Physics 2A
Fall 2018

ave. = 6.3
σ = 2.7

Name Answer Key

Lab: early late (circle one)

Quiz #2: Motion in One Dimension

Problem 1 (1 point)
A stone is thrown vertically upwards, reaches a highest point, and returns to the ground. When the stone is at the **top** of its path, its acceleration

C

a) is zero.
b) is directed upwards.
(c) is directed downwards.
d) changes direction from upwards to downwards.

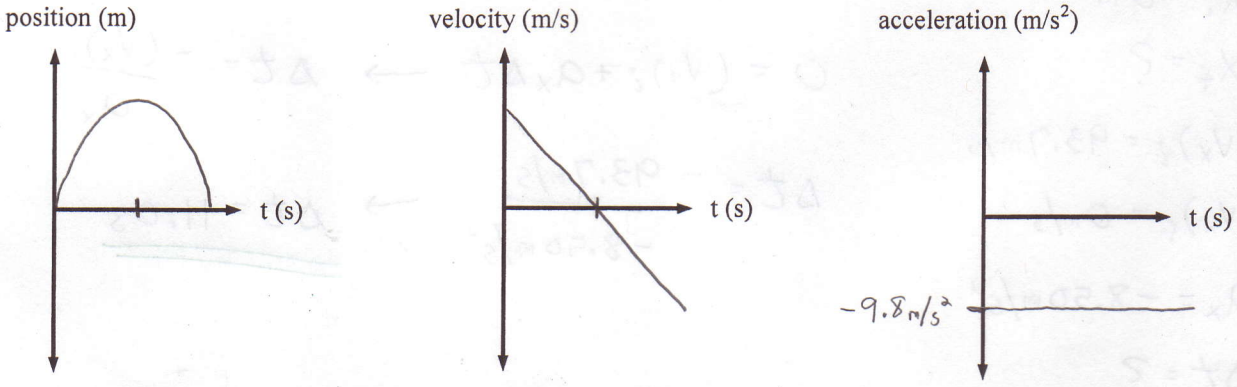
Problem 2 (1 point)
Which one of the following situations is *not* possible?

D

a) A body has zero velocity and non-zero acceleration.
b) A body travels with a northward velocity and a northward acceleration.
c) A body travels with a northward velocity and a southward acceleration.
(d) A body travels with a constant velocity and a time-varying acceleration.
e) A body travels with a constant acceleration and a time-varying velocity.

if velocity is constant then acceleration = 0 m/s²

Problem 3 (3 points)
A ball is thrown vertically upward, rises to its maximum height, and returns to the thrower's hand. Sketch three different graphs showing the position, velocity, and acceleration of the ball as a function of time. Take upward to be the positive direction and the release point of the ball to be the zero position.



Problem 3 (5 points)
SuperJoe, using his incredible Physics knowledge, starts from rest and accelerates at a spectacular rate of 13.5 m/s^2 for a distance of 325 m. He then uses his awesome powers to slow down at the rate of –8.50 m/s^2. How long was SuperJoe in motion, from start to stop?

Part 1

$x_i = 0\text{ m}$
$x_f = 325\text{ m}$
$(v_x)_i = 0\text{ m/s}$
$(v_x)_f = ?$
$a_x = 13.5\text{ m/s}^2$
$\Delta t = ?$

$$(v_x)_f^2 = (v_x)_i^2 + 2a_x\Delta x \quad (v_x)_i = 0$$

$$(v_x)_f^2 = 2a_x\Delta x \rightarrow (v_x)_f = \sqrt{2a_x\Delta x}$$

$$(v_x)_f = \sqrt{2(13.5\text{ m/s}^2)(325\text{ m})} \rightarrow (v_x)_f = 93.7\text{ m/s}$$

$$(v_x)_f = (v_x)_i + a_x\Delta t \quad (v_x)_f = 0$$

$$(v_x)_f = a_x\Delta t \rightarrow \Delta t = \frac{(v_x)_f}{a_x}$$

$$\Delta t = \frac{93.7\text{ m/s}}{13.5\text{ m/s}^2} \rightarrow \Delta t = 6.94\text{ s}$$

Part 2

$x_i = 0\text{ m}$
$x_f = ?$
$(v_x)_i = 93.7\text{ m/s}$
$(v_x)_f = 0\text{ m/s}$
$a_x = -8.50\text{ m/s}^2$
$\Delta t = ?$

$$(v_x)_f = (v_x)_i + a_x\Delta t \quad (v_x)_f = 0$$

$$0 = (v_x)_i + a_x\Delta t \rightarrow \Delta t = -\frac{(v_x)_i}{a_x}$$

$$\Delta t = -\frac{93.7\text{ m/s}}{-8.50\text{ m/s}^2} \rightarrow \Delta t = 11.0\text{ s}$$

total time $= 6.94\text{ s} + 11.0\text{ s} = 17.94\text{ s}$

$= \boxed{17.9\text{ s}}$