

PHYSICS 1A

Quiz #2B

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Closed book and notes; only these sheets, Scantron, pen/pencil and calculator may be used. This is exam version D. Mark your Scantron Test Form "D" and code your UCSD ID# under ID Number. Write your Name and ID number on the second sheet of this Quiz. Answer Questions 1-6 on the Scantron; answer Problem 7 in the space provided. Organize your work if you want to be considered for partial credit. GOOD LUCK!

Useful Formulae:

$$net\vec{F} = m\vec{a}$$

$$F_{grav} = mg$$

$$f_s \leq \mu_s N \quad f_k = \mu_k N$$

$$\langle \vec{v} \rangle = \frac{\Delta \vec{x}}{\Delta t} \quad \vec{v} = \frac{d\vec{x}}{dt}$$

$$\langle \vec{a} \rangle = \frac{\Delta \vec{v}}{\Delta t} \quad \vec{a} = \frac{d\vec{v}}{dt} = \frac{d^2 \vec{s}}{dt^2}$$

$$x = x_0 + v_{0x} \cdot t + \frac{1}{2}a_x \cdot t^2 \quad y = y_0 + v_{0y} \cdot t + \frac{1}{2}a_y \cdot t^2$$

$$v_x = v_{0x} + a_x t \quad v_y = v_{0y} + a_y t$$

$$g = -9.80 m s^{-2}$$

$$\text{Quadratic :} \quad ax^2 + bx + c = 0 \quad \rightarrow \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1. In a naval battle a battleship simultaneously fires shells at enemy ships which are 1000m and 2000m away. In the trajectories shell 1 reaches a maximum height of 200m while shell 2 reaches a maximum height of 100m. The first shell to hit reaches its target in (Use $g = -10 \text{ m s}^{-2}$):

- a) 4.5s
- b) 6.3s
- c) 10s
- d) 20s
- e) cannot answer w/o knowing the shells' velocities.

2. A car headed west at 10 m/s rounds a curve in 10s so that it is now headed north at the same speed. Its average acceleration is

- a) 0
- b) 1 m s^{-2}
- c) 1.4 m s^{-2}
- d) 2 m s^{-2}
- e) 4 m s^{-2}

3. A box sits at rest on a table-top. Newton's third law force pairs are:

- a) Weight of box & Normal force of table on box, $F_g(\text{earth} - \text{box})$ & $F_g(\text{box} - \text{earth})$
- b) $F(\text{box-table})$ & Normal force of table on box, Weight of box & $F_g(\text{box} - \text{earth})$
- c) Weight of box & $F_g(\text{box} - \text{earth})$, only
- d) $F(\text{box-table})$ & Normal force of table on box, only.
- e) Weight of box & Normal force of table on box, only.

4. An elephant and a field mouse collide in the African savannah. During the collision the force of the mouse on the elephant

- a) is at all times less than the force of the elephant on the mouse.
- b) is at all times greater than the force of the elephant on the mouse.
- c) is at all times equal to the force of the elephant on the mouse.
- d) is momentarily less than the force of the elephant on the mouse.
- e) we need to know velocities to answer.

5) You are running with a speed of 2 m/s while throwing a ball upward and catching it. If you throw the ball with a speed of 2 m/s, in order to catch it as it comes down you should: (neglect air resistance)

- a) throw it straight upward and maintain the same speed.
- b) throw it at an angle of 45° and maintain the same speed.
- c) throw it straight upward and slow down to catch it.
- d) stop and throw the ball straight upward then catch it 'cause you can't walk & throw at the same time.

6) A freight train with a mass of 10^7 kg is pulled by a locomotive capable of exerting a force of 10^6 N ; how long will it take for the train to move 1 km, accelerating uniformly.

- a) 100s
- b) 141s
- c) 200s
- d) 1410s
- e) 20,000s

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7. $m_1 = 2kg$ is connected to $m_2 = 3kg$ as shown. m_2 is accelerating downward at $5m\ s^{-2}$. What is the coefficient of kinetic friction, μ_k between m_1 and the table top?

 $\mu_k =$ _____