Mechanics I – Quiz 5 - Group C

2019-2020 Dec 19, 2019

Full Name:..... KEY .....

(The quiz is over 2 marks. Choose 2 questions and answer.)

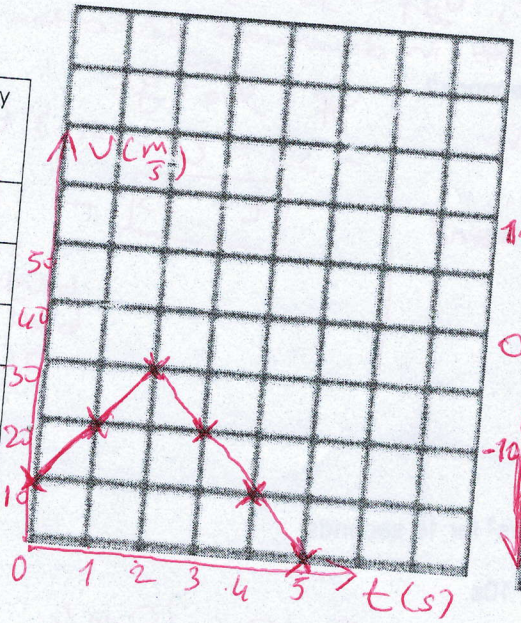
Question 1

The table below shows the changes in the velocity of a moving object with respect to time.

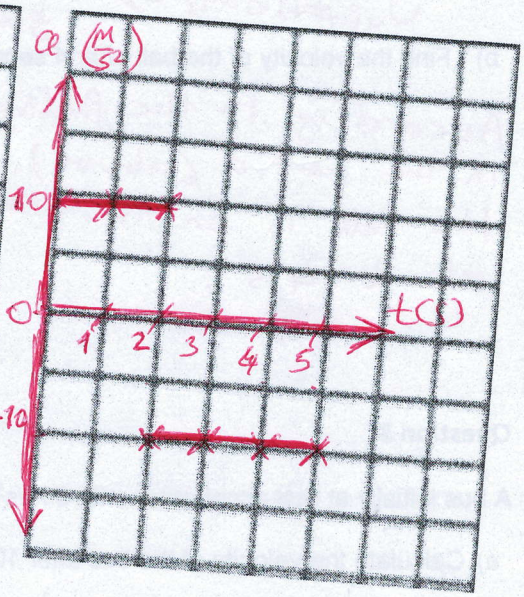
	Time(s)	Velocity (m/s)
t_0	0	V_0 10
t_1	1	V_1 20
t_2	2	V_2 30
t_3	3	V_4 20
t_5	4	V_5 10
t_6	5	V_6 0

a_1 (
a_2 (
a_3 (
a_4 (
a_5 (

a. Plot the velocity - time graph



b. Plot the acceleration - time



$$a = \frac{\Delta V}{\Delta t}$$

$$a_1 = \frac{V_1 - V_0}{t_1 - t_0} = \frac{20-10}{1-0} = 10\ m/s^2$$

$$a_2 = \frac{V_2 - V_1}{t_2 - t_1} = \frac{30-20}{2-1} = 10\ m/s^2$$

$$a_3 = \frac{V_3 - V_2}{t_3 - t_2} = \frac{20-30}{3-2} = -10\ \frac{m}{s^2}$$

$$a_4 = \frac{V_4 - V_3}{t_4 - t_3} = \frac{10-20}{4-3} = -10\ \frac{m}{s^2}$$

$$a_5 = \frac{V_5 - V_4}{t_5 - t_4} = \frac{0-10}{5-4} = -10\ \frac{m}{s^2}$$

Question 2

A ball is released from rest to make a free fall from a hight of 45m from th eground. (take, g= -10m/s²)

a) How long will it take for the ball to hit on the ground.

$V_{0y} = 0$ $\quad g = -10\ m/s^2$ $\quad V_{fy} = ?$ $\quad t = ?$

$y = 45$

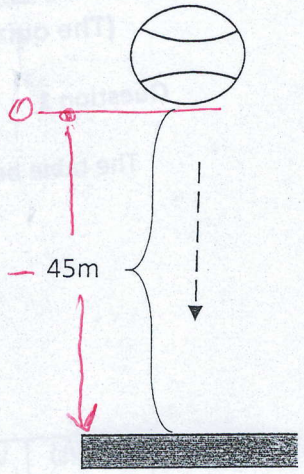
$g = -10$

$V_{yf}^2 = V_{y0}^2 + 2g\Delta y$

$V_{yf}^2 = 0 + 2(-10\ \frac{m}{s^2})(-45m)$

$V_{yf}^2 = 900$

$V_{yf} = -30\ m/s$ → It is $V_{yf} = -30\ m/s$ because it goes in downward direction.



b) Find the velocity of the ball after 4 seconds?

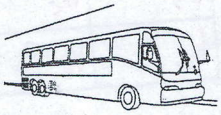
According to the finding in the part "a" (above) the ball is on the ground at t = 4 s.

$V_{yf} = V_{y0} + gt$

$-30 = 0 + (-10).t$

$t = 3s$ → It means that after 3 seconds from the beginning of the motion, the ball reaches to the ground.

Question 3



A bus initially at rest accelerates with 3 m/s² for 10 seconds.

a) Calculate the velocity of the bus after 10s.

$V_{xf} = V_{x0} + at$ $\quad V_{xf} = 3.10 = 30\ m/s$

b) How far will it move during this time?

$\Delta x = V_{0x}t + \frac{1}{2}at^2$

$\Delta x = 0 + \frac{1}{2}.3.10^2 = 150m$