PHYSICS 1A

Quiz #1D

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Closed book and notes; only these sheets, Scantron, pen/pencil and calculator may be used. This is exam version **D**. *Write your name on your Scantron, mark your Scantron Test Form* **"D"** *and code your UCSD ID# under ID Number. Write your ID number and name on thelast sheet of this Quiz. Answer Puestions 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:

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

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

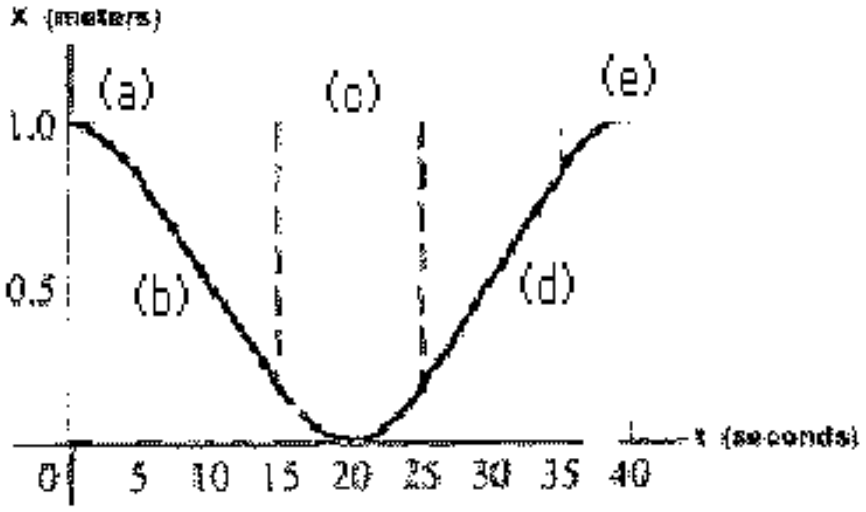
$$x \;=\; x_0 \,+\, v_0 \cdot t \,+\, \frac{1}{2} a \cdot t^2$$

$$v \;=\; v_0 \,+\, at$$

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

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

1–3) The graph below is a plot of the displacement of a spider crawling along the floor as a function of time. Section "a"(0–5s), "c"(15–25s) and "e"(35–40s) are parabolic; "b"(5–15s) and "d"(25–35s) are straight lines. Answer the following questions (2 pts each):



1. In section "c" (15–25s) the spider's acceleration is
   a) constant and negative
   b) constant and positive
   c) positive, increasing with time.
   d) negative, decreasing (becoming more negative) with time.
   e) zero

2. Over this interval the spider's velocity is:
   a) constant and positive.
   b) constant and negative
   c) positive, decreasing with time.
   d) continuously decreasing from positive to negative.
   e) continuously increasing from negative to positive.

3. In section "b" (5–15s) the spider's velocity is about
   a) -0.06 m/s
   b) -0.6 m/s
   c) 0.06 m/s
   d) 0.6 m/s
   e) 6 m/s

4. The world record for the 100m dash is just under 10s. How long would it take to run a mile (1610m) with the same average acceleration?
   a) 40s
   b) 56s
   c) 160s
   d) 4 minutes
   e) 400s

5. There are about a 500 billion stars in the Milky Way galaxy. The mass of the sun is about $2 \times 10^{30}\,kg$. Estimate the mass of the Milky Way.
   a) $10^{18}\,kg$
   b) $10^{40}\,kg$
   c) $10^{41}\,kg$.
   d) $10^{42}\,kg$.
   e) $10^{50}\,kg$.

6. A ball drop experiment measures $t = 1.5s$ for a drop of 1.88m. You conclude that g is
   a) $10\ m\,s^{-2}$
   b) $9.800\ m\,s^{-2}$
   c) $9.798\ m\,s^{-2}$
   d) $1.67\ m\,s^{-2}$
   e) $0.60\ m\,s^{-2}$

Do you know where you might be?

Name_____ ID # A_____

7. Standing at the top of the Campanile in Pisa ($h = 55m$) Galileo throws a 1kg weight upward with a velocity of 12 m/s; at the same time his assistant throws a 2kg weight downward with the same velocity.

a) What is the time difference between the impact of the first and second weights?

$t_{1kg} - t_{2kg} =$ _____

b) What are their velocities just before they strike the ground?

$v(1kg) =$ _____

$v(2kg) =$ _____