AP Physics
Instructor: Mr. Butler

Target Test
Rectilinear Kinematics II

1. Suppose that an object is moving with constant nonzero acceleration. Which of the following is an accurate statement concerning its motion?

A) In equal times its speed changes by equal amounts.
B) In equal times its velocity changes by equal amounts.
C) In equal times it moves equal distances.
D) A graph of its position as a function of time has a constant slope.
E) A graph of its velocity as a function of time is a horizontal line.

2. The motion of a particle is described in the velocity versus time graph shown in the figure. We can say that its speed
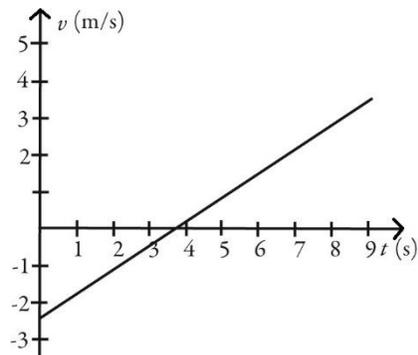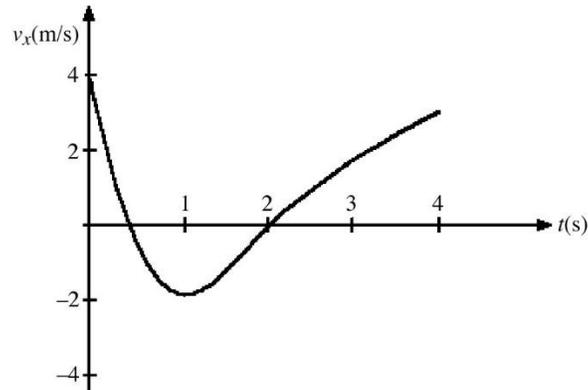

A) increases.
B) decreases.
C) increases and then decreases.
D) decreases and then increases.

3. An object is moving with constant non-zero acceleration along the $+x$-axis. A graph of the velocity in the x direction as a function of time for this object is

A) a horizontal straight line.
B) a vertical straight line.
C) a straight line making an angle with the time axis.
D) a parabolic curve.

4. The figure represents the velocity of a particle as it travels along the x-axis. At what value (or values) of t is the instantaneous acceleration equal to zero?

A) $t = 0$
B) $t = 0.5$ s and $t = 2$ s
C) $t = 1$ s

5. Two objects are dropped from a bridge, an interval of 1.0 s apart, and experience no appreciable air resistance. As time progresses, the DIFFERENCE in their speeds
A) increases.
B) remains constant.
C) decreases.
D) increases at first, but then stays constant.
E) decreases at first, but then stays constant.

6. On the earth, when an astronaut throws a 0.250-kg stone vertically upward, it returns to his hand a time T later. On planet X he finds that, under the same circumstances, the stone returns to his hand in $2T$. In both cases, he throws the stone with the same initial velocity and it feels negligible air resistance. The acceleration due to gravity on planet X (in terms of g) is

A) $g/4$.
B) $g/2$.
C) $g/\sqrt{2}$.
D) $g\sqrt{2}$.
E) $2g$.

7. Uniform acceleration means that

A. speed changes by equal amounts during equal time intervals.
B. acceleration changes by equal amounts during equal time intervals.
C. velocity changes by equal amounts during equal time intervals.
D. position changes by equal amounts during equal time intervals.
E. displacement changes by equal amounts during equal time intervals.

8. Use the *acceleration-time* graph of an object moving in a straight line below to answer the following question.
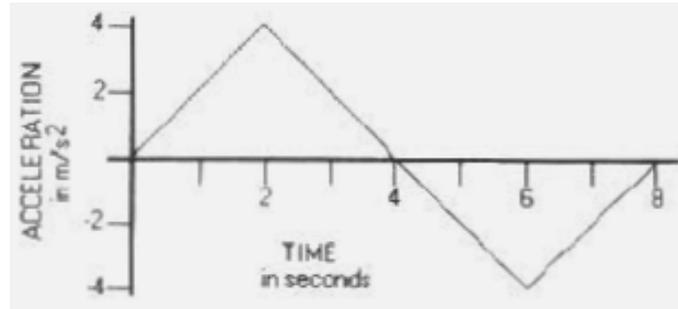

For which time interval does the object move with uniform acceleration?

   A. Between 0 and 2 s
   B. Between 2s and 6s
   C. Between 6s and 8s
   D. All time intervals
   E. No time intervals

9. Acceleration is defined as

   A. the rate at which the position changes with respect to time.
   B. the rate of change of speed with respect to time.
   C. the difference between the initial and final positions with respect to time.
   D. the rate of change in velocity with respect to position.
   E. None of the above

10. A freely falling body has a constant acceleration of 9.8 m/s² when the effect of air is neglected. This means that:

   A. the body falls 9.8 m during each second
   B. the body falls 9.8 m during the first second only
   C. the speed of the body changes by 9.8 m/s during each second
   D. the acceleration of the body increases by 9.8 m/s² during each second
   E. the acceleration of the body decreases by 9.8 m/s² during each second

11. Which of the following statements concerning the motion of freely-falling objects are true?

   I.   The velocity varies with time according to Galileo's law of odd numbers.
   II. The distance traveled in individual successive time intervals varies according to Galileo's law of squares.
   III. The acceleration will be uniform as the object falls.

   (A) I only   (B) III only   (C) I and II only   (D) I and III only   (E) II and III only

12. A tick tape is passed through a tick-tape device and attached to a small mass. The mass is then dropped from rest and allowed to fall freely. Which of the tick tapes below would correspond to the falling mass? *Assume that the bottom of the tick tape in each case went through the device first.*

Neglect the effect of air.

Bottom

<A>   <B>   <C>   <D>   <E>
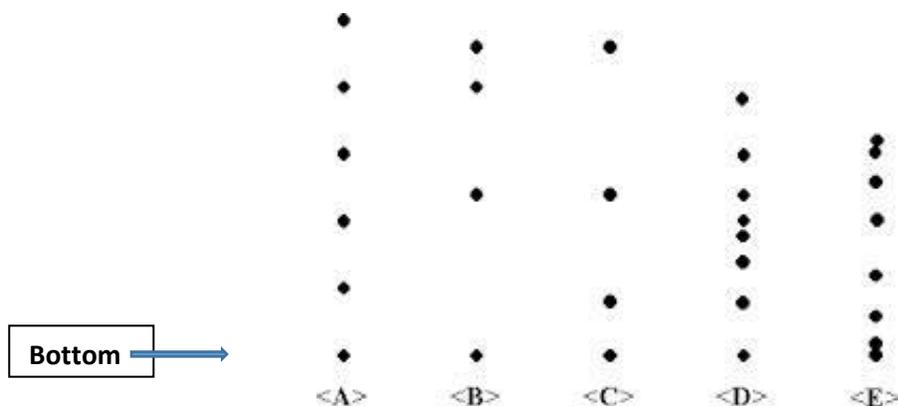
13. Which statements regarding medieval scholars' descriptions of motion are accurate?

   a. Nicole Oresme argued that that speed of a falling body varies proportionally with the distance it falls.
   b. Albert Saxony conducted the first serious quantitative study of motion.
   c. Da Vinci hypothesized that freely falling bodies accelerate and that the distances fallen increase with time.
   d. Galileo's attempts to describe free-fall motion were based on carefully designed experiments in observing and measuring dropped objects of differing weights from the tower in Pisa.
   e. Galileo used the inclined plane to speed up the motion of objects so he could measure their motion with more accuracy.

A skydiver makes a jump from an airplane flying at a high altitude. The figure below shows the forces on the skydiver at certain points in the fall. Use the figure to answer questions 14 and 15.
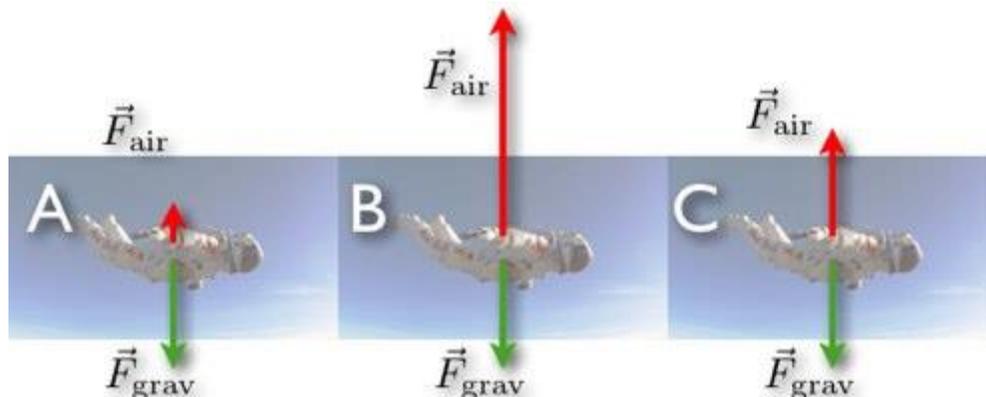
Which diagram corresponds to the point in the fall where:

14. the skydiver reaches a zero acceleration?

15. the velocity of the skydiver is increasing?

16, The diagram below shows a ball rolling a long a track that turns sticky at x=0.

2 frames
per second
t = 0 s

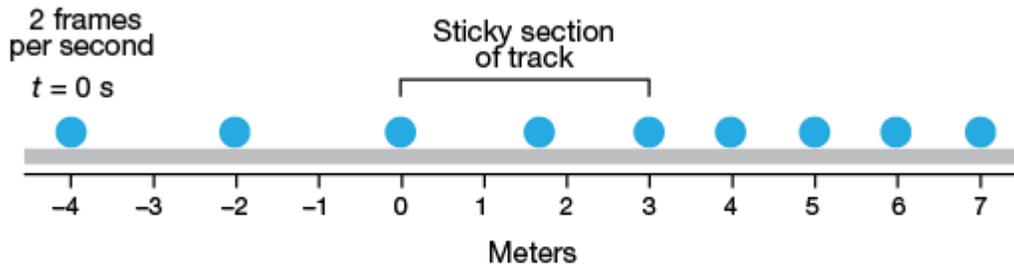Sticky section
of track

Meters

Figure 6. Motion Diagram of a Ball Moving on a Track with a Sticky Section

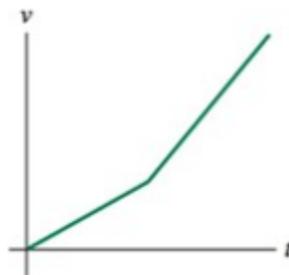Which set of vector arrows correctly represents the ball's motion at the indicated position?

a.   x = -2   a > , v >
b.   x = 0   a > , v <
c.   x = 1.8   a < , v >
d.   x = 5   a >, v >
e.   none of the above

17. Consider the following:

Here is a motion diagram of a car moving along a straight stretch
of road:

What can be said about the following velocity graph regarding the car's motion?

a.   The graph correctly represents the car's motion because it shows that the car's speed
     increases according to the velocity vectors in the motion diagram.
b.   The slopes of the two line sections on the graph should be interchanged in order to agree with
     the velocity vectors in the motion diagram.
c.   No part of the velocity graph agrees with the way the car moves according to the motion
     diagram.

Refer to the following rectilinear motion graphs for questions 18-20.
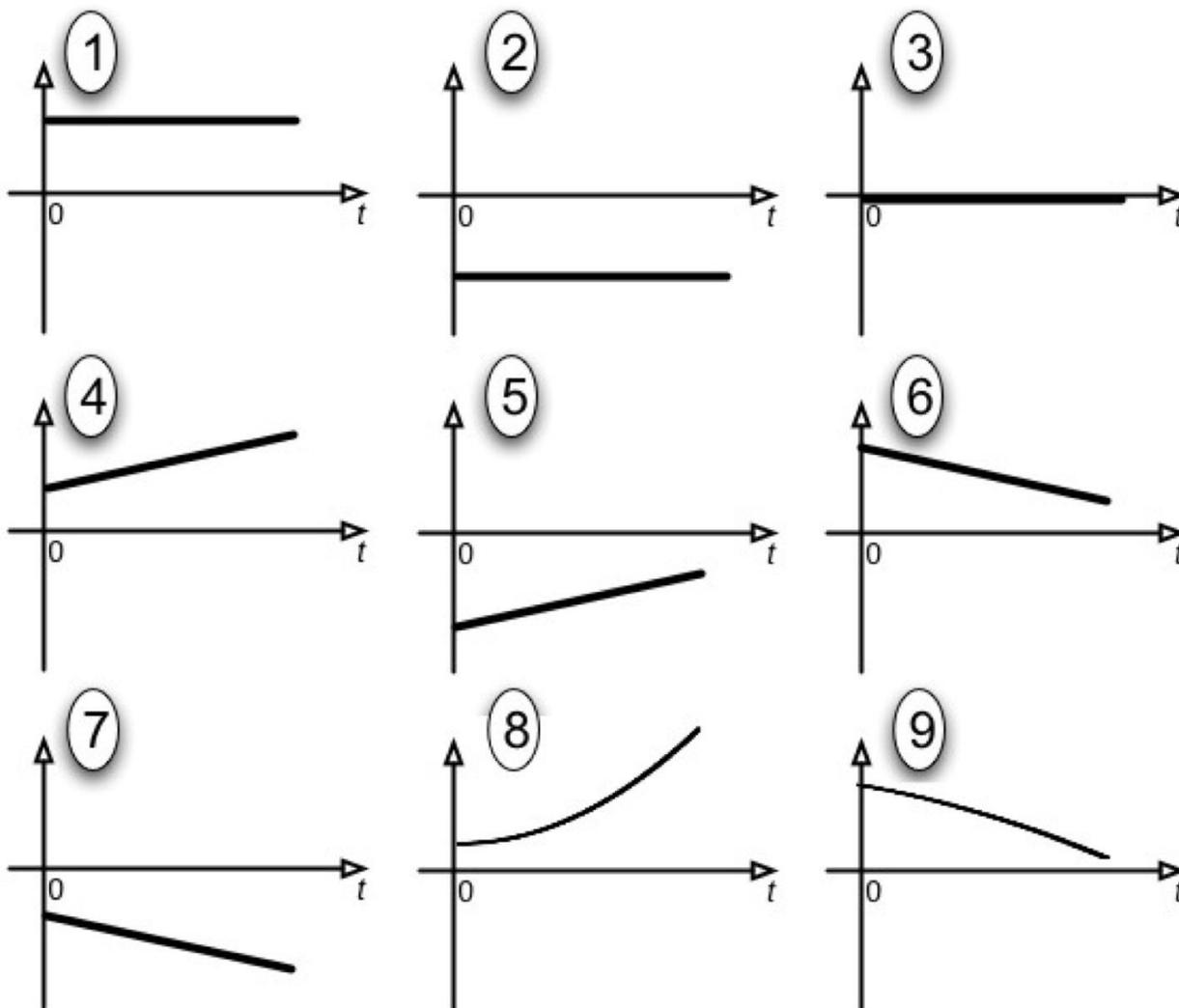
18. If **Graph 8** represents position-time, which two graphs could represent the velocity and acceleration for the same motion?

    a. 7 and 6   b. 4 and 5   c. 1 and 6   d. 5 and 2   e. none of these

19. If **Graph 9** represents position-time, which two graphs could represent the velocity and acceleration for the same motion?

    a. 6 and 2   b. 4 and 5   c. 1 and 6   d. 5 and 2   e. none of these

20. If **Graph 7** represents velocity-time, which two graphs could represent the position and acceleration for the same motion?

    a. 6 and 2   b. 9 and 2   c. 9 and 1   d. 4 and 2   e. none of these

Answer Key

1. B
2. D
3. C
4. C
5. B
6. B
7. C
8. E
9. E
10. C
11. B
12. C
13. C
14. C
15. A
16. E
17. C
18. E
19. E
20. B