

Solutions

PHYS 1408-001 Exam #1 - Fall, 2009

$g=9.80 \text{ m/s}^2$

Bubble in your answers on your scantron. BUBBLE IN YOUR ARRRRRRR NUMBER CORRECTLY!!

Please return this exam sheet as well, with your name on it

0% correct

1. About how many times does a human heart beat in one lifetime?

- a) 2×10^{13} b) 2×10^{11} **c) 2×10^9** d) 2×10^7 e) 2×10^5

Assuming 1 beat/sec, 70 years

76% C

beats = # seconds in 70 years = $(70 \text{ yr})(365 \frac{\text{days}}{\text{yr}})(24 \frac{\text{hr}}{\text{day}})(3600 \frac{\text{s}}{\text{hr}}) = 2.2 \times 10^9 \text{ s} \approx 2 \times 10^9$

2. Which of the following numbers has the largest number of significant figures?

- a) 105 b) 0.00032 **c) 3000.** d) 5.24×10^{-5}

52% C

decimal point!

3. There are 1.609 km in a mile, and 40 acres is a square area 1/4 mile on a side. How many 40 acre parcels are in one square kilometer?

- a) 0.2** b) 2.5 c) 0.16 d) 0.40 e) 16

38% a

$(\frac{1}{4} \text{ mi})^2 = [1.609 \text{ km} (\frac{1}{4})]^2 = 0.162 \text{ km}^2 = 40 \text{ acres}$

So $1 \text{ km}^2 = \frac{1}{0.162} (40 \text{ acres}) = 6.2 \times 40 \text{ acres}$

4. A truck slows down from an initial speed of 35 m/s to a stop, with an acceleration of -0.120 m/s^2 . The stopping distance of the truck is, in m,

- a) 23 b) 150 c) 290 d) 1200 **e) 5100**

78% e

$V_f = 0$ $V_i = 35 \text{ m/s}$, know a ,
want $x_f - x_i$

$V_f^2 - V_i^2 = 2a(x_f - x_i)$ so $x_f - x_i = \frac{-V_i^2}{2a} = 5100 \text{ m}$

5. Bob travels west, beginning at 3:30 p.m., at an average speed of 55 km/hr. Alice travels east, beginning at 4:00 p.m., at an average speed of 75 km/hr. How far apart are they, in km, at 5:00 p.m.?

- a) 200 b) 8.0 c) 75 **d) 160** e) 85

90% d

$x_B = -(1.5 \text{ hr})(55 \text{ km/hr}) = -83 \text{ km}$ if west negative

$x_A = (1.0 \text{ hr})(75 \text{ km/hr}) = 75 \text{ km}$

$x_A - x_B = 75 \text{ km} + 83 \text{ km} = 158 \text{ km}$

6. A particle's position is given by $x(t) = (1.50 \text{ m/s}^2)t^2 - (4.20 \text{ m/s})t + 10.0 \text{ m}$. Its average velocity between $t=2.0 \text{ s}$ and $t=3.0 \text{ s}$ seconds is, in meters/second,

- a) 11 **b) 3.3** c) 1.1 d) 1.7 e) 8.0

86% b

$\bar{v} = \frac{v_3 - v_2}{\Delta t}$

$v_3 = (1.50 \text{ m/s}^2)(3 \text{ s})^2 - (4.20 \text{ m/s})(3 \text{ s}) + 10.0 \text{ m} = 10.9 \text{ m/s}$

$v_2 = (1.50 \text{ m/s}^2)(2 \text{ s})^2 - (4.20 \text{ m/s})(2 \text{ s}) + 10.0 \text{ m} = 7.6 \text{ m/s}$

$\bar{v} = \frac{10.9 \text{ m/s} - 7.6 \text{ m/s}}{1.0 \text{ s}} = 3.3 \text{ m/s}$

7. The slope of a line tangent to the velocity versus time curve for a particle gives the

- a) instantaneous velocity b) average velocity c) displacement
d) instantaneous acceleration e) average acceleration

67% d

8. When I throw a ball directly upwards, its acceleration is zero when

- a) it has just left my hand b) it hits the ground
c) never during its motion d) it reaches its maximum height

50% c

9. A ball is thrown straight upwards from an initial height of 50 m above the ground, at a speed of 35 m/s.

How long will it be before it hits the ground?

- a) 1.22 s b) 3.57 s c) 7.14 s **d) 8.36 s** e) 14.5 s

53% d

$y_f - y_i = -50 \text{ m}$, $v_{0y} = 35 \text{ m/s}$

$y_f - y_i = v_{0y}t - \frac{1}{2}gt^2$
 $-50 \text{ m} = (35 \text{ m/s})t - (4.9 \text{ m/s}^2)t^2$
 $(4.9 \text{ m/s}^2)t^2 - (35 \text{ m/s})t - 50 \text{ m} = 0$

$t = \frac{1}{9.8 \text{ m/s}^2} [35 \text{ m/s} \pm \sqrt{(35)^2 - 4(4.9)(-50)} \text{ m/s}] = \frac{1}{9.8 \text{ m/s}^2} [35 \pm 47] \text{ m/s}$
 $t = 8.36 \text{ s}$ (+ sign)