Part I

1. An object goes from one point in space to another. After it arrives at its destination

    (a) its displacement is the same as its distance traveled.
    (b) its displacement is always greater than its distance traveled.
    (c) its displacement is always smaller than its distance traveled.
    (d) its displacement is never larger than its distance traveled.

2. If the acceleration of a car is zero, must its velocity be zero? If the velocity of a car is zero must its acceleration be zero? Explain your answers.

3. An accelerating body must at all times

    (a) have positive velocity.
    (b) have an increasing speed.
    (c) have a changing direction.
    (d) have a changing velocity.

4. The diagram below shows a piece of a ticker tape which passed through a vibrating marker which vibrated at a constant rate of 20 s^{-1}
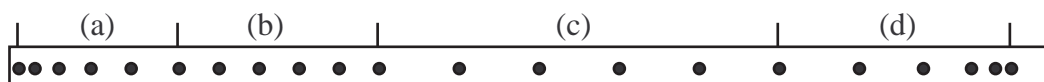

   In which region was the average speed the greatest? In which region was average acceleration the greatest?

5. A ball is thrown straight up from height H while a second is thrown straight down. Neglect air resistance. After the balls have been released

    (a) the one thrown up has the greater acceleration.
    (b) the one thrown down has the greater acceleration.
    (c) the accelerations are the same.
    (d) neither ball accelerates after it has been released.

Part II

1. The motion of a particle is described by the position-time graph shown below. During which interval is the *instantaneous* velocity of the particle greatest?
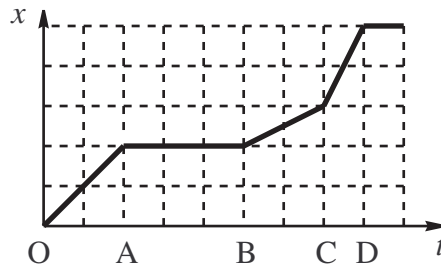
(a) OA   (b) AB   (c) BC   (d) CD

2. For the above position-time graph during which interval is the *average* velocity greatest.

(a) OA   (b) OB   (c) OC   (d) OD

3. Given an example of an object that has

   (a) high velocity and low acceleration.

   (b) low velocity and high acceleration.

   (c) an unchanging speed but high acceleration.

4. Two stones are released from rest at a certain height, one slightly after the other. Answer the following questions regarding their motion as they fall through the air, with explanations.

   (a) will the difference in their speeds increase, decrease, or stay the same?

   (b) will their distance between them increase, decrease, or stay the same?

   (c) will the time interval between the instants at which they hit the ground be smaller than, equal to, or larger than the time interval between the instants of their release?

5. A sprinter in a 100 dash accelerates uniformly from rest reaching a top speed of 14.7 m/s after 6.00 seconds. He then runs at constant speed for the remainder of the race.

   (a) What is his rate of acceleration during the initial phase of the race?

   (b) How far did he travel in the first phase of the race?

   (c) What was his time in the race?

   (d) What was his average acceleration over the entire race?

   (e) What was his average speed over the entire race?

6. The following graphs show the motion of a toy car along a straight track. For each situation describe the motion and complete and sketch the missing graph.

(a)

(b)

(c)

(d)