PHY105 Quiz 1

Instructor: Mohammed Alsenani – malsenani@psu.edu.sa
18/09/2024

Name	
Student ID	

Rules:

a. You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
b. NO talking or looking around during the examination.
c. NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
d. Show all your work when required and be organized.
e. Assume $g = 9.81\ m/s^2$ unless the problem says otherwise.
f. Unless the problem says otherwise, ignore air-resistance.
g. Include units in your final answer, if applicable.

Q1. **[2 points]** Choose the **correct dimension** for each of the quantities below. Note: t is time, v is velocity, and a is acceleration.

Quantity	$\boldsymbol{t}$	$\boldsymbol{vt}$	$\boldsymbol{at}$	$\boldsymbol{2at}$
Dimension [0.5 pts each]	a) [T] b) [L] c) [L]/[T] d) [L]/[T^2]	a) [T] b) [L] c) [L]/[T] d) [L]/[T^2]	a) [T] b) [L] c) [L]/[T] d) [L]/[T^2]	a) [T] b) [L] c) [L]/[T] d) [L]/[T^2]

Q2. **[1 point]** One **furlong** is a unit of *length* equal to $\mathbf{201.168\ meters}$. One **fortnight** is a unit of *time* equal $\mathbf{1,209,600\ seconds}$ (or 2 weeks). If the speed of light is 3.00×10^8 m/s, convert this to units of furlongs/fortnight.

a) 1.23 fur/ftn
b) 4.99×10^4 fur/ftn
c) 1.80×10^{12} fur/ftn
d) 7.30×10^{16} fur/ftn

Q3. **[2 points]** You throw a baseball directly upward and catch it again 10 seconds later (5 seconds rising and 5 seconds falling). Ignore air-resistance.

a) **[1 point]** What was the initial velocity of the baseball right after it was thrown?

It takes 5 seconds to reach the peak, where the velocity is zero.

$$v = \boldsymbol{v_0} + at \quad \Longrightarrow \quad \boldsymbol{v_0} = v - at$$
$$= (0\ \text{m/s}) - (-9.81\ \text{m/s}^2)(5\ \text{s})$$
$$= \mathbf{+49.05\ m/s\ (up)}$$

b) **[1 point]** What was the maximum height reached by the baseball?

Method 1:

$$\boldsymbol{\Delta x} = v_0 t + \frac{1}{2}at^2$$
$$= (+49.05\ \text{m/s})(5\ \text{s}) + \frac{1}{2}(-9.81\ \text{m/s}^2)(5\ \text{s})^2$$
$$= \mathbf{122.625\ m}$$

Method 2:

$$v^2 = v_0^2 + 2a\boldsymbol{\Delta x} \quad \Longrightarrow \quad \boldsymbol{\Delta x} = \frac{v^2 - v_0^2}{2a}$$
$$= \frac{(0\ \text{m/s})^2 - (49.05\ \text{m/s})^2}{2(-9.81\ \text{m/s}^2)}$$
$$= \mathbf{122.625\ m}$$