

Only two questions must be answered.

Mechanics I – Quiz 5 - Group D

2019-2020

Dec 19, 2019

Full Name: **KEY**

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

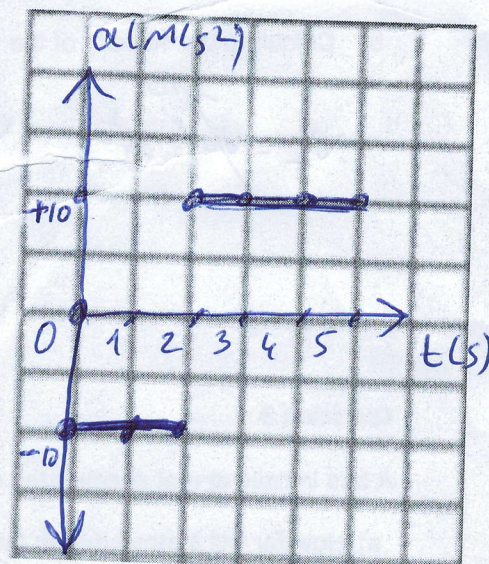
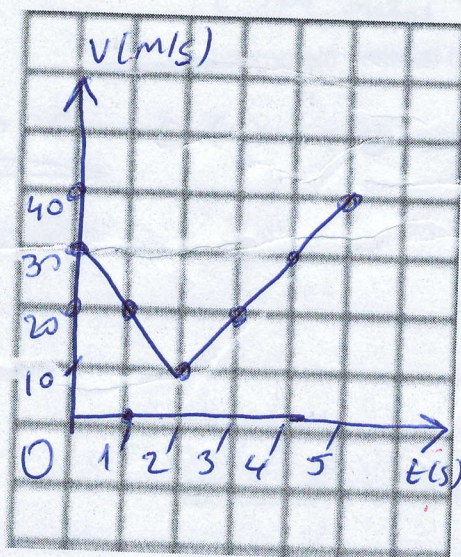
Question 1

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

a. Plot the velocity - time graph

b. Plot the acceleration - time

Time(s)	Velocity (m/s)
t_0 0	v_0 30
t_1 1	v_1 20
t_2 2	v_2 10
t_3 3	v_3 20
t_4 4	v_4 30
t_5 5	v_5 40



$$a_1 = \frac{\Delta v}{\Delta t} = \frac{v_1 - v_0}{t_1 - t_0} = \frac{20 - 30}{1 - 0} = -10 \frac{\text{m}}{\text{s}^2}$$

$$a_2 = \frac{v_2 - v_1}{t_2 - t_1} = \frac{10 - 20}{2 - 1} = -10 \frac{\text{m}}{\text{s}^2}$$

$$a_3 = \frac{v_3 - v_2}{t_3 - t_2} = \frac{20 - 10}{3 - 2} = +10 \frac{\text{m}}{\text{s}^2}$$

$$a_4 = \frac{v_4 - v_3}{t_4 - t_3} = \frac{30 - 20}{4 - 3} = +10 \frac{\text{m}}{\text{s}^2}$$

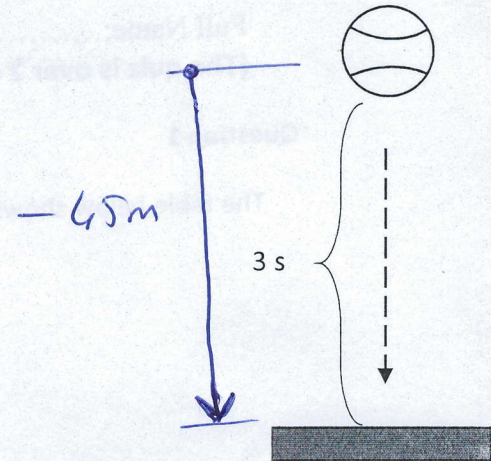
$$a_5 = \frac{v_5 - v_4}{t_5 - t_4} = \frac{40 - 30}{5 - 4} = +10 \frac{\text{m}}{\text{s}^2}$$

Question 2

A ball is released from rest to make a free fall. It takes 3 seconds for ~~the~~ ^{the ball} to hit on the ground. (take, $g = -10 \text{ m/s}^2$)

a) Calculate the height the ball will fall.

$$\Delta y = v_{iy} \cdot t + \frac{1}{2} g t^2$$
$$h = \Delta y = \frac{1}{2} (-10) (3)^2 = \underline{\underline{-45 \text{ m}}}$$

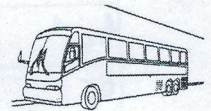


b) Calculate the velocity of the ball ^{Just before hitting to} ~~to~~ ^{hit on} the ground..

$$v_f = v_i + gt$$
$$v_f = 0 + (-10) \cdot 3 = \underline{\underline{-30 \text{ m/s}}}$$

Question 3

A bus initially at rest accelerates with 2 m/s^2 for 20 seconds.



a) How far will it move during this time?

$$v_i = 0 \quad a = 2 \text{ m/s}^2 \quad t = 20 \text{ s}$$
$$\Delta x = v_i \cdot t + \frac{1}{2} a t^2$$
$$\Delta x = \frac{1}{2} (2) (20)^2 = 400 \text{ m}$$

b) Calculate the velocity of the bus after 20s.

$$v_f = v_i + at$$
$$v_f = 2 \cdot 20 = 40 \text{ m/s}$$