Name _____ 1a

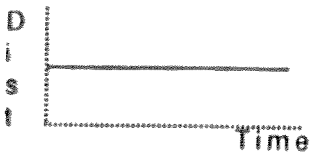
Lab Partner(s) _____

HOMEWORK: INTRODUCTION TO MOTION
Distance(Position)-Time Graphs

Answer the following questions in the spaces provided.

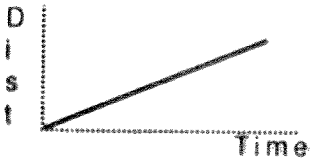
1. What do you do to create a horizontal line on a distance-time graph?

Be a certain distance away but don't move



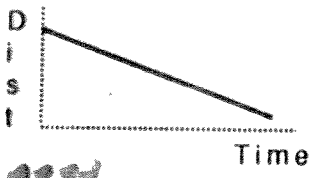
2. How do you walk to create a straight line that slopes up?

Walk away from detector at same steady speed



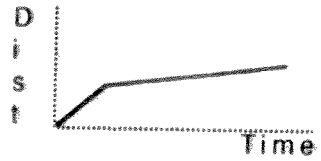
3. How do you walk to create a straight line that slopes down?

Walk Towards the detector at same steady speed



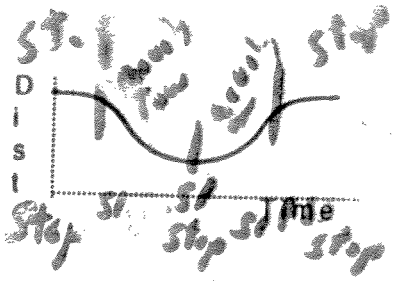
4. How do you move so the graph goes up steeply at first, and then continues up gradually?

Walk away from detector at a fast steady speed then switch to a slower steady speed



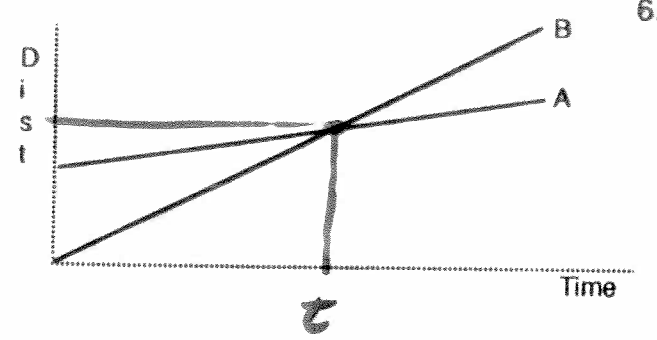
5. How do you walk to create a U-shaped graph?

From rest, quickly walk forward towards detector, then away again



16

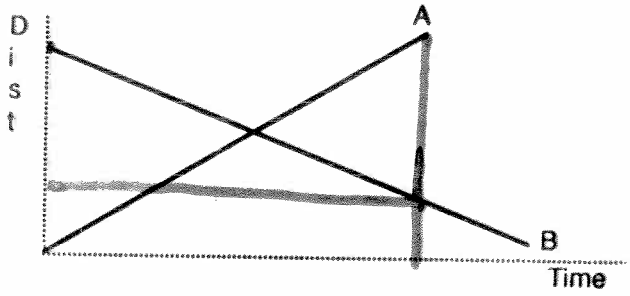
Answer the following about two objects, A and B, whose motion produced the following distance (position) -time graphs.



6. a) Which object is moving faster--A or B? B

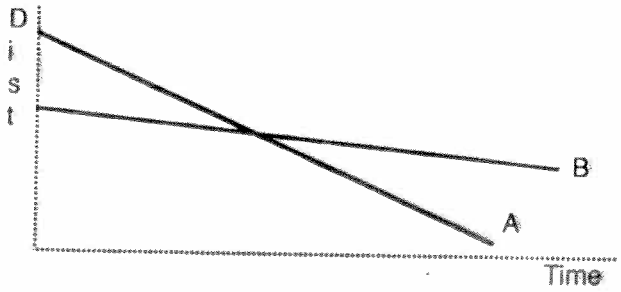
b) Which starts ahead? A
Define what you mean by "ahead."
A is further from the detector at the start

c) What does the intersection mean?
this is where both objects are momentarily the same distance from the detector.



7. a) Which object is moving faster? A (steeper slope)

b) Which object has a negative velocity according to the convention we have established? B



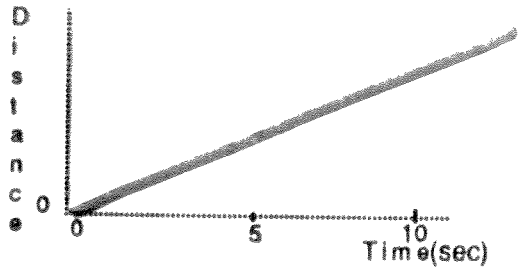
8. a) Which object is moving faster? A (steeper slope)

b) Which starts ahead? B
Explain what you mean by"ahead."
B is closer to detector and both objects are moving towards the detector so B is ahead of A as they beginning moving towards the detector.

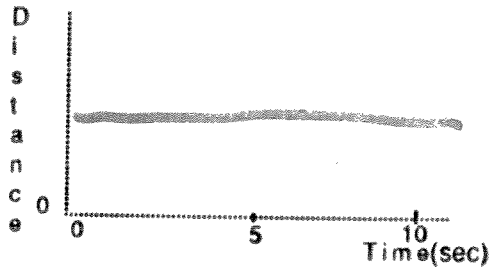
2a

Sketch the distance (position)-time graph corresponding to each of the following descriptions of the motion of an object.

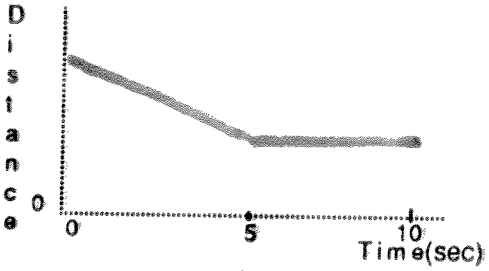
9. The object moves with a steady (constant) velocity away from the origin.



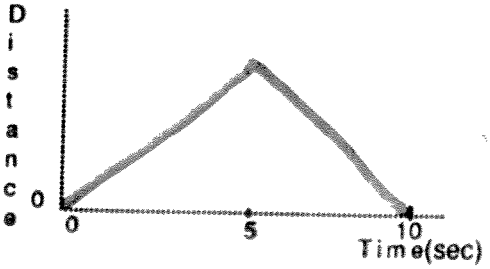
10. The object is standing still.



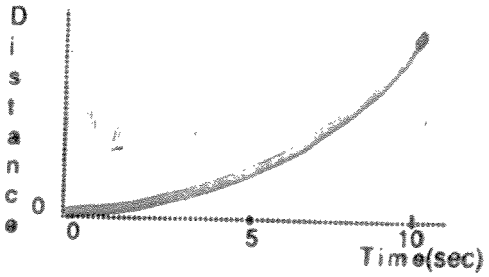
11. The object moves with a steady (constant) velocity toward the origin for 5 seconds and then stands still for 5 seconds.



12. The object moves with a steady velocity away from the origin for 5 seconds, then reverses direction and moves at the same speed toward the origin for 5 seconds.



13. The object moves away from the origin, starting slowly and speeding up.



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Velocity-Time Graphs

After studying the velocity-time graphs you have made, answer the following questions:

1. How do you move to create a horizontal line in the positive part of a velocity-time graph?

Move at a steady speed, away from the detector

2. How do you move to create a straight-line velocity-time graph that slopes up from zero?

steady speed, accelerating away from the detector.

3. How do you move to create a straight-line velocity-time graph that slopes down?

steadily slowing down from the detector decelerating away

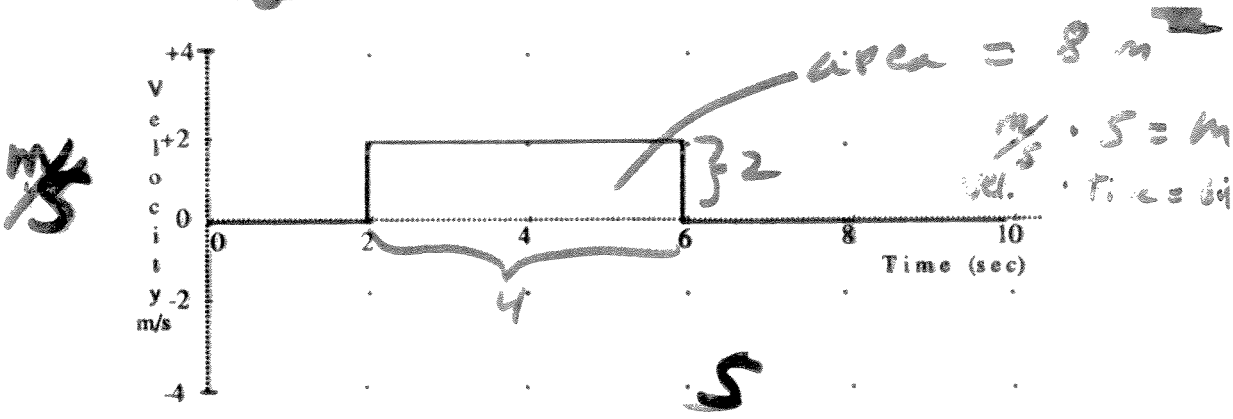
4. How do you move to make a horizontal line in the negative part of a velocity-time graph?

Move at a steady speed, towards the detector

3a

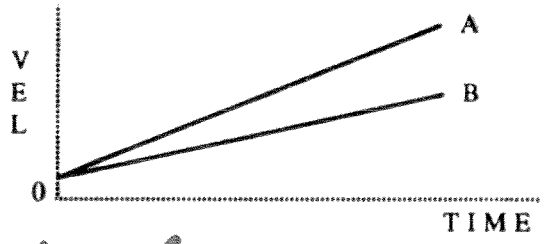
5. The velocity-time graph of an object is shown below. Figure out the total *distance* traveled by the object. Show your work.

Distance = 8 meters.



6. Both of the *velocity* graphs below, 1 and 2, show the motion of two objects, A and B. Answer the following questions separately for 1 and for 2. Explain your answers when necessary.
   a) Is one faster than the other? If so, which one is faster? (A or B)
   b) What does the intersection mean?
   c) Can one tell which object is "ahead"? (define "ahead")
   d) Does either object A or B turn around? Explain.

1



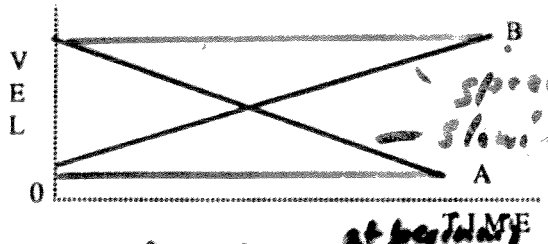
a) A is faster

b) Both A & B are moving at same speed at the time at intersection

c) No positions are not given, only speeds

d) no both keep moving away from detector

2



a) A is faster at beginning

b) Both A & B are moving at the same speed at the time of intersection

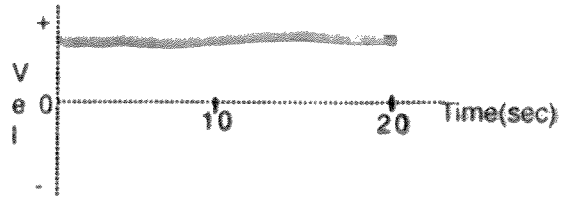
c) No positions are not given, only speeds

d) No, each objects motion continues towards (A) (B) the lines are going

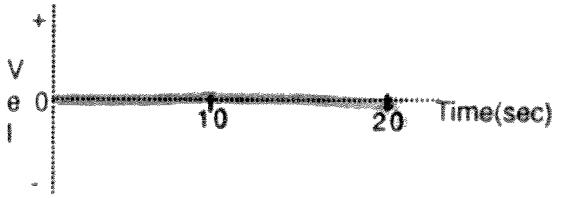
36

Sketch ~~velocity-time~~ the velocity -time graph corresponding to each of the following descriptions of the motion of an object.

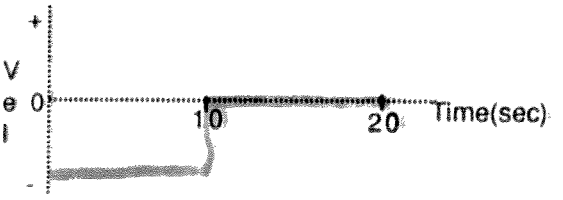
7. The object is moving away from the origin at a steady (constant) velocity.



8. The object is standing still.



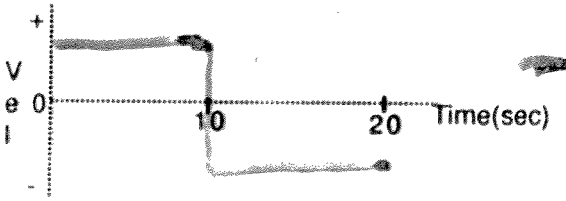
9. The object moves toward the origin at a steady (constant) velocity for 10 seconds, and then stands still for 10 seconds.



ideal

actual

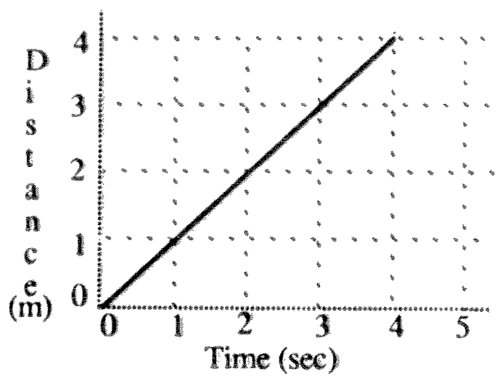
10. The object moves away from the origin at a steady (constant) velocity for 10 seconds, reverses direction and moves back toward the origin at the same speed for 10 seconds.

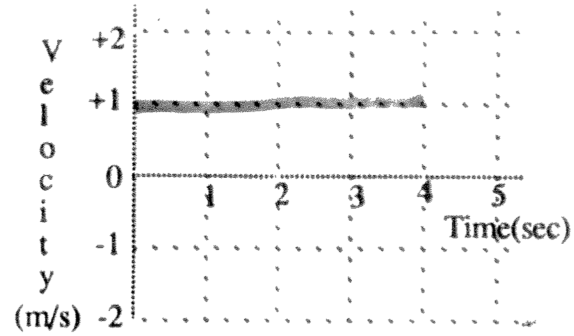


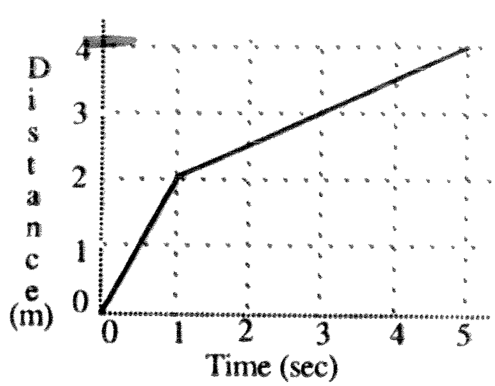
4a

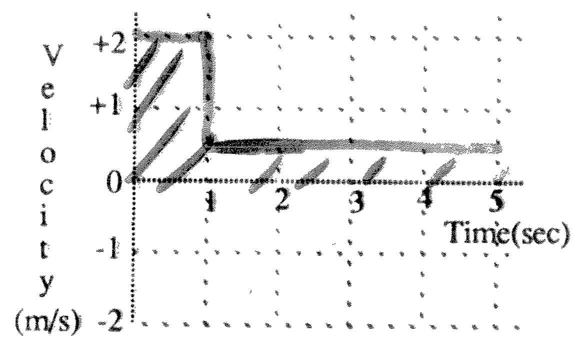
11. Draw the velocity graphs for an object whose motion produced the distance-time graphs shown below on the left. Distance is in meters and velocity in meters per second. (That is, the velocity is the number of meters the object would move in one second.)

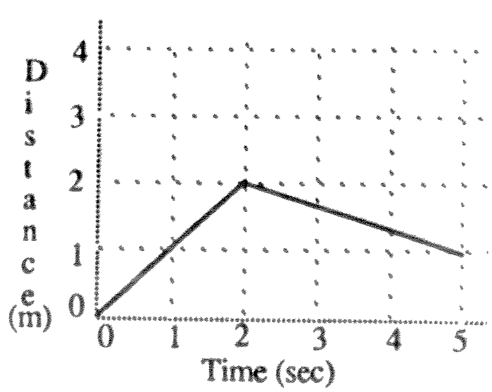
Note: Unlike most real objects, you can assume these objects can change velocity so quickly that it looks instantaneous with this time scale.

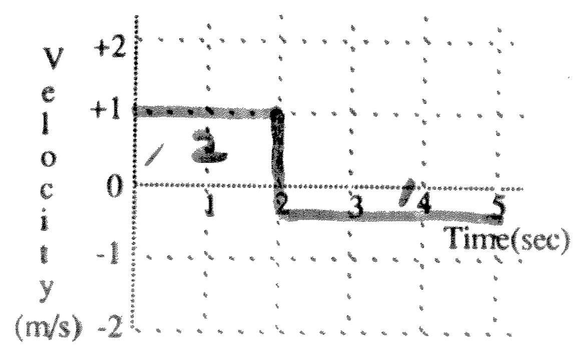






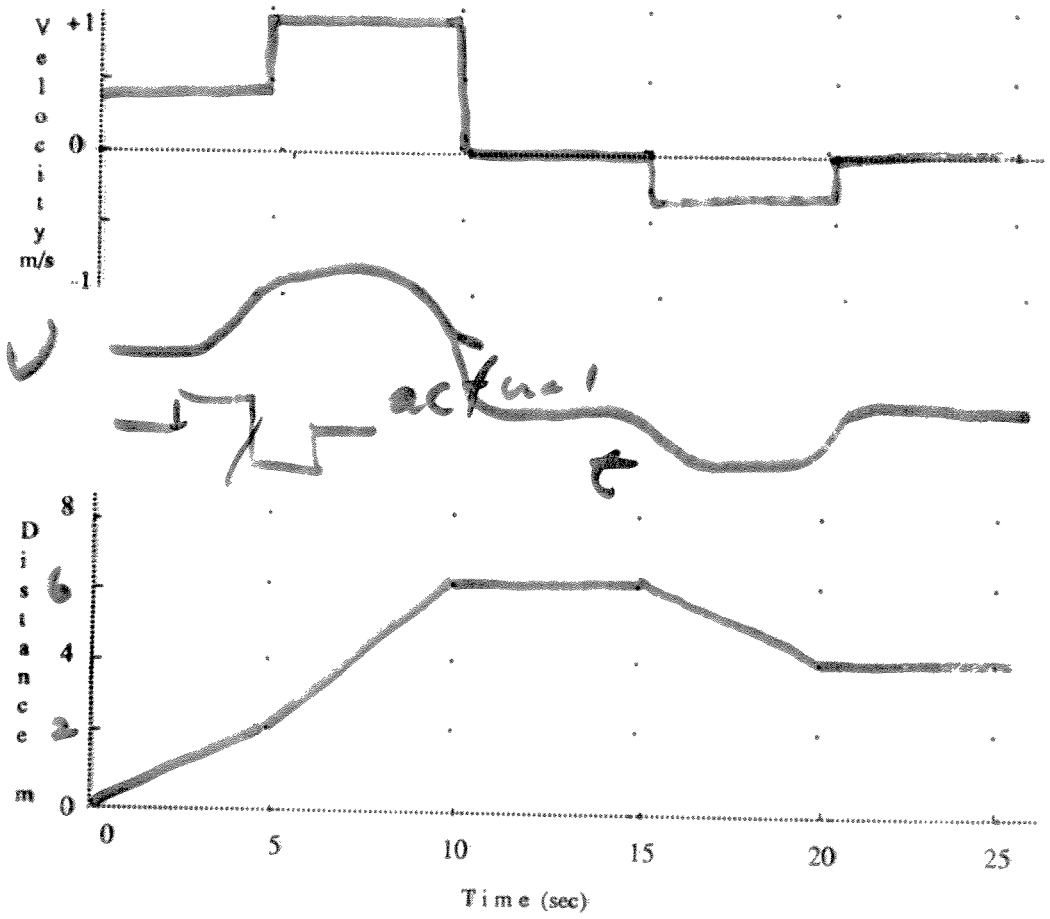






46

12. Draw careful graphs below of distance and velocity for a cart that—
    a. moves away from the origin at a slow and *steady* (constant) velocity for the first 5 seconds.
    b. moves away at a medium-fast, *steady* (constant) velocity for the next 5 seconds.
    c. stands still for the next 5 seconds.
    d. moves toward the origin at a slow and *steady* (constant) velocity for the next 5 seconds.
    e. stands still for the last 5 seconds.



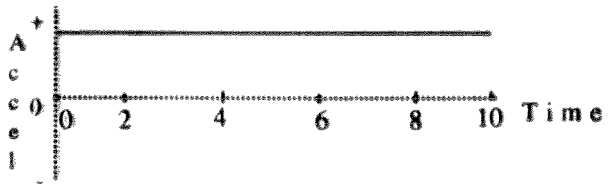
5a

Name_____

Lab Partner(s)_____

HOMEWORK: INTRODUCTION TO MOTION--CHANGING MOTION

After studying the acceleration and velocity graphs you made, answer the following questions.



1. An object moving along a line (the + distance axis) has the acceleration-time graph above. How might the object move to create this graph

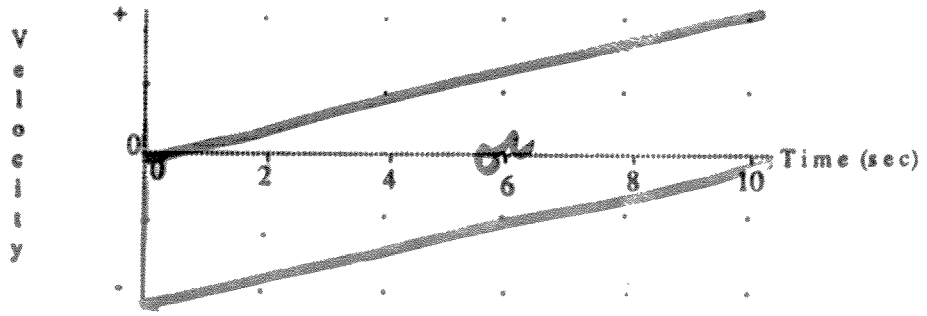
   A. If it is moving away from the origin

   Accelerating Constantly

   B. If it is moving toward the origin

   Decelerating Constantly

2. Sketch on the axes below the velocity-time graphs that go with the above acceleration-time graph (for cases A and B). Label your graphs.



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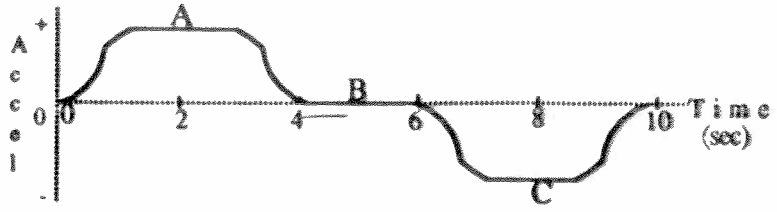


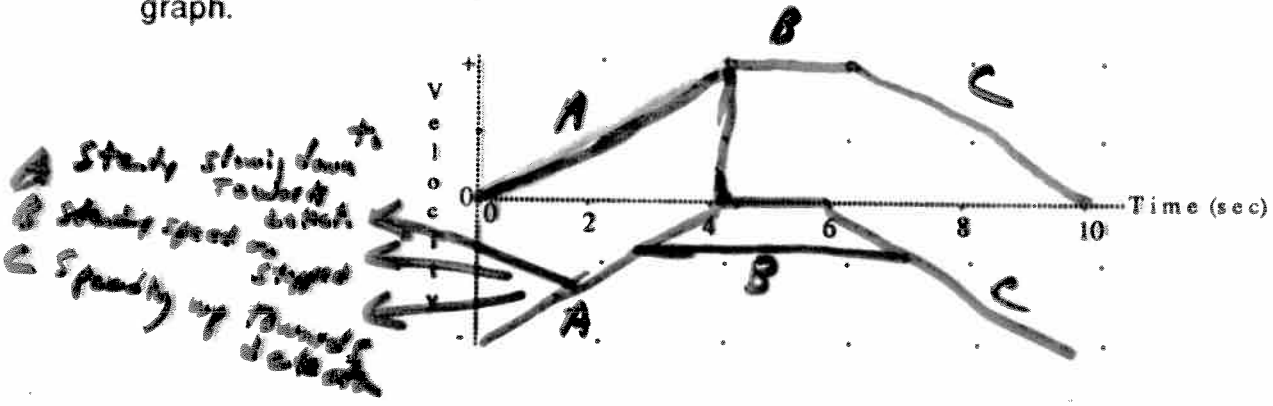
3. How would an object move to create each of the three labeled parts of the acceleration-time graph above?

A: Steady acceleration away from detector

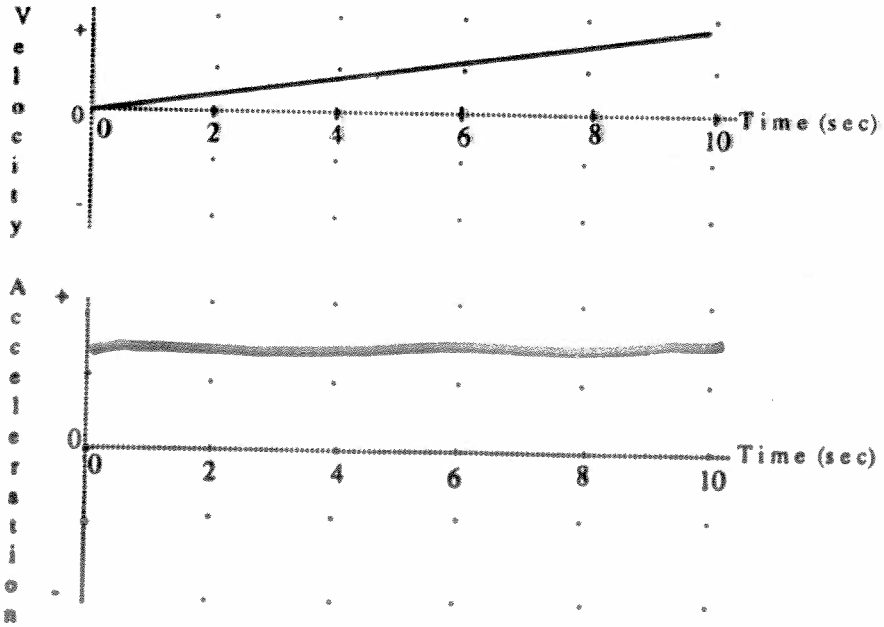
B: Stopping or steady speed (no acceleration)

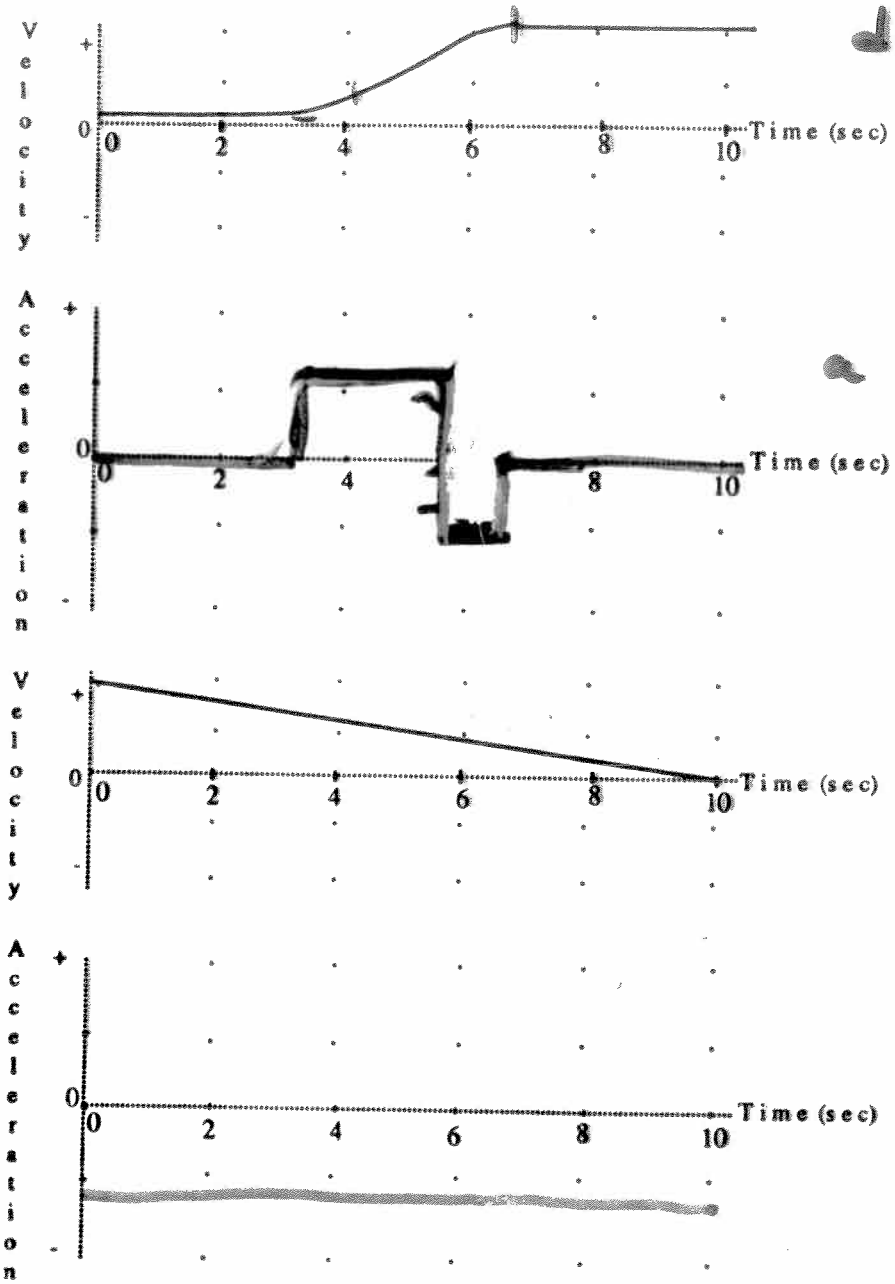
C: Steady deceleration away from detector

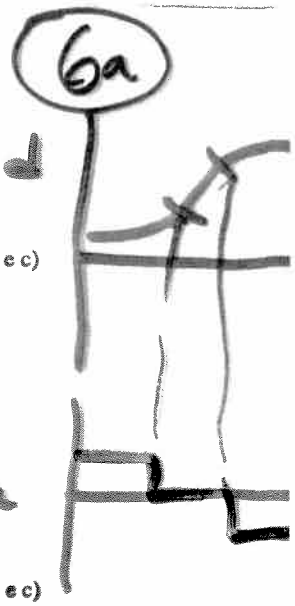
4. Sketch below a velocity-time graph which might go with the above acceleration-time graph.



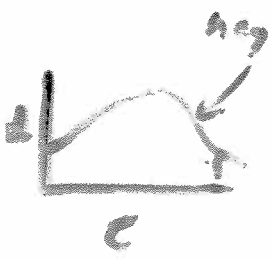
5. For each of the velocity-time graphs below, sketch the shape of the acceleration-time graph that goes with it.







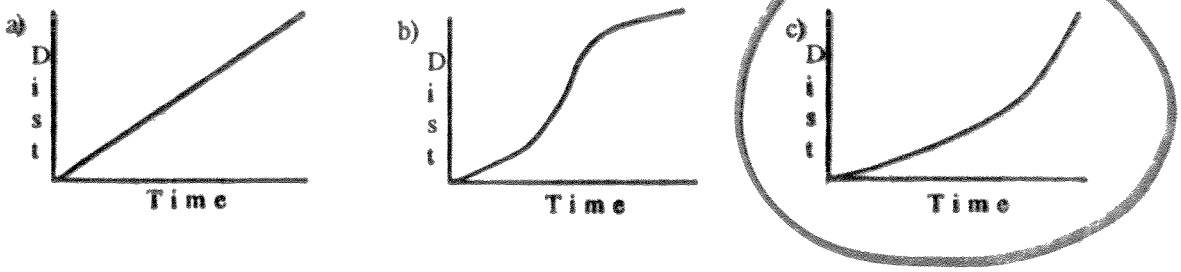
6. A car moves along a line [the + distance (position) axis]. Fill in the table below with the sign (+ or -) of the velocity and acceleration of the car for each of the motions described.



	Distance (Position)	Velocity	Acceleration Speeding Up	Acceleration Slowing Down
Car moves away from the origin	+	+	+	−
Car moves toward the origin	+	−	−	+

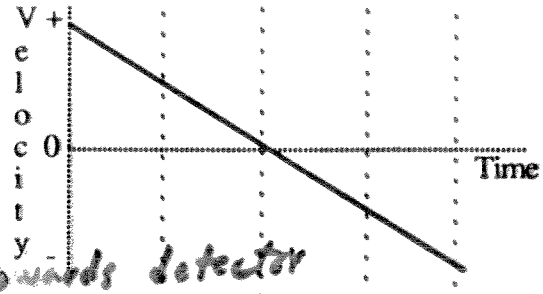
66

7. Which position-time graph below could be that for a cart that is steadily accelerating away from the origin?

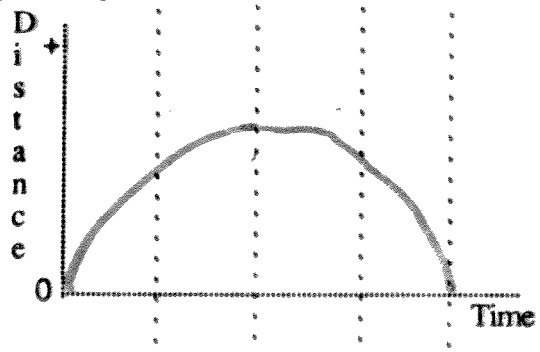


8. Describe how you would move to produce the velocity time graph on the right.

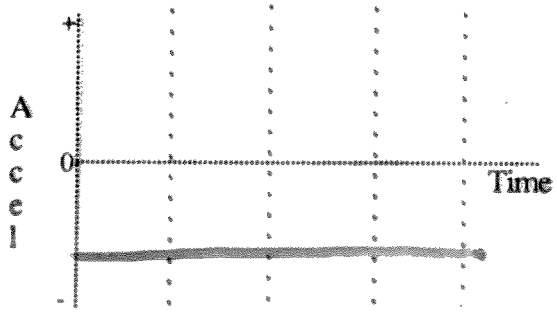
Moving away from detector but slowing down then stopping and speeding up towards detector



9. Sketch a distance-time graph graph for this motion on the axes on the right.



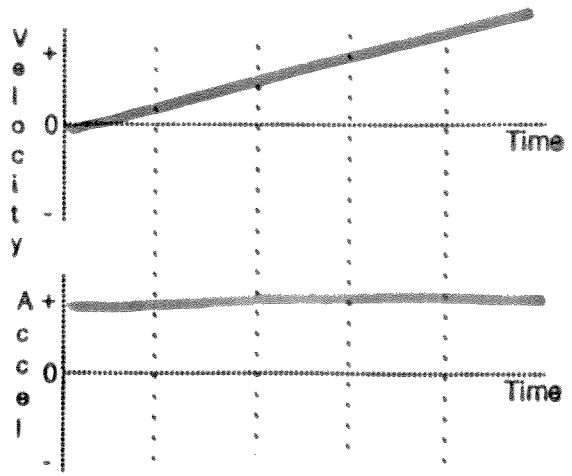
10. Sketch an acceleration-time graph for this motion on the axes on the right.



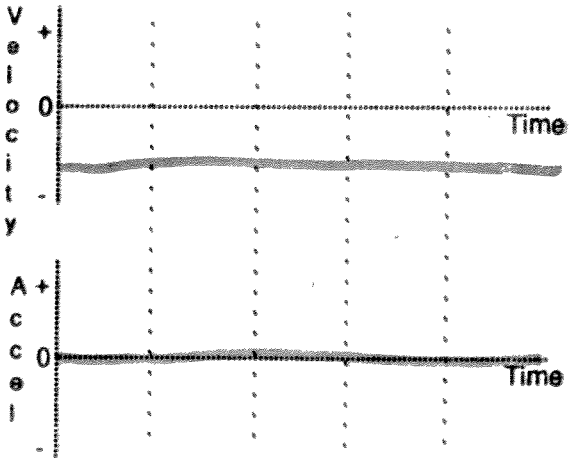
7a

A car can move in either direction along a line (the + distance axis). Sketch velocity-time and acceleration-time graphs which correspond to each of the following descriptions of the car's motion.

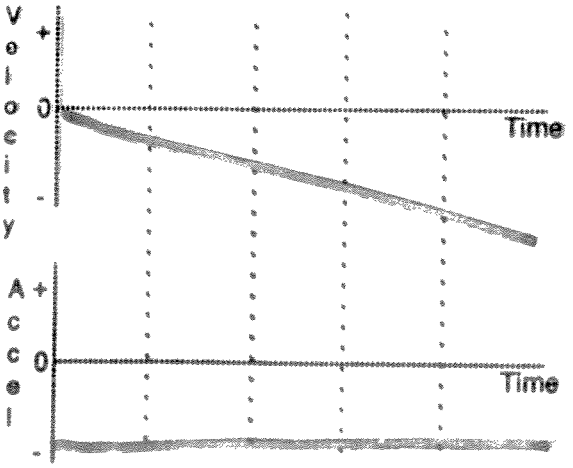
11. The car starts from rest, and moves away from the origin increasing its speed at a steady rate.



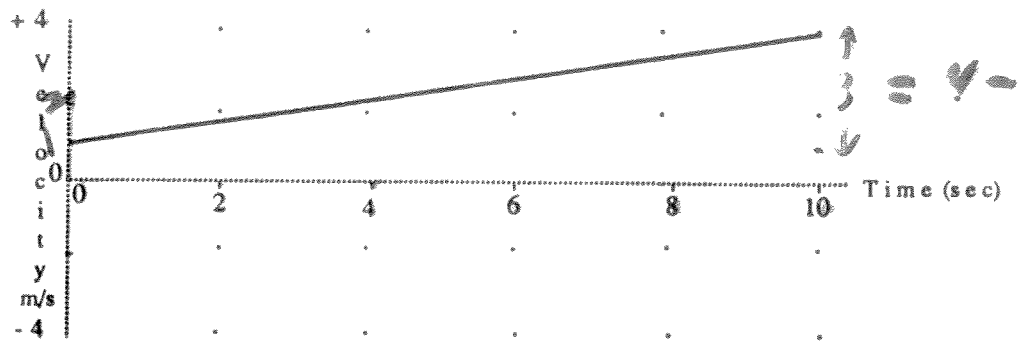
12. The car is moving toward the origin at a constant velocity.



13. The car starts from rest, and moves toward the origin, speeding up at a steady rate.



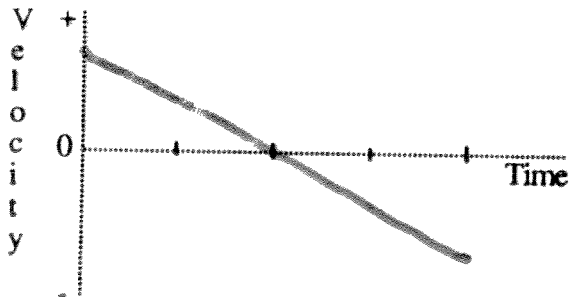
14. The following is a velocity-time graph for a car.

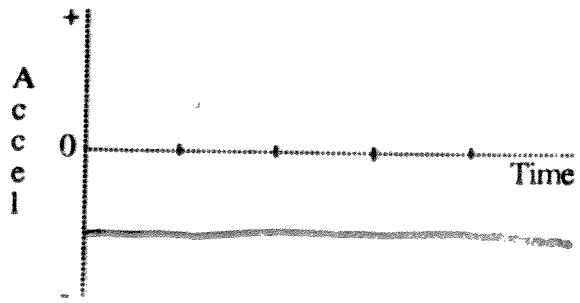


What is the average acceleration of the car? Show your work below.

$\frac{3\ m/s}{10\ s}$ $.3\ m/s^2$

15. A ball is tossed in the air. It moves upward, reaches its highest point and falls back downward. Sketch a velocity-time and an acceleration-time graph for the ball from the moment it leaves the thrower's hand until the moment just before it reaches her hand again. Consider the positive direction to be upward.





8

The graphs on this page represent the motion of objects along a line which is the positive distance (position) axis. Notice that the motion of objects is represented by distance, velocity, or acceleration graphs.

Answer the following questions. You may use a graph more than once or not at all, and there may be more correct choices than blanks. If none of the graphs is correct, answer J.

A 16. Pick one graph that gives enough information to indicate that the velocity is always negative.

Pick three graphs that represent the motion of an object whose velocity is constant (not changing).

A 17. F 18. I 19.

C 20. Pick one graph that definitely indicates an object has reversed direction.

I 21. Pick one graph that might possibly be that of an object standing still.

Pick 3 graphs that represent the motion of objects whose acceleration is changing.

B 22. E 23. G 24.

Pick a velocity graph and an acceleration graph that could describe the motion of the same object during the time shown.

F 25. Velocity graph. C

I 26. Acceleration graph. H