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 **B**. *Mark your Scantron Test Form* **"B"** *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:

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

$$F_{grav} = mg$$

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

$$< \vec{v} >= \frac{\Delta \vec{x}}{\Delta t} \qquad \vec{v} = \frac{d\vec{x}}{dt}$$

$$< \vec{a} >= \frac{\Delta \vec{v}}{\Delta t} \qquad \vec{a} = \frac{d\vec{v}}{dt} = \frac{d^2\vec{s}}{dt^2}$$

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

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

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

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

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 $g = -10\,m\,s^{-2}$):

a) 20s
b) 10s
c) 6.3s
d) 4.5s
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, $F_g(earth - box)$ & $F_g(box - earth)$
b) Weight of box & Normal force of table on box, only.
c) Weight of box & $F_g(box - earth)$, only
d) F(box-table) & Normal force of table on box, only.
e) F(box-table) & Normal force of table on box, Weight of box & $F_g(box - earth)$

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 at an angle of 45° and maintain the same speed.
b) throw it straight upward 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) 2000s
e) 40,000s

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7. $m_1 = 1kg$ is connected to $m_2 = 2kg$ 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?

$\mu_k =$ _____