1. Which graph represents a student walking at constant speed away from the motion sensor? (A) (B) (C)

2. Which graph represents a student standing still? (A) (B) (C)

3. Which graph represents a student walking at constant speed toward the motion sensor? (A) (B) (C)

4. The following questions refer to Graph D.
   
a. Which line on graph D represents a person moving toward the detector with the lesser speed? (1) (2) (3) (4)
b. Which line on graph D represents a person moving away from the detector with the lesser speed? (1) (2) (3) (4)
c. Which line on graph D represents a person moving away from the detector with the greatest speed? (1) (2) (3) (4)
d. Which line on graph D represents a person moving toward the detector with the greatest speed? (1) (2) (3) (4)

5. What else can be determined from a distance vs time graph?
Action Physics Chapter 2 Quiz a – Interpreting Graphs of Motion

Darken in the correct answer(s) after each question. (The dark line represents the motion graph.)

1. Which graph(s) represent a car moving at constant speed away from the motion sensor? (A) (B) (C) (D) (E)
2. Which graph(s) represents a car standing still? (A) (B) (C) (D) (E)
3. Which graph(s) represent a car moving at constant speed toward the motion sensor? (A) (B) (C) (D) (E)
4. Which graph(s) represents a car moving away from, stops quickly and then moves toward the detector? (A) (B) (C) (D) (E)

5. The following questions refer to Graph F.
   a. Which line on graph F represents a car moving away from the detector with the greatest acceleration? (1) (2) (3) (4)
   b. Which line on graph F represents a car moving toward the detector with the greatest accelerations? (1) (2) (3) (4)
   c. Which line on graph F represents a car moving away from the detector with the lesser acceleration? (1) (2) (3) (4)
   d. Which line on graph F represents a car moving toward the detector with the lesser acceleration? (1) (2) (3) (4)

6. What else can be determined from a velocity vs time graph? Explain.
Darken in the correct answer(s) after each question.

1. Which segment(s) of the graph represent moving away from the detector? (1) (2) (3) (4) (5) (6)
2. Which segment(s) of the graph represent not moving? (1) (2) (3) (4) (5) (6)
3. Which segment(s) of the graph represent moving toward the detector? (1) (2) (3) (4) (5) (6)
4. Which segment(s) of the graph represent moving away from the detector at the greater speed? (1) (2) (3) (4) (5) (6)
5. Which segment(s) of the graph represent moving toward the detector at the greatest speed? (1) (2) (3) (4) (5) (6)
6. Which segment(s) of the graph represent moving away from the detector at the lesser speed? (1) (2) (3) (4) (5) (6)
7. Which segment(s) of the graph represent moving toward the detector at the lesser speed? (1) (2) (3) (4) (5) (6)
(a) not moving
(b) moving away from sensor speeding up
(c) moving away from sensor slowing down
(d) moving away from sensor at constant speed
(e) moving toward the sensor speeding up
(f) moving toward the sensor slowing down
(g) moving toward the sensor at constant speed

In the following 10 questions, choose the correct answer from the 7 choices above and darken in the correct answer. (8 points each)

1. In segment 1, you are: (a) (b) (c) (d) (e) (f) (g)
2. In segment 2, you are: (a) (b) (c) (d) (e) (f) (g)
3. In segment 3, you are: (a) (b) (c) (d) (e) (f) (g)
4. In segment 4, you are: (a) (b) (c) (d) (e) (f) (g)
5. In segment 5, you are: (a) (b) (c) (d) (e) (f) (g)
6. In segment 6, you are: (a) (b) (c) (d) (e) (f) (g)
7. In segment 7, you are: (a) (b) (c) (d) (e) (f) (g)
8. In segment 8, you are: (a) (b) (c) (d) (e) (f) (g)
9. In segment 9, you are: (a) (b) (c) (d) (e) (f) (g)
10. In segment 10, you are: (a) (b) (c) (d) (e) (f) (g)

Darken in the correct answer.

11. Assume you started from some point, where did you end up? (2 points)
(a) At the position where you started?
(b) Closer to the sensor than where you started?
(c) Further away from the sensor than where you started?

12. Coming to school this morning, a car drew opposite your instructors car. It took 12 seconds for the car to reach a bridge further down the road. It took your instructor 21 seconds to reach the same bridge. Your instructor glanced down and saw that he was traveling at 63 miles per hour. How fast was the other car going? Show your work. (3)
1. What must you do to create a horizontal line on a distance-time graph?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

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

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

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

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

6. a. Which object is moving faster, A or B? ___
    b. Which starts ahead, A or B? ___ Define what you mean by "ahead".
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________

7. a. Which object was moving faster, A or B? ___
    b. Which object has a negative velocity according to the convection we have established. ___
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________

8. a. Which object was moving faster, A or B? ___
    b. Which starts ahead, A or B? ___ Define what you mean by "ahead".
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
1. How do you move to create a horizontal line in the positive part of a velocity-time graph at the right? (2)

2. How do you move to create a straight-line velocity-time graph that slopes upward as shown at the right? (2)

3. How do you move to create a straight-line velocity-time graph that slopes downward shown at the right? (2)

4. How do you move to create a straight-line velocity time graph that slopes upward as shown at the right? (2)

5. The velocity-time graph of the movement of an object is shown at the right. (4)
   The distance traveled is ____________. The displacement is ____________.
   Sketch v-t graphs corresponding to:

6. Object moving away from the origin at constant speed. (1)

7. The object is accelerating in a positive direction. (1)

8. The object moves toward the origin at a constant speed for 1/4th the time, stands still for 1/4th the time and then moves away at constant speed in the remaining time. (2)

9. The object moves toward the origin at a constant velocity for half the time, reverses direction and moves away from the origin at the same speed in the other half. (2)
10. Both of the velocity graphs below, 1 and 2, show the motion of two objects, A and B. Answer the following questions separately for graph 1 and graph 2. (8)

a. Is one acceleration greater than the other one? If so, which is greater, A or B?
b. What does the intersection where the two graphs indicate?
c. Which object is ahead? Explain why.
d. Does either object, A or B, reverse direction? Explain

(a) 
(b) 
(c) 
(d) 

11. Draw careful graphs below of distance-time and velocity for a car that: (10)

a. moves away from the origin to the 2 meter mark at a slow, constant speed for the first 5 seconds.
b. moves away at a medium-fast, constant speed of 0.8 m/s for the next 5 seconds.
c. moves toward the origin at a slow, constant speed of 0.5 m/s for the next 5 seconds.
d. stands still for the next 3 seconds.
e. moves toward the origin at a slow, constant speed of 0.5 m/s for the next 5 seconds.

Distance-Time Graph:

```
<table>
<thead>
<tr>
<th>Time (s)</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (m)</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>
```

Velocity-Time Graph:

```
<table>
<thead>
<tr>
<th>Time (s)</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velocity (m/s)</td>
<td>-1</td>
<td>0</td>
<td>0.5</td>
<td>0.8</td>
<td>0</td>
<td>-0.5</td>
</tr>
</tbody>
</table>
```
I. The position of an object as a function of time is shown in the diagram at the left.

1. What is the velocity during the first second?
2. What is the average velocity during the first 7 seconds?
3. What is the velocity during the second second?
4. What is the velocity at $t = 3$ seconds?
5. What is the velocity at $t = 5$ seconds?
6. What is the displacement during the first 6 seconds?
7. What is the distance traveled during the first 7 seconds?

II. The velocity of an object as a function of time is shown in the diagram at the right.

8. How far does the object go during the first second?
9. How far does the object go during the 2nd second?
10. What is the acceleration at $t = 1.5$ second?
11. What is the acceleration at $t = 3.0$ seconds?
12. What is the acceleration at $t = 5.0$ seconds?
13. How far did the object go from $t = 4$ to $t = 7$ see?

III. Plot the following graphs

1. A velocity vs time graph of the displacement-time graph at left.
2. A position vs time graph of the velocity-time graph at right.
Car A is stopped at a traffic light. The light turns green and A starts up. Just as it does so, car B passes it, going at a steady velocity. Their velocity-time curves are shown above. Explain how you solved each part.

a. How long does it take car A to be going as fast as car B?

b. At that time, how much is car B ahead of car A?

c. Which car is ahead, and by how much, at the end of 0.008 hour?

d. At what time does car A catch up with car B?

e. How far have they traveled from the traffic light by the time car A catches up?
IS THERE A DIFFERENCE BETWEEN VELOCITY AND ACCELERATION?

The following is taken from
Conceptual Physics
Second Edition
Page 21

Adapted for Operation Physics Force and Motion Workshop
by
Dick Heckathorn

Much of the confusion that arrives in analyzing the motion of objects comes about from mixing up "how fast" with "how far". When we wish to specify how fast something is traveling we are talking about speed or velocity. When we wish to specify how far that object has gone, we are talking about distance.

The most confusing concept, and one of the most difficult encountered is "how quickly does speed or velocity change". This we call acceleration. What makes acceleration so complex is that it is a rate of a rate. It is often confused with velocity which is itself a rate (the rate at which distance is covered). Acceleration is not velocity, nor is it even a change in velocity; acceleration is the rate at which velocity itself changes.

The following activity is designed to illustrate the difference between velocity and acceleration.

To show constant velocity:

1. Go into the hall or to a place that has floor tile on the floor. If none is available, place masking tape on the floor at an evenly spaced distance, say 8 inches.

2. While someone claps at a regular rate, move 1 tile per clap (or if you would like every other clap). Do this for about 10 claps.

3. Next do 2 tiles per clap, then 3 tiles per clap and finally 4 tiles per clap.

4. What type of motion have you demonstrated? [steady velocity at 1 tile per clap (1 tile/clap)]

To show an acceleration of 1 tile/clap/clap:

1. While someone claps at a regular rate, move 1 tile during the first clap interval, 2 tiles during the second clap interval, 3 tiles during the third clap interval, 4 tiles during the fourth clap interval and so forth.

2. How long did it take before you were unable to accelerate at 1 tile/clap/clap?

Describe to someone near you velocity, acceleration and the difference between the two.