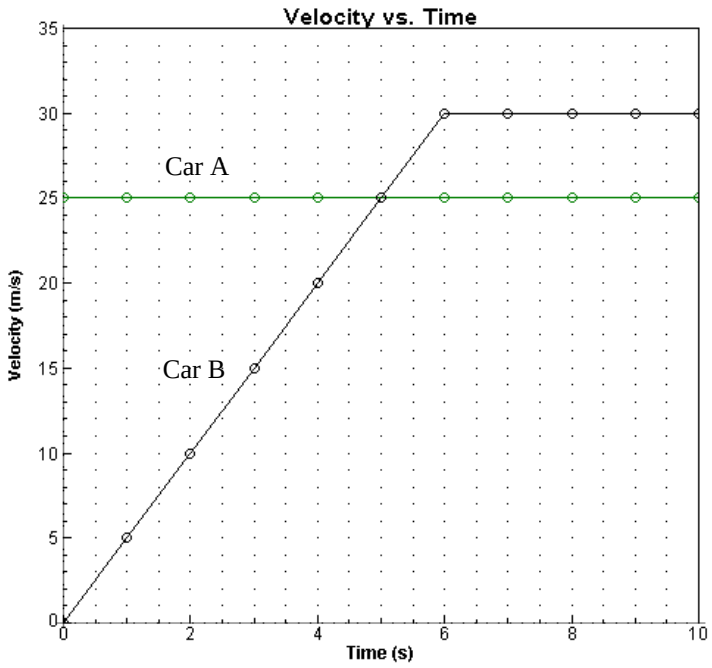
Question G:

Complete the missing Velocity-Time graph for the situation below. Assume all unknown initial velocity and acceleration values are zero.





The Velocity vs. Time graph below shows the velocities of two cars over a time period of 10 seconds. Use the graph to answer Questions #H - I below. Assume that both cars began with an initial position of zero.



Question H:

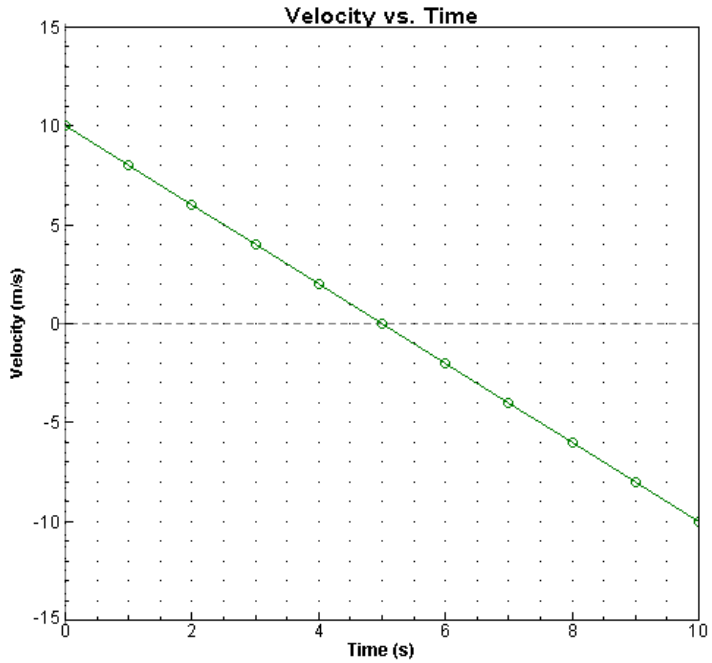
Use the area under a curve method to calculate the position of each of the cars after 10 seconds. Which car has experienced a greater change in position?

Question I:

Draw a rough sketch showing the general shape of a Position vs. Time graph for . . .

a) Car A.
b) Car B.

The Velocity vs. Time graph below shows the velocity of a single marble as it rolls in a straight-line path, beginning at a position of zero. Use the graph to answer Questions #J - M below.



Question J:

Is the marble traveling relatively fast, relatively slow, or stopped at a time of . . .

a) $t = 0$?
b) $t = 5$?
c) $t = 10$?

Question K:

a) What is the major difference between the motion of the marble at time $t = 0$ and at $t = 10$?

b) Describe the overall motion of the marble during the 10 second time period.

Question L:

Calculate the acceleration of the marble from . . .

a) 0 to 5 seconds.
b) 5 to 10 seconds.

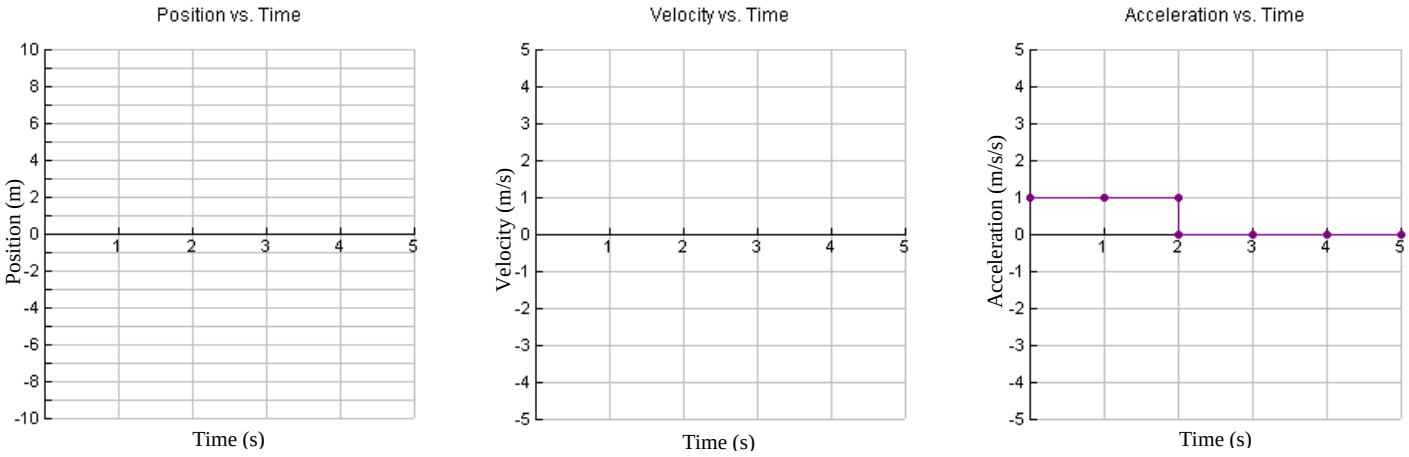
Question M:

Use the area under a curve method to calculate the displacement of the marble from . . .

a) 0 to 5 seconds.
b) 5 to 10 seconds.
c) 0 to 10 seconds.

Question N:

Complete the missing Position-Time and Velocity-Time graphs for the situation below. Assume all unknown initial position and velocity values are zero. Use the area under a curve method to calculate the displacements needed to complete the Position-Time graph.



Question O:

With the crack of his baseball bat, Bo Batter sends a fly ball straight up into the air with a speed of 25.0 m/s.

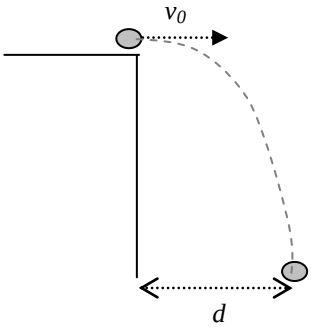
a) What is the speed of the ball after 3.0 seconds? Is the ball still flying up or falling back down towards the ground?

b) Calculate the exact time for the ball to reach the top of its path.

Question P:

The Steamboat Geyser in Yellowstone National Park, Wyoming, is capable of shooting its hot water up from the ground with a speed of 42.0 m/s. What is the height of a drop of water 2.6 seconds after it leaves the geyser?

AP Physics: Chapter 3
Projectile Motion



Question A:

An object is launched horizontally with an initial velocity v_o from the top of a cliff. It strikes a target located a horizontal distance d from the base of the cliff. In terms of v_o, d, and appropriate constants, determine . . .

a) the time of flight of the projectile.

b) the height of the cliff.

Question B:

A model rocket is fired due east, at an angle of 40.0˚ with the horizontal, with an initial velocity of 25.0 m/s. Neglecting air resistance, calculate . . .

a) the maximum altitude reached by the rocket.
b) the range of the rocket when it lands.

The same model rocket is again fired due east, at an angle of 40.0˚ with the horizontal, with an initial velocity of 25.0 m/s. In this case, a wind of 8.0 m/s is blowing due west.

c) Is the maximum altitude of the rocket affected by the wind? If so, calculate the new altitude. If not, explain why not.
d) Is the range of the rocket when it lands affected by the wind? If so, calculate the new range. If not, explain why not.

Question C:

A projectile is fired with an initial velocity v_0 at an initial angle θ from the horizontal. In terms of v_0, θ, and appropriate constants, determine . . .

a) the total time of flight of the projectile.
b) the maximum height reached by the projectile.

Question D:

During lunch break, Silly Sam shoots his water gun off of the second floor balcony. If a drop of water leaves the gun with a horizontal velocity of 24 m/s, what is . . .

a) the horizontal distance traveled by the drop after 0.86 seconds?
b) the vertical distance traveled by the drop after 0.86 seconds?

Question E:

A world record motorcycle jump occurred on August 31, 1986, when Chris Bromham took off on his Yamaha and jumped across a row of cars. Chris's jump was achieved with a velocity of 63.0 m/s and an angle of 25° to the horizon.

a) Calculate Chris's initial horizontal and vertical velocities.
b) How long did it take Chris to reach the highest point of his jump?
c) How long did it take Chris to complete his jump and return to ground level?

Question F:

Annie, the archery expert, shoots an arrow into the air with a velocity of 28.0 m/s, at an angle of 50° to the horizon.

a) How far away does the arrow land?
b) How high is the arrow at the highest point of its flight?

Question G:

In order to qualify for the 2000 Summer Olympics, Marion Jones won the long jump with a leap of 7.02 meters. Suppose her hang time for the entire jump was .81 seconds. What was the initial resultant velocity of Marion's jump?