PHYSICS 1A

Quiz #3B

H. E. Smith 7 May 2004

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 1–5 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:

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

$$F_{grav} = mg$$

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

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

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

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

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

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

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

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

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

1. 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) 1 m/s
b) 2 m/s
c) 4.5 m/s
d) 20 m/s
e) 22.5 m/s.

2. 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) 230J
b) 300J
c) 2000J
d) 2300J
e) 3000J

3. 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) $v = \sqrt{2gL}$
b) $v = gL$
c) $v = (gL)^2$
d) $v = MgL$
e) $v = \sqrt{MgL}$

4. 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) $KE_2 = 2KE_1$
b) $KE_2 = \sqrt{2}KE_1$
c) $KE_2 = KE_1$
d) $KE_2 = \frac{1}{\sqrt{2}}KE_1$
e) $KE_2 = \frac{1}{2}KE_1$

5. A car traveling at $v = 10m/s$ skids to a stop in a distance of 10m. If the same car is traveling with $v = 20m/s$, how far will it skid before stopping?

a) 14m.
b) 20m.
c) 40m.
d) 50m.
e) 100m.

Name_____ ID # A_____

6) (13 pts) A sled with mass $m = 50kg$ 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 $7m/s$ 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.