Kinematics Practice Items

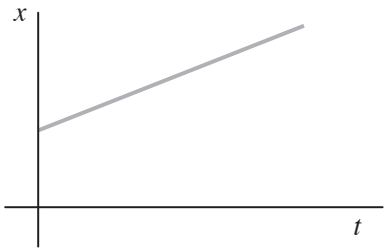
1. Which of the following is not a vector quantity?

A. The velocity of a golf ball in flight
B. The distance from Atlanta to Dallas
C. The acceleration of a feather in free fall through a vacuum
D. The displacement of a fluid particle from one end of a pipe section to the other

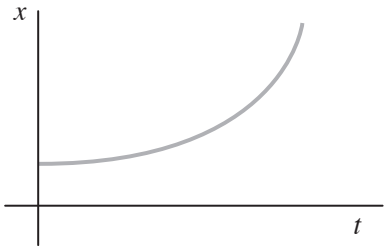
2. Which of the displacement-time graphs below represents constant positive velocity?

A.

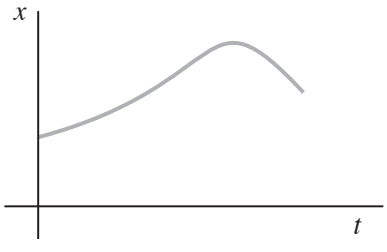
B.



C.



D.



3. Speed...

A. is the magnitude of the change per unit time of the velocity vector.
B. can never be negative.
C. is equivalent to the slope of the line tangent to the displacement curve.
D. has both magnitude and direction.

x

4. How long does it take a ball thrown straight upwards at 10 m/s to reach its maximum height (neglecting air resistance)?

A. 5 s
B. 0.5 s
C. 1 s
D. 10 s

5. An automobile travels in a straight line for 10 seconds at 20 m/s then accelerates uniformly to a speed of 30 m/s in the next 10 seconds. Find the total displacement.

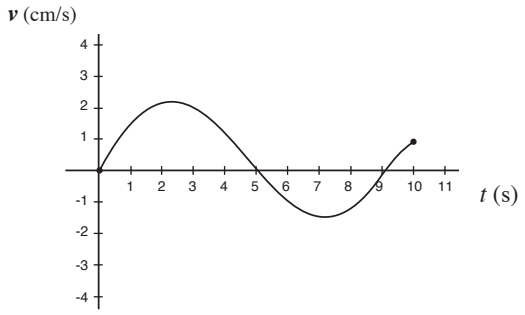
A. 450 m
B. 500 m
C. 550 m
D. 800 m

6. At time t = 10 s a dragster is moving in a straight line with a velocity of 80 m/s. At t = 20 s its velocity is 120 m/s. What is the average velocity of the dragster for the interval 10 s to 20 s?

A. 95 m/s
B. 100 m/s
C. 110 m/s
D. cannot be determined from given information

The graph below pertains to questions 7-9.

The graph was derived from measurements of blood velocity within the port of a hemodialysis catheter carried out over ten seconds.



7. At which approximate moment in time did the blood cease moving forward and begin moving backward in the catheter?

A. 2.2 s
B. 5.0 s
C. 7.2 s
D. 9.1 s

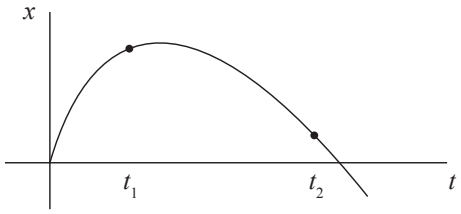
8. At which approximate moment in time did a volume element in the blood experience an acceleration equal to zero?

A. 0 s
B. 5.0 s
C. 7.2 s
D. 10 s

9. Which of the following is the nearest approximation of the average acceleration of a volume element within the blood during that time period?

A. 0.001 m/s^2
B. 0.1 m/s^2
C. 1 m/s^2
D. 10 m/s^2

10. For the one dimensional motion of a particle, the curve below shows displacement vs. time. Which of the following is the best description of the motion within the time interval t_1 to t_2?



A. The particle attains maximum speed then returns to its original position.
B. The particle attains maximum speed then gradually decelerates.
C. The particle comes to rest then moves away from its original position.
D. The particle comes to rest then moves with negative velocity towards its original position.

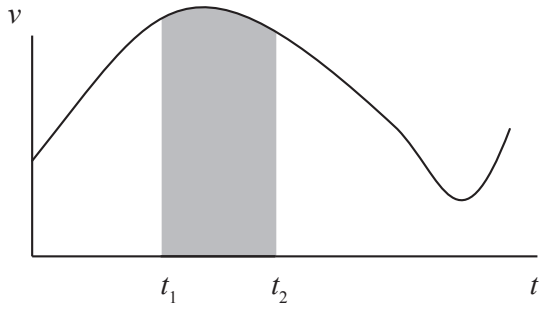
11. A car uniformly increases its speed from 30 m/s to 50 m/s over a distance of 400 meters on a straightaway. What is the magnitude of acceleration?

A. 0.5 m/s^2
B. 2 m/s^2
C. 5 m/s^2
D. 4 m/s^2

12. What is the vertical component of the velocity of a sky-diver 10 seconds after jumping? Disregard air resistance.

A. -25 m/s
B. -50 m/s
C. -100 m/s
D. -500 m/s

13. For a particle in one dimensional motion, the shaded area beneath the velocity vs. time curve below corresponds to:



A. the average velocity of the particle during the time interval t_1 to t_2
B. the displacement the particle over the time interval t_1 to t_2
C. the average speed of the particle during the time interval t_1 to t_2
D. the acceleration of the particle during the time interval t_1 to t_2

14. Which of the following statements is true concerning an object undergoing uniform circular motion?

A. The velocity and acceleration vectors are always perpendicular.
B. The object moves with constant speed.
C. The direction of the acceleration vector is towards the center.
D. All of the above are true statements.

15. Over a distance of 3 cm an electron accelerates uniformly from a speed of 9×10^3 m/s to a speed of 6×10^6 m/s. How long does it take the electron to cross this distance?

A. 1.0×10^{-8} s
B. 3.6×10^{-8} s
C. 5.0×10^{-7} s
D. 1.0×10^{-6} s

16. The velocity of a particle moving along a line is described by this expression:

$$v(t) = \frac{1}{3}\left[(t-1)^{(t+1)}\right]$$

Find the average acceleration of the particle during the time interval t = 1 s to t = 4 s.

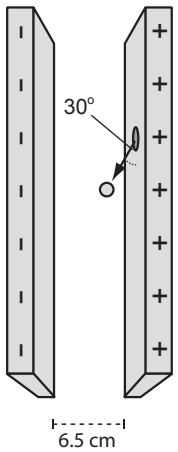
A. 0.3 m/s^2
B. 27 m/s^2
C. 81 m/s^2
D. Cannot be determined from given information.

17. A projectile is launched from ground level over a horizontal plane on the surface of the Earth at sea level at a 30^o angle to the horizontal. Neglecting air resistance, what other information is needed to calculate the range of its trajectory?

A. initial speed
B. initial speed, mass
C. the vertical component of the velocity
D. the initial kinetic energy of the projectile

The following passage pertains to questions 16 - 18.

If the size of oppositely charged parallel conducting plates is large compared to the distance between the plates, then the plates can be treated like infinite planes (neglecting fringing), and the electric field is the same everywhere between the plates. No matter where a charge is placed between to oppositely charged parallel plates, the net force on that charge is the same, and it will experience uniform acceleration.



An electron enters the region between two parallel electrically charged metal plates with an initial velocity of 6.0×10^5 m/s at an angle of 30° to the positive plate as shown in the figure at right. The electron experiences a constant acceleration of 1.5×10^{12} m/s^2 to the right.

18. The electron follows a path that is

A. parabolic
B. circular
C. a straight line
D. composed of two straight line segments

19. How long will the electron be in flight?

A. 2.0×10^{-8} s
B. 3.4×10^{-8} s
C. 2.0×10^{-7} s
D. 4.0×10^{-7} s

20. Assume the electron will be in flight for 4.0×10^{-7} s. What is the minimum distance at which the two plates may be spaced to prevent the electron from striking the negatively charged plate?

A. 1.2 cm
B. 2.4 cm
C. 3.0 cm
D. 6.0 cm