

PHYSICS 1A

Quiz #3C

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Closed book and notes; only these sheets, Scantron, pen/pencil and calculator may be used. This is exam version C. Mark your Scantron Test Form "C" and code your UCSD ID# under ID Number. Write your Name and ID number on the second sheet of this Quiz. Answer Questions 1-5 on the Scantron; answer Problem 6 in the space provided. Organize your work if you want to be considered for partial credit. GOOD LUCK!

Useful Formulae:

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

$$F_{\text{grav}} = mg$$

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

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

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

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

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

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

$$W = \int F_{\parallel} ds$$

$$PE_{\text{grav}} = mgh \quad KE = \frac{1}{2} m v^2$$

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

1. A student lifts a 20 kg box to a height of 1.5m, then walks a distance of 10m. The work done by the student is about
 - a) 3000J
 - b) 2300J
 - c) 2000J
 - d) 300J
 - e) 230J

2. You push a 100kg crate 10m across the floor with a horizontal force of 200N. The coefficients of friction between the crate and the floor are $\mu_s = 0.2$ and $\mu_k = 0.1$. If the crate starts at rest, the final speed is about
 - a) 2 m/s
 - b) 2.5 m/s
 - c) 4.5 m/s
 - d) 20 m/s
 - e) 22.5 m/s.

3. A car traveling at $v = 10\text{m/s}$ skids to a stop in a distance of 10m. If the same car is traveling with $v = 20\text{m/s}$, how far will it skid before stopping?
 - a) 100m.
 - b) 40m.
 - c) 28m.
 - d) 20m.
 - e) 14m.

4. A mass, M , is attached to a massless rod with length, L , to act as a pendulum. The mass is lifted through a 90° angle so that the rod is horizontal, then released. At the bottom of its swing the pendulum has velocity
 - a) $v = (gL)^2$
 - b) $v = gL$
 - c) $v = MgL$
 - d) $v = \sqrt{2gL}$
 - e) $v = \sqrt{MgL}$

5. Two Physics 1 students of equal mass sit at the top of a playground slide which makes an angle of 45° with the ground. Student #1 falls off the slide (vertically downward) as student #2 starts sliding downward. Assuming that they both start off with $KE = 0$, then, when they reach the ground
 - a) $KE_1 = 2KE_2$
 - b) $KE_1 = \sqrt{2}KE_2$
 - c) $KE_1 = KE_2$
 - d) $KE_1 = \frac{1}{\sqrt{2}}KE_2$
 - e) $KE_1 = \frac{1}{2}KE_2$

Name _____

ID # A _____

6) (13 pts) A sled with mass $m = 50\text{kg}$ slides up a hill at 30° inclination and then back down as shown. The velocity of the sled as it starts up the hill is 4m/s and it experiences a frictional force of 50N both on its way up and on its way down. How far up the hill does the sled slide?

 $d =$ _____

In the spaces below draw graphs of the KE, PE and total mechanical energy of the sled as a function of time.