Quiz #1 Ch.#2 T133 Phys101.02-v1

Student ID:..... Student Name:.....

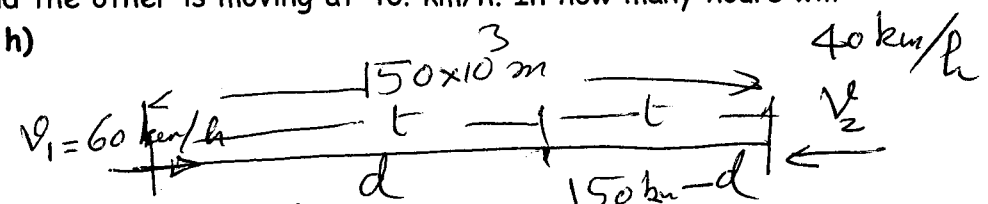
Q1. Starting at time t = 0, an object moves along a straight line. Its coordinate in meters is given by $x(t)=75t-1.0t^3$, where t is in seconds. When it momentarily stops, its position is: A) x = 250 m

$x = 75t - t^3 \Rightarrow v = 75 - 3t^2$

particle at rest $\Rightarrow v = 0 = 75 - 3t^2 \Rightarrow t = \pm 5\,sec$

position $x(t = +5\,sec) = 75 \times 5 - (5)^3 = 250\,m$

Q#2. Two cars are 150 km apart and traveling toward each other. One car is moving at 60. km/h and the other is moving at 40. km/h. In how many hours will they meet? **(Ans: 1.5 h)**



Both the Car meet at time t

$$t = \frac{d}{60} = \frac{150 - d}{40}$$

$$40d = 60(150 - d)$$

$$40d + 60d = 60 \times 150 = 9000$$

$$d = \frac{9000}{100} = 90\,km$$

$$t = \frac{90\,km}{60} = 1.5\,h$$

Quiz #1 Ch.#2 T133 Phys101.02-v2

Student ID:..... Student Name:.....

Q#1. The position of a particle x(t) as a function of time (t) is described by the equation: $x(t) = 2.0 + 3.0\,t - t^3$, where x is in m and t is in s. What is the maximum positive position of the particle on the x axis? (Ans: 4.0 m).

$x(t) = 2+3t-t^3 \Rightarrow v = 3-3t^2$

at turning point, $v = 0 = 3-3t^2 \Rightarrow t = \pm 1$ sec

its position $x(t=1) = 2+3\times1-(1)^3 = 2+3-1 = 4.0$ m

Q#2. A stone is thrown vertically downward from a building with an initial speed of 2.0 m/s. It reaches the ground after 5.0 s. What is the height of the building? (Ans: 130 m)

$v_i = -2.0$ m/s

$t_{fall} = 5$ sec ,

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

$= -2\times5 - \frac{1}{2}\times9.8\times(5)^2 = -10 - 122.5$

$y = -10 - \frac{122.5}{2} = -132.5$ m.

Quiz #1 Ch.#2 T133 Phys101.02-v3

Student ID:..... Student Name:.....

Q1 Starting at time t = 0, an object moves along a straight line. Its coordinate in meters is given by x(t) = 75*t - 1.0*t**3 , where t is in s. When velocity (v) of the object = 0, the value of its acceleration is : (Ans: -30 m/s**2)

$x = 75t - t^3 \Rightarrow v = 75 - 3t^2 \Rightarrow a = -6t$

when $v = 0 = 75 - 3t^2 \Rightarrow t = \pm 5$

$a(t = +5\,sec) = -6 \times 5 = -30\ m/s^2$

Q2.Two automobiles, ~~150~~ 100 kilometers apart, are traveling toward each other. One automobile is moving at ~~60~~ 50 km/h and the other is moving at ~~40~~ 30 km/h. In how many hours will they meet? (A: 1.5)

$t = \frac{d}{50} = \frac{100 - d}{30}$

$30d = 50(100 - d)$

$30d = 50 \times 100 - 50d$

$30d + 50d = 50 \times 100$

$d = \frac{50 \times 100}{80} = 62.5$

$t = \frac{62.5}{50} = 1.25\ h$

Quiz #1 Ch.#2 T133 Phys101.02-v4

Student ID:..... Student Name:.....

Q1. Starting at time t = 0, an object moves along a straight line with a velocity in m/s given by $v = 72 - 2t^2$, where t is in seconds. Find its acceleration when it stops momentarily. (Ans: -24 m/s**2)

$v = 72 - 2t^2$ when object stop $v = 0$

then $72 - 2t^2 = 0 \Rightarrow 36 - t^2 = 0$, $t = \pm 6$

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

$$a(t = +6\,sec) = -4 \times 6 = -24\ m/s^2$$

Q2. A ball is thrown vertically upward. After 4.00 s the ball returned back to its initial position. The maximum height above the initial position of the ball is:

A) 19.6m

$$t_{tot} = t_{up} + t_{down} = 2t_{up} \Rightarrow t_{up} = \frac{t_{tot}}{2}$$

$$t_{up} = \frac{t_{tot}}{2} = \frac{4}{2} = 2.0\ sec$$

max. height $= h = v_{iy}t - \frac{1}{2}gt^2$ (but $v_{iy} = 0$ for return journey)

$$h = -\frac{9.8 \times 2}{4} = -19.6\ m$$

Quiz #1 Ch.#2 T133 Phys101.02-v5

Student ID:..... Student Name:.....

Q#1. The position of an object is given as a function of time by $x = 4.0t^2 - 3.0t^3$, where x is in meters and t is in seconds. Its average acceleration during the interval from t = 1.0 s to t = 2.0 s is:(Ans: -19 m/s^2)

$x = 4t^2 - 3t^3$

$v = 8t - 9t^2 \Rightarrow$ $v(t=2s) = 8\times2 - 9\times4 = 16-36 = -20\ m/s$

$v(t=1s) = 8 - 9 = -1\ m/s$

$a_{avg} = \dfrac{v(t=2s) - v(t=1.0s)}{2-1}$

$= \dfrac{-20-(-1)}{2-1} = -19\ m/s^2$

(1)

Q#2: Two cars A and B travel on a straight line. The displacement of car A is given by $x_A(t) = 2.60\,t + 1.20\,t^2$, where t is in seconds and xA in m. The displacement of car B is given by $x_B(t) = 2.80\,t^2 - 0.20\,t^3$. At what time the two cars will have the same acceleration? (A 2.67 s)

$x_A = 2.6t + 1.2t^2$ $\quad x_B = 2.8t^2 - 0.2t^3$

$v_A = 2.6 + 2.4t$ $\quad v_B = 5.6t - 0.6t^2$

$a_A = 2.4$ $\quad a_B = 5.6 - 1.2t$

Time t when $a_A = a_B \Rightarrow 2.4 = 5.6 - 1.2t$

$t = \dfrac{5.6-2.4}{1.2} = 2.67$ sec

(Q#2) $v_{avg} = \dfrac{\Delta x}{\Delta t} = \dfrac{60}{6} = 10\ m/s$

$v_{avg} = 10 = \dfrac{v_f + v_i}{2} \Rightarrow 20 = v_f + v_i$

$v_i = 20 - v_f = 20 - 15 = 5\ m/s$

Quiz #1 Ch.#2 T133 Phys101.02-v6

Student ID:..... Student Name:.....

Q#1: A particle moves along the *x* axis. Its position is given by the equation $x=2.0+3t-t^3$ with *x* in meters and *t* in seconds. The average acceleration from $t = 0$ to $t = 2.0$ s is: A) $-6.0\ m/s^2$

$$x = 2 + 3t - t^3$$

$$v = 3 - 3t^2$$

$$a_{avg} = \frac{v(t=2s) - v(t=0s)}{2-0} = \frac{(3-12) - (3-0)}{2}$$

$$= \frac{-12}{2} = -6\ m/s^2$$

Q#2: An arrow is shot straight up with an initial speed of 98 m/s. If friction is neglected, how high the arrow can reach? (A) 490 m

$$v_i = 98\ m/s$$

$$h = \frac{v_i^2}{2g} = \frac{(98)^2}{2 \times 9.8} = 490\ m/s$$

Quiz #1 Ch.#2 T133 Phys101.02-v7

Student ID:..... Student Name:.....

Q#1: The coordinate of a particle in meters is given by $x=2t-2t^2$, where the time t is in seconds. The particle is momentarily at rest at time t equal to:
A) 0.50 s

$x = 2t - 2t^2$

$v = 2 - 4t$

particle at rest i.e $v = 0 = 2 - 4t \Rightarrow t = \frac{1 \text{ sec}}{2}$

$t = 0.5$ sec

Q2. At a traffic light, a truck traveling at 10 m/s passes a car as it starts from rest. The truck travels at a constant velocity and the car accelerates at 4.0 m/s^2. How much time does the car take to catch up with the truck? (Ans: 5.0 s)

both overtake after t sec after a distance d

$d = 10 \times t = \frac{1}{2} a t^2 = \frac{1}{2} \times 4 \times t^2$

$5 \cancel{10} t = 2 t^2 t \Rightarrow 5 = t$

$t = 5.0$ sec

Quiz #1 Ch.#2 T133 Phys101.02-v8

Student ID:..... Student Name:.....

Q1) 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? (Ans: 32 m.)

$X = 24t - 2t^3 \Rightarrow V = 24 - 6t^2$

When particle stops $V = 0 = 24 - 6t^2 \Rightarrow t = \pm 2\ sec$

$X(t = 2\ sec) = 24 \times 2 - 2 \times 8 = 48 - 16 = 32\ m$

Q4. A ball is thrown from ground straight upward with a velocity of 26 m/s. How long does it take the ball to strike the ground? (Ans: 5.3 s)

$t_{tot}, \quad V_f = V_i - |g| t_{tot}$

$-26 = 26 - (9.8) t_{tot}$

$t_{tot} = \frac{-52}{-9.8} = 5.31\ sec$

Quiz #1 Ch.#2 T133 Phys101.02-v9

Student ID:..... Student Name:.....

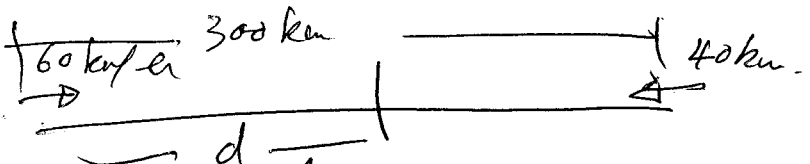
Q1 The position of a particle moving along the x axis is described by the equation x(t) = 5.0 + 2.0t + t**3. Find its average acceleration for the time interval t = 1.0 s to t = 2.0 s. (Ans: 9.0 m/s**2)

$$X = 5 + 2t + t^3 \Rightarrow v = 2 + 3t^2$$

$$a_{avg} = \frac{v(t=2s) - v(t=1.0s)}{2-1} = \frac{(2+3\times4) - (2+3)}{1}$$

$$= \frac{14-5}{1} = 9\ m/s^2$$

Q2. Two automobiles are 3.00×10^2 kilometers apart and traveling toward each other. One automobile is moving at 60.0 km/h and the other is moving at 40.0 km/h. In how many hours will they meet? A) 3.00



$$t = \frac{d}{60} = \frac{300-d}{40}$$

$$40d = 60(300-d)$$

$$40d + 60d = 60\times300$$

$$100d = 18000$$

$$d = 180\ km$$

$$t = \frac{180}{60} = 3h.$$

Quiz #1 Ch.#2 T133 Phys101.02-v10

Student ID:..... Student Name:.....

Q1: The displacement of a car is given by $x = 5t^2 - 20t + 10$, where x is in meters and t is in seconds. The car was initially moving towards the East. At what time does it change direction and move towards the West? (Ans: 2 s)

$x = 5t^2 - 20t + 10$

$v = 10t - 20$

turning point at $v = 0 = 10t - 20 \Rightarrow t = +2$ sec

$t = 2$ sec

Q2.: A person throws down a stone into a well with an initial speed of 10 m/s. It takes the stone 3 s to reach the surface of the water in the well. What is the distance traveled by the stone to reach the surface of the water? (Ans: 74.1 m)

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

$-y = -10 \times 3 - \frac{1}{2} \times 9.8 \times (3)^2$

$= -30 - 44.1 = -74.1$ m

$y = 74.1$ m