

Physics
Quiz # 2

Date Given: April 14, 2022

Date Due: April 21, 2022

Q1. (1 point) The area under the velocity-time curve is the:

- (a) Acceleration.
- (b) Displacement.
- (c) Mass.
- (d) Force.

Answer:

(b) The area under the velocity versus time curve is found by integrating velocity with respect to time. Velocity is the derivative of displacement with respect to time, so the integration of velocity with respect to time is the displacement.

Q2. (1 point) The slope of the velocity versus time curve is the:

- (a) Inverse of the acceleration.
- (b) Acceleration.
- (c) Work done.
- (d) Displacement.

Answer:

(b) Acceleration is defined as the time derivative of the velocity, so the slope of the velocity versus time curve is the acceleration.

Q3. (1 point) For rectilinear motion the relationship between displacement, s , velocity, v , acceleration, a , and time, t , $s = s_0 + v_0t + (1/2)at^2$ is valid:

- (a) Only if the acceleration and the initial velocity are in the same direction.
- (b) Only if the acceleration is constant.
- (c) For all forms of acceleration.
- (d) Only if the initial velocity is zero.

Answer:

(b) The integration of the differential equations expressing the relationship between displacement, velocity, acceleration, and time used to obtain this expression assumed constant acceleration.

Q4. (2 points) The position of the particle is given by $s(t) = (2t^2 - 8t + 6)$ m, where t is in seconds. Determine the time when the velocity of the particle is zero, and (assuming that the motion starts at $t = 0$ s) the total distance traveled by the particle when $t = 3$ s.

Answer:

- (a) $v = ds(t)/dt = 4t - 8$ therefore $v = 0$ when $t = 2$ s.
- (b) At $t = 0$, $s(0) = 6$ m. At the interval $0 < t < 2$ the velocity is negative and $s(t)$ is decreasing to $s(2) = -2$ m. The net displacement at the interval $0 < t < 2$ is $|-2 - 6| = 8$ m. At the interval $2 < t < 3$ the velocity is positive and $s(t)$ is increasing to $s(3) = 0$ m. The net displacement at the interval $2 < t < 3$ is $|0 - (-2)| = 2$ m. Therefore, the net displacement at the interval $0 < t < 3$ is $8 + 2 = 10$ m.

Q5. (1 point) Determine v at $s = 2$ m if $v = 1$ m/s at $s = 0$.

Answer: Here, we have $a = 2s$ and from $\int_1^v v dv = \int_0^2 a ds$ we get $\frac{v^2-1}{2} = [s^2]_0^2 = 4$. Therefore $v = 3$ m/s.

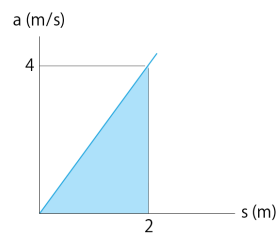


Figure 1: Illustration to question Q5.