Physics 4A
Spring 2025

ave. = 6.9
σ = 2.4

Name Answer Key

Lab: 8:00 am 11:10 am 2:30 pm (circle one)

Quiz #2: Kinematics in One Dimension

Problem 1 (1.5 points)
A car can go from 0 to 30 m/s in 12 s. A second car is capable of twice the acceleration of the first car. How much time will this second car take to go from 0 to 60 m/s?

D

a) 3.0 s
b) 6.0s
c) 9.0 s
d) 12 s
e) none of the above

$V_x = V_{ox}^{=0} + a_x t \rightarrow t = V_x / a_x$

⇒ if acceleration is doubled, it will take the same time to reach twice the speed

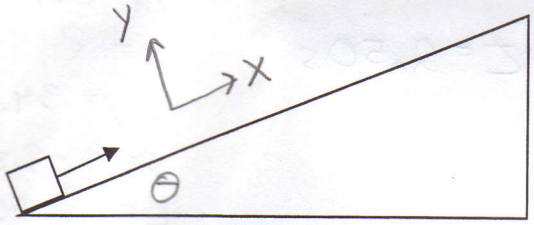
Problem 2 (1.5 points)
Ball A is dropped from the top of a building. One second later, ball B is dropped from the same building. As time progresses, the distance between them

A

a) increases.
b) remains constant.
c) decreases.
d) cannot be determined from the information given.

⇒ this was a question from PLC #3

Problem 3 (3.5 points)
A crate is sent up a frictionless inclined plane as shown in the figure to the below. The initial speed of the crate is 12.5 m/s. How fast is the crate moving when it has traveled a distance of 17.0 m along the incline?



11.0 m

25.0 m

$\theta = \tan^{-1}\left(\frac{11.0\,m}{25.0\,m}\right) = 23.7°$

frictionless incline $a = g\sin\theta$

$a_x = (9.80\,m/s^2)\sin 23.7°$

$= 3.95\,m/s^2$ down incline

$x_o = 0$

$x = 17.0m$

$V_{ox} = 12.5m/s$

$V_x = ?$

$a_x = -3.95m/s^2$

$t =$

$V_x^2 = V_{ox}^2 + 2a_x(x - x_o^{=0})$

$V_x = \pm\sqrt{V_x^2 + 2a_x x}$

$V_x = \sqrt{(12.5\,m/s)^2 + 2(-3.95\,m/s^2)(17.0m)}$

$V_x = 4.67\,m/s$

3.5 pts

Problem 3 (4 points)

A rock is thrown vertically upward (in the absence of air resistance) from ground level at time t = 0 s. At t = 2.50 s, it passes the top of a tall tower, and 1.00 s later it reaches its maximum height. What is the height of the tower?

⇒ we first need the speed the rock was thrown upward

↓ it takes 3.50s to reach highest point ($V_y = 0 m/s$)

$y_0 = 0 m$

$y =$

$V_{oy} = ?$

$V_y = 0 m/s$

$a_y = -9.80 m/s^2$

$t = 3.50 s$

$V_y = V_{oy} + a_y t$ ($V_y = 0$)

$V_{oy} = -a_y t$

$V_{oy} = -(-9.80 m/s^2)(3.50 s) = 34.3 m/s$

⇒ now find height of rock at $t = 2.50 s$

$y = y_0 + V_{oy} t + \frac{1}{2} a_y t^2$ ($y_0 = 0$)

$y_0 = 0 m$

$y = ?$

$V_{oy} = 34.3 m/s$

$a_y = -9.80 m/s^2$

$t = 2.50 s$

$y = (34.3 m/s)(2.50 s) + \frac{1}{2}(-9.80 m/s^2)(2.50 s)^2$

$y = 55.1 m$