Quiz #1 Ch.#2 T121 Phys101.37-39-v1

Student ID:..... Student Name:..... Section # .....

Q#1: A particle starts from rest at t = 0 s. Its acceleration as a function of time is shown in Fig. 1. What is its speed at the end of the 6.0 s? (A) 4.0 m/s)

$\Delta V = v_f - v_i = at = \text{Area}$.

$v_f = v_i + \text{Area}$

$= 0 + 4\times 2 - 2\times 2$

$v_f = 4$ m/s

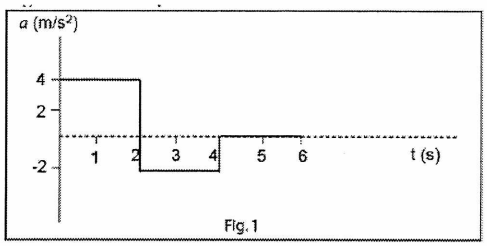


Fig. 1

Q#2: A ball is thrown vertically upward with an initial velocity vo and reaches its maximum height in 6.0 s. After how many seconds will it have a velocity -vo/2? (A1 9.0 s)

$v_{fy} = v_{iy} - |g|t$

For max. height $\Rightarrow 0 = v_0 - 9.8\times 6 \Rightarrow v_0 = 6\times 9.8 = 58.8$ m/s

$\frac{v_0}{2} = \frac{58.8}{2} = 29.4$ m/s then time t' to reach $v_f = -\frac{v_0}{2} = -29.4$

is $v_{fy} = v_{iy} - |g|t' \Rightarrow +29.4 = +9.8\times t' \Rightarrow t' = \frac{29.4}{9.8} = 3$ sec

total time $= 6+3 = 9$ sec

Q#3: The position of an object moving along an X-axis is given by x = 3 + 60t - 5t**3, where x is in meters and t is in seconds. At what time is the object momentarily at rest?

$x = 3 + 60t - 5t^3$

$v = 60 - 15t^2$

For $v=0$, $60 - 15t^2 = 0$

$4 - t^2 = 0$

$t = +2$ sec

Quiz #1 Ch.#2 T121 Phys101.37-39-v2

Student ID:..... Student Name:..... Section # .....

Q#1: Figure 2 represents the straight line motion of a car. What is the distance traveled by the car from t = 0 to t = 5 h? (h stands for hours) (A1 480 km)

$\Delta X = v t = \text{Area}$

$\Delta X = \text{Area} = \frac{120 \times 2}{2} + 3 \times 120$

$= 120 + 360$

$\Delta X = 480 \text{ km}$

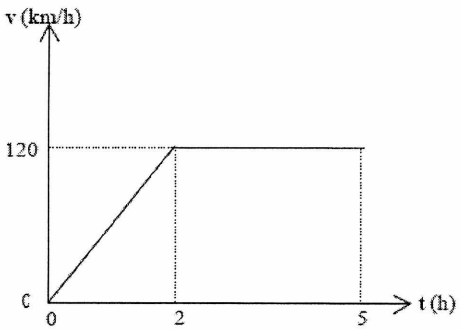


Figure 2

Q#2: A stone is released from rest from a height H. It takes 2.00 seconds to fall a vertical distance of H/2. What is the time needed to fall the total vertical distance (H)? (A1 2.83 s)

$y = v_i t - \frac{1}{2} g t^2$

at $t = 0$, $v_i = 0$, $y = -\frac{H}{2}$ from $t = 2$ sec

$\frac{H_0}{2} = \frac{1}{2} \times g \times (2)^2 = 2g$

$H_0 = 2 \times 2 \times g = 2 \times 2 \times 9.8 = 39.2 \text{ m}$

For total fall time: $t = \sqrt{\frac{2 \times H_0}{g}} = \sqrt{8} = 2.83 \text{ sec}$

Q#3: An electron moving along the x axis has a position given by x = 40 t - 10 t**2, where x is in m and t is in s. How far is the electron from the origin when it momentarily stops? (A1 40 m)

$X = 40t - 10t^2$, $v = 40 - 20t$

for $v = 0$, $40 - 20t = 0 \Rightarrow 2 - t = 0$

$t = \sqrt{2} = 1.41 \text{ sec}$

$\Delta X = X(t) - X(t=0) = X(t) - 0 = X(t)$

$= 40 \times 1.41 - 10 \times (1.41)^2$

$= 56.4 - 19.88 = 36.5 \simeq 40 \text{ m}$

Quiz #1 Ch.#2 T121 Phys101.37-39-v3

Student ID:..... Student Name:..... Section # .....

Q#1: A particle starts from the origin at t = 0 and moves along the positive x-axis. A graph of the velocity of the particle as a function of time is show in Fig 1. The average velocity of the particle between t = 0.0 s and 5.0 s is: (A) 1.4 m/s)

$$v_{avg} = \frac{\Delta x}{\Delta t}$$

$$\Delta x = vt = \text{Area}$$

$$v_{avg} = \frac{\text{Area}}{\Delta t} = \frac{\frac{2\times4}{2} + \frac{2\times4}{2} - \frac{1\times2}{2}}{(5-0)}$$

$$v_{avg} = \frac{7}{5} = 1.4 \text{ m/s}$$

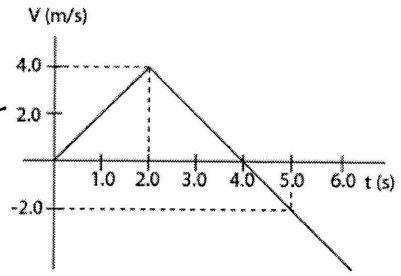


Figure 1

Q#2 A stone is thrown vertically upward with an initial speed of 10 m/s. What is its speed when it returns to a height of 3.83 m above its starting point?:(A1 5.0 m/s)

$$v_{fy}^2 = v_{iy}^2 - 2|g|y$$

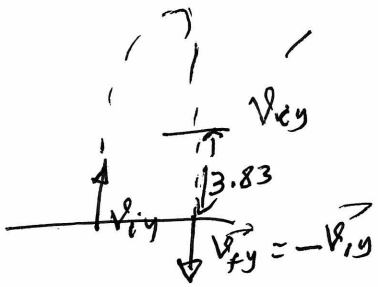
$$v_{fy} = -10 \text{ m/s}$$

$$y = -3.83 \text{ m}$$

$$v_{iy} = \sqrt{v_{fy}^2 + 2|g|y}$$

$$= \sqrt{(-10)^2 + (2\times9.8\times-3.83)}$$

$$v_{iy} = 5.0 \text{ m/s}$$



Q#3: Starting at time t = 0, an object moves along a straight line with a velocity in m/s given by v = 72 - 2 t**2, where t is in seconds. Find its acceleration when it stops momentarily. (A1 -24 m/s**2)

$$v = 72 - 2t^2, \quad v=0 = 72 - 2t^2$$

$$72 - 2t^2 = 0 = 36 - t^2$$

a) $t = \pm 6$ sec, $v = 0$

$$a = \frac{dv}{dt} = -4t$$ The

at $t = 6$ sec, $a = -4t = -4\times6 = -24 \text{ m/s}^2$

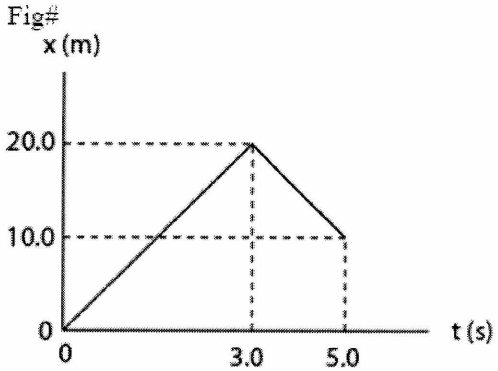
Quiz #1 Ch.#2 T121 Phys101.37-39-v4

Student ID:..... Student Name:..... Section # .....

Q1 Fig 1 shows the position-time graph of an object. What is the average velocity of the object between t=0.0 s and t= 5.0 s? (A) 2.0 m/s)

$$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

$$= \frac{10 - 0}{5 - 0} = \frac{10}{5} = 2 \text{ m/s}$$



Q2: A balloon carrying a package is ascending (going vertically upward) at the rate of 12 m/s. When it is 80 m above the ground the package is released. How long does it take the package to reach the ground? (A1 5.4 s)

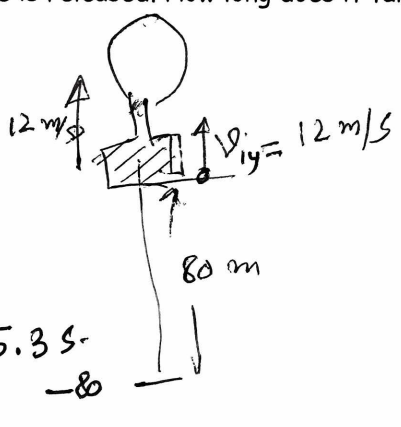
$$\Delta y = y_f - y_i = v_{iy} t - \frac{1}{2} \times |g| t^2$$

$$v_{iy} = 12 \text{ m/s} \; ; \; y_i = 0 \; ; \; y_f = -80 \text{ m}$$

$$\Delta y = -80 = 12t - \frac{9.8}{2} t^2$$

$$80 + 12t - 4.9t^2 = 0$$

$$t = \frac{-12 \pm \sqrt{144 + 4 \times 80 \times -4.9}}{-2 \times 4.9} = 5.3 \text{ s}$$



Q3 The position of a particle moving along the x axis is described by the equation x(t) = 5.0 + 2.0t - t**3. What is the position of the particle ,when it is momentarily at rest?.

$$x(t) = 5.0 + 2t - t^3 \; ; \; v = \frac{dx}{dt} = 2 - 3t^2$$

If $v = 0$, then $v = 2 - 3t^2 = 0$

$$t = \sqrt{\frac{2}{3}} = 0.82 \text{ Sec}$$

Then particle position at $t = 0.82$ sec is

$$x(t = 0.82) = 5 + 2 \times 0.82 - (0.82)^3$$

$$x(t = 0.82) = 6.09 \text{ m}$$

Quiz #1 Ch.#2 T121 Phys101.37-39-v5

Student ID:..... Student Name:..... Section # .....

Q1 Fig. 1 shows a graph of position versus time for a particle moving along the x axis. What is the total distance travelled by the particle in 15 s? (A1 12.5 m)

~~ΔX = Xf - Xi~~

~~ΔS~~ = 5 + 7.5 + 0 = 12.5 m

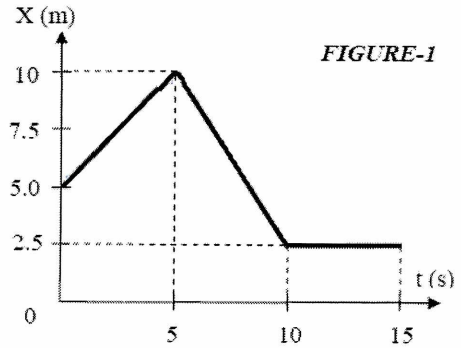


FIGURE-1

Q2: ~~Q4 Q0~~ An object is released from rest at a height H. It takes 2.00 s for the object to fall from point A to point B (see Figure 1). What is the initial height H? (A1 385 m)

Calculate height "h" by calculating V_A & then add it to 200 m.

$$\Delta y_{BA} = V_{iy}t - \frac{1}{2}gt^2$$

$$-[(H-60)-(H-200)] = V_A t - \frac{1}{2}\times 9.8 \times t^2$$

$$-140 = V_A t - \frac{9.8}{2}t^2 = 2V_A - \frac{9.8}{2}\times 4$$

$$= 2V_A - 19.6$$

$$-140 + 19.6 = 2V_A$$

$$V_A = 60.2 \text{ m/s}$$

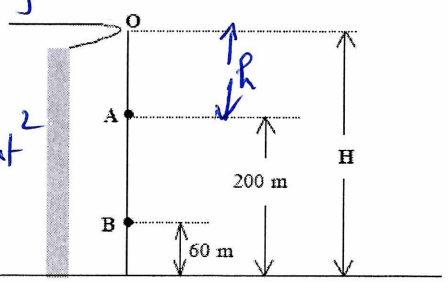


Figure 1

For h calculate

$$V_f^2 = V_i^2 - 2gy = -2gh = -2\times 9.8\times h.$$

$$V_A^2 = -2\times 9.8\times h \Rightarrow h = -\frac{V_A^2}{2\times 9.8} = -\frac{(60.2)^2}{2\times 9.8} = -184.9$$

$$H = -200 - 184.9 = -384.9 \text{ m}$$

Q3 A particle moving along the x axis has a position given by x =(24 t - 2 t**3) meters, where t is measured in seconds. How far is the particle from the origin (x=0) when the particle stops momentarily? (A1 32 m)

$$x = 24t - 2t^3 \Rightarrow v = \frac{dx}{dt} = 24 - 6t^2$$

when $v = 0 = 24 - 6t^2 \Rightarrow 0 = 4 - t^2$

at $t = 2$ sec particle stop.

$$x_f(t=2) = 24\times 2 - 2\times(2)^3$$

$$= 48 - 16 = 32 \text{ m}$$

Quiz #1 Ch.#2 T121 Phys101.37-39-v6

Student ID:..... Student Name:..... Section # .....

Q1 Figure 1 shows the velocity-time graph of a particle moving along the x-axis. What is the average acceleration of the particle during the time interval t = 1.0 s to t = 8.0 s??(A) - 2.1 m/s2)

$a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$

$v_f(t=8s) = -5\ m/s$

$v_i(t=1.0s) = +10\ m/s$

$a_{avg} = \frac{-5-10}{8-1} = \frac{-15}{7}$

$= -2.1\ m/s^2$

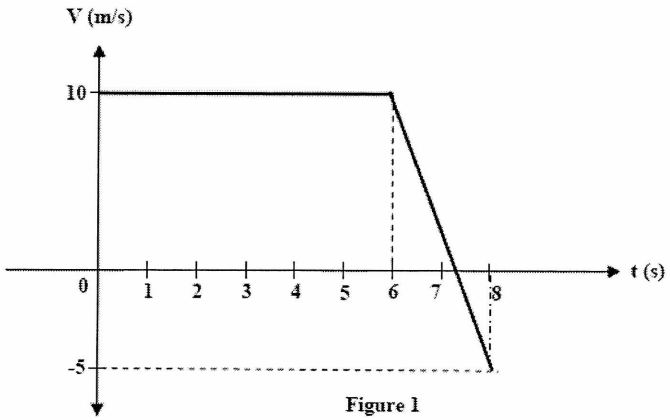


Figure 1

Q2: A stone is thrown vertically upward such that it has a speed of 9.0 m/s when it reaches one half of its maximum height above the launch point. Determine the maximum height. (A1 8.3 m)

Calculate upper half of max. height using 9.0 m/s as initial velocity and then double it to calculate "h"

$v_{fy}^2 = v_{iy}^2 - 2gy \Rightarrow 0 = (9.0)^2 - 2\times 9.8 \times h' \Rightarrow h' = \frac{9^2}{2\times 9.8} = 4.13\ m$

max. height $h = 2\times h' = 2\times 4.13 = 8.26\ m \simeq 8.3\ m$

Q3 An object moving along the x axis has a position given by x = (3 t - t**3) m, where t is measured in s. What is the acceleration of the object when its velocity is zero? (A1 -6.0 m/s**2)

$x = 3t - t^3 \Rightarrow v = 3 - 3t^2,\ a = -6t$

when $v=0$, the $3 - 3t^2 = 0$ at $t = 1\ sec$, $v = 0$

$a(t=1s) = -6\ m/s^2$