

Essay Exam 1 questions

Jay Patel

Classical Physics 210 Online OL01

Professor Van Huett

Classical Physics I-PHY210-OL01-Exam1 Summer 2015 Name: Jay, Patel

Essay Questions (10 points each). **Show your work**, partial-credit will be given. **Circle your answer**.

1) A student jumps 0.85 meters straight up, on level ground. (a) How long is the student in the air? (b) For how long is the student within 0.10 meters of the top of the jump? (c) What fraction of the time is the student in the top 0.10 meters of the jump?

$h = 0.85\text{m}$
 $u = \text{initial velocity}$
 $v = \text{final velocity} = 0$

$v^2 = u^2 - 2gh$
 $0 = u^2 - 2 \times 9.81 \times 0.85$
 $u^2 = 2 \times 9.81 \times 0.85$
 $u = 4.084\text{ m/s}$

$v = u - at$
 $0 = 4.084 - 9.8t$
 $0.416\text{sec} = t$

b) $h = ut - \frac{1}{2}gt^2$
 $0.75 = 4.084 \cdot t - \frac{1}{2} \cdot 9.81t^2$
 $-\frac{1}{2} \cdot 9.81t^2 + 4.084t - 0.75 = 0$
using quadratic equations
0.27

c) $\frac{0.27}{0.416} = \frac{0.27}{0.832} = 0.3245$
0.3245

Essay Questions (10 points each). Show your work, partial-credit will be given. Circle your answer.

2) A diving platform or diving tower has three platforms at 10 m, 7.5 m, and 5.0 m. Some students are going to drop or throw straight down identical balls from each platform and they want the balls to reach the water with the same velocity. The ball from the highest platform will just be dropped with zero initial velocity. (a) What velocity do you need to throw the ball from the middle platform? (b) What velocity do you need to throw the ball from the bottom platform?

$$h = h_0 + v_0 t - \frac{1}{2} g t^2$$

$$10 + 0t - 4.9t^2 = 0$$

$$t = 1.429 \text{ seconds}$$

$$\text{ie final speed is } v = 6.1428 \approx 3.8$$

$$v = -14.00 \text{ m/s}$$

So the ball will hit after t seconds

So, now the middle ball should be thrown downwards

$$v - g \cdot t = -14.00$$

$$7.5 + v - 4.9t^2 = 0$$

$$v = -7 \text{ m/s}$$

$$v^2 = u^2 + 2gh$$

$$(-14.00)^2 = u^2 + 2 \cdot 9.81 \cdot 7.5$$

$$28 = u^2 + 147.15$$

$$u^2 = 119.15$$

$$u = 10.915$$

and now, the low ball must satisfy

$$v - g \cdot t = -14.00$$

$$5.0 + v - 4.9t^2 = 0$$

$$v = -9.9 \text{ m/s}$$

$$v^2 = u^2 + 2gh$$

$$(-14.00)^2 = u^2 + 2 \cdot 9.81 \cdot 5$$

$$28 = u^2 + 98.1$$

$$u^2 = 70.1$$

$$u = 8.3725$$

Essay Questions (10 points each). **Show your work**, partial-credit will be given. **Circle** your answer.

- 3) A football is kicked at an angle of 60 degrees above the horizontal. To make the field goal it must reach a height of at least 3.048 m above the ground. What is the minimum speed the ball can be kicked in order to make a field goal?

formula for maximum height

$$\frac{v^2 \sin^2 \theta}{2g} = h$$

$$\frac{v^2 (\sin 60)^2}{2 \times 9.81}$$

$$= 3.048$$

$$v = 8.928 \text{ m/s}$$