Ch. 3 Homework

Phy101

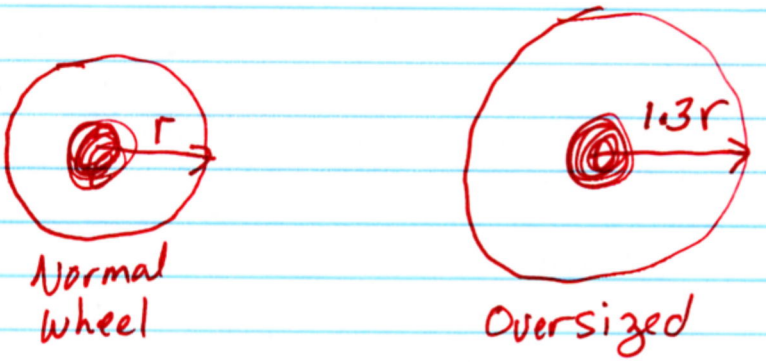
Ch. 3 Qs 2, 3, 9, 10 (graph), 13, 14 (graph), 15, 16
Probs 2, 15, 17-19 (graph), 21, 22

Questions

(2.) Uniform Motion Accel. Motion

a. 35 mph North
b. 50 mph around curve
c. leaping out of water
d. 500 mph at 30,000 ft
e. book on desk
f. Moon

(3.)



Circumferance of a circle = $2\pi r$

Normal wheel = $2\pi r$
Oversized = $2\pi(1.3r) = 2.6\pi r$

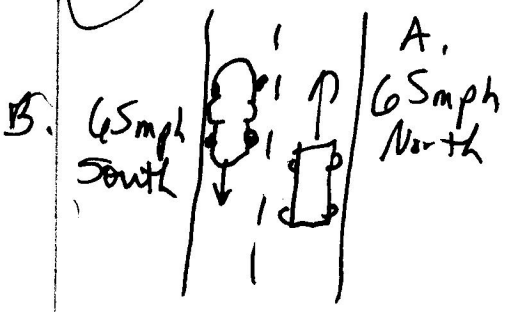
Each time the wheel goes around, the speedometer gives your speed. The conversion to speed = $\frac{dis}{time}$ assumes a certain circumferance for the tire. If the tire is oversized, it travels further in each rotation than a normal car.

Thus, it moves faster than the speedometer says.

Ch. 3 HW

Qs (cont)

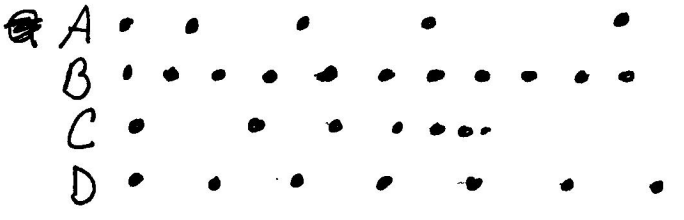
(9.)



Car A has same speed as Car B.

Car A has a different velocity because it is pointed in a different direction.

(10.) Oil drops every 3sec. over 200 m

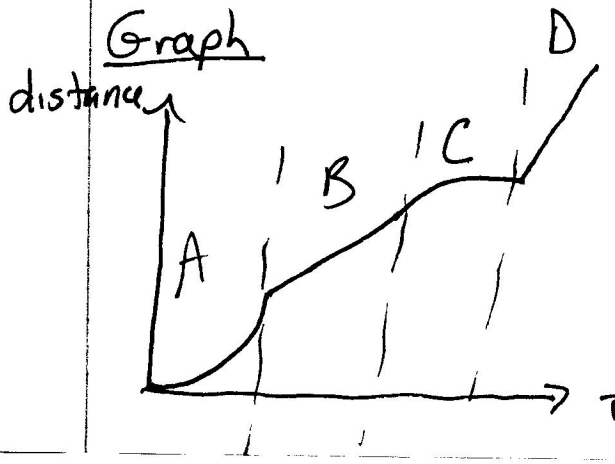


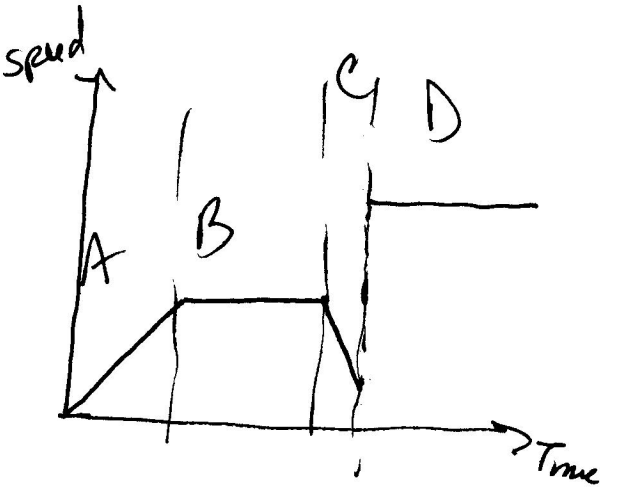
6 dots
11 dots
7 dots
7 dots (±)

a) car accalerating? A
b) constant speed? B & D
c) greatest ave. speed? A - fewest # dots over equal distance

Motion A - accel, B - slow const. speed,
C - decel., D - med. const. speed

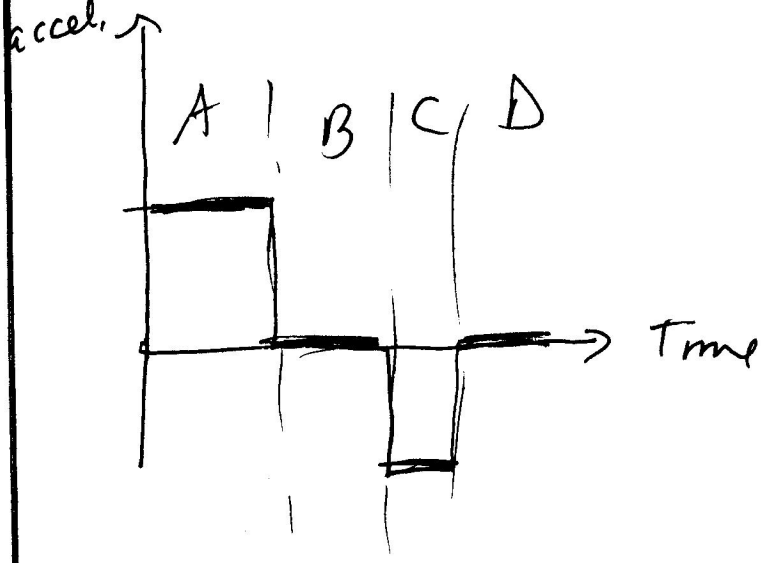
Graph



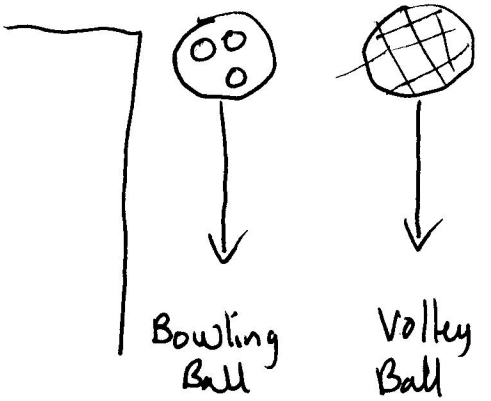


9,15 (cont.)

10. (cont) GRAPH



13.

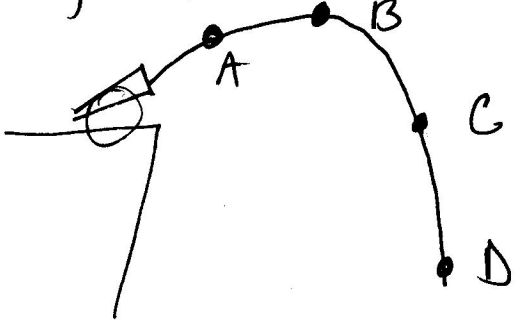


a) Neglecting air resistance, both will fall at same rate

b) With air resistance, although surface area is almost the same, the mass of bowling ball is higher.

So, volley ball will reach terminal velocity first & bowling ball will land first.

14.



Neglecting air resistance,

a) greatest acceleration? All the same, $g = 9.8 \frac{m}{s^2}$

b) fastest? D

c) speed = 0?, vertical speed = 0 at B, but still has horizontal speed there

Ch. 3 HW

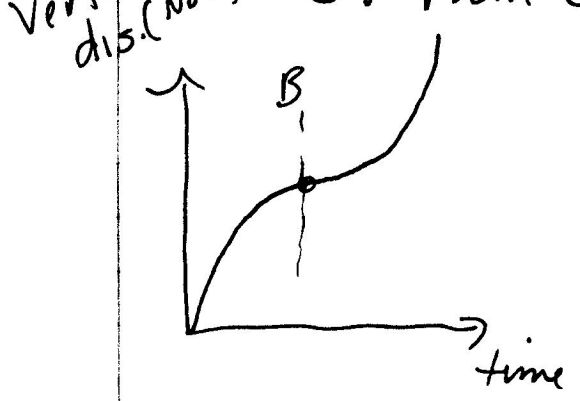
Qs (cont)

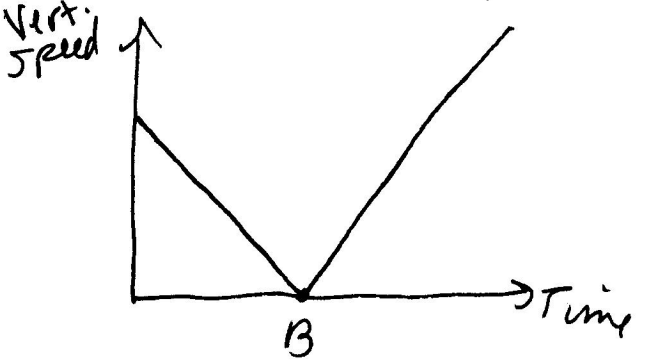
(14.) cont

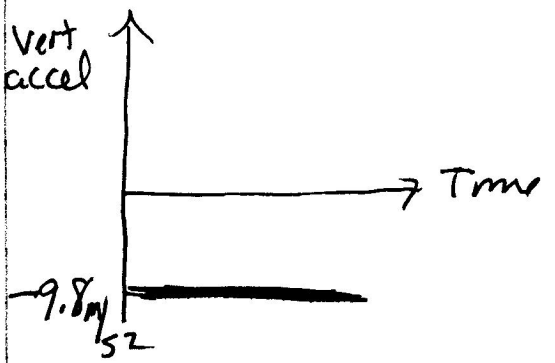
d) accel = 0? Nowhere

Graph – of Vertical Motion –

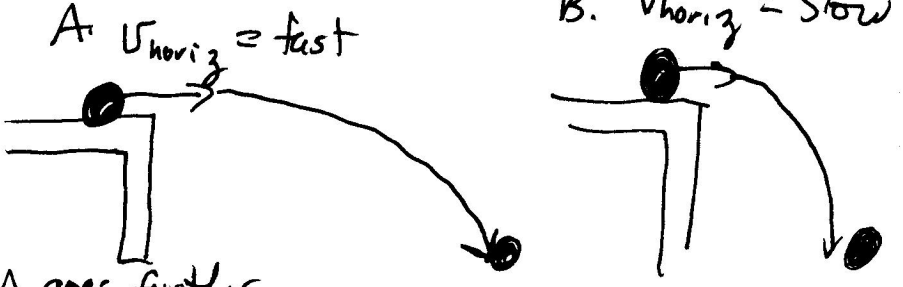
Motion 1: From cannon to B, ball slows down
2: From B to C, ball speeds up to ~same as A
3: From C to D, ball speeds up more







(15.)



Ball A goes further

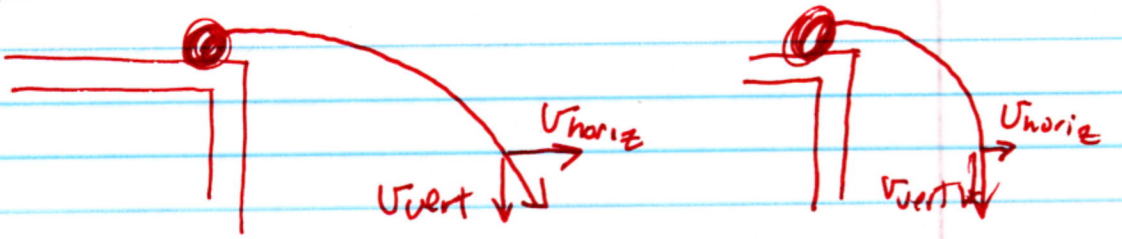
Ball A goes further because of horizontal speed

Times will be the same, they depend only on V_{vert}!

Ch. 3 HW

Qs (cont)

16.



Faster horizontal speed, case A

slower horiz. speed, case B

See, v_{TOTAL} for A $>$ v_{TOTAL} for B

Problems

(2.) $v_f = 60$ mi/hr $\quad v_i = 0$ mi/hr $\quad t = 6$ sec.

$$\text{accel} = a = \frac{\Delta v}{\Delta t} = \frac{60 - 0}{6\,\text{sec}}\ \text{mi/hr} = 10\ \frac{\text{mi}}{\text{hr sec}}$$

Unit conversion:

$$a = 10\ \frac{\text{mi}}{\text{hr sec}}\left(\frac{1\,\text{hr}}{60\,\text{min}}\right)\left(\frac{1\,\text{min}}{60\,\text{sec}}\right) = \boxed{2.78 \times 10^{-3}\ \text{mi/sec}^2}$$

Ch. 3 HW

Prob (cont)

(15.) $v_{747} = 530$ mi/hr $v_{concord} = 1500$ mi/hr

$d_{Tot} = 25{,}000$ miles $t = ?$

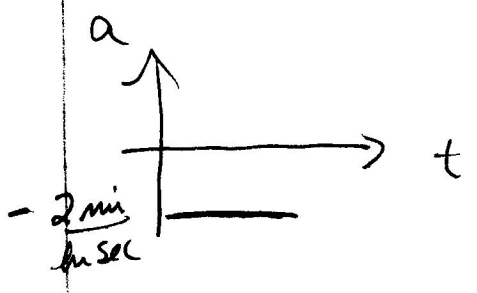
a) $t_{747} = \frac{d}{v_{747}} = \frac{25000 \text{ mi}}{530 \text{ mi/hr}} = \boxed{47.2 \text{ hrs}}$

b) $t_{concorde} = \frac{25{,}000 \text{ mi}}{1500 \text{ mi/hr}} = \boxed{16.7 \text{ hrs.}}$

(17.) $v_i = 50$ mi/hr $v_f = 0$

$t = 25$ sec. $a = \frac{v_f - v_i}{t} = \frac{0 - 50 \text{ mi/hr}}{25 \text{ sec}}$

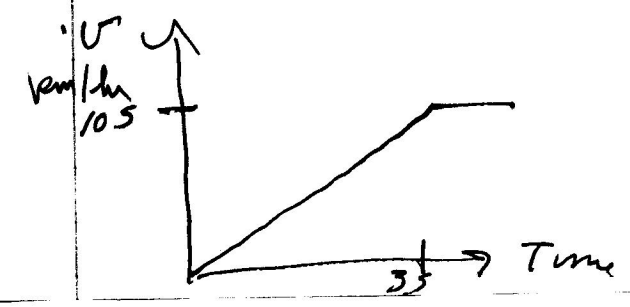
$a = \frac{-2 \text{ mi}}{\text{hr sec}} \left(\frac{1 \text{ hr}}{3600 \text{ sec}}\right) = \boxed{-5.6 \times 10^{-4} \frac{\text{mi}}{\text{s}^2}}$



(18.) $v_i = 0$, $v_f = ?$, $t = 35$ sec, $a = \frac{3 \text{ km}}{\text{hr sec}}$

$a = \frac{v_f - v_i}{t} \Rightarrow v_f = v_i + at = 0 + \frac{3 \text{ km}}{\text{hr sec}}(35 \text{ sec})$

$\boxed{v_f = 105 \text{ km/hr}}$



Ch. 3 HW

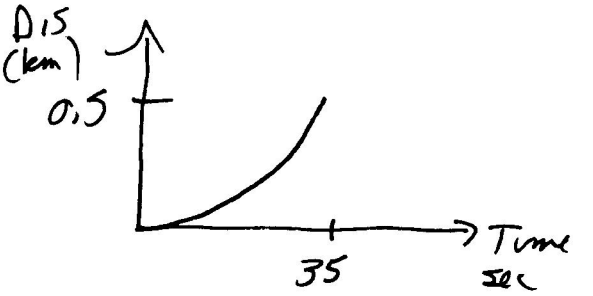
Probs (cont)

18. (cont) Total Dis. Traveled

$$d = \cancel{d_0}^{0} + \cancel{v_i}^{0} t + \frac{1}{2} a t^2$$

$$d_{TOT} = \frac{1}{2}\left(\frac{3\,km}{1\,sec}\right)(35\,sec)^2\left(\frac{1\,hr}{3600\,sec}\right)$$

$$\boxed{d_{TOT} = 0.51\,km}$$



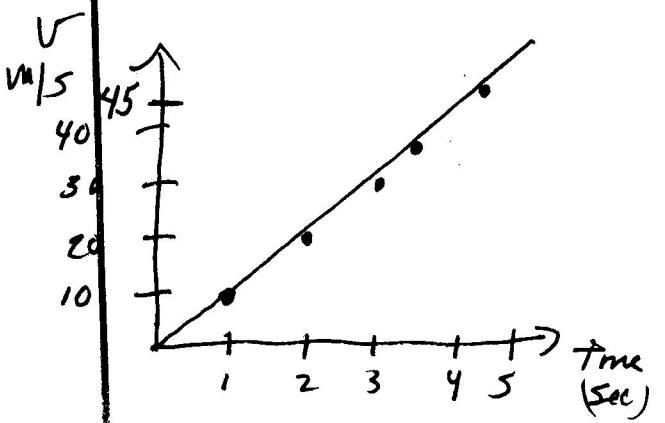
19.

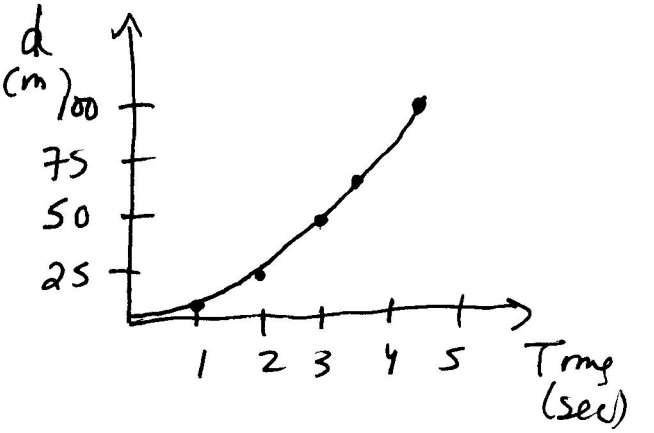
$v = at$

v	t
9.8 m/s	1
19.6 m/s	2
29.4 m/s	3
34.3 m/s	3.5
44.1 m/s	4.5

$d = \frac{1}{2} a t^2$

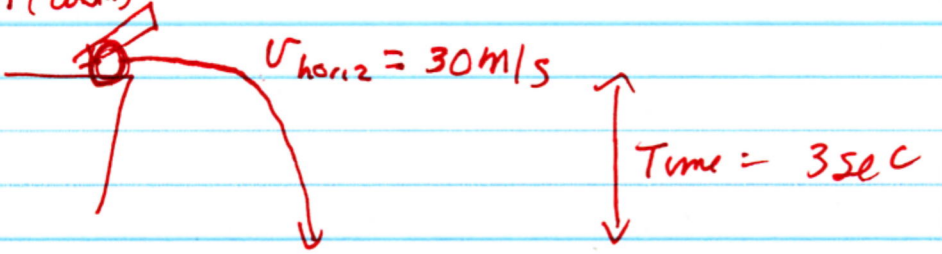
d	t
4.9 m	1
19.6 m	2
44.1 m	3
60 m	3.5
99.2 m	4.5





Probs (cont.)

(21.)



a) $d_{horiz} = v_{horiz}(t) = 30 m/s (3 sec) = \boxed{90 m}$

b) $d_{vert} = \frac{1}{2} a t^2 = \frac{1}{2} (9.8 m/s^2)(3 sec)^2 = \boxed{44.1 m}$

(22.)

Time = 5sec up & down, $t = 2.5$ sec uponly

a) speed at top (A) = 0 (all vertical speed)

b.) $v_i = ?$ Use $v_f - v_i = -at$

$v_i = \cancel{v_f}^{0} + at = 9.8 m/s^2 (2.5 sec)$

$\boxed{v_i = 24.5 m/s}$

c) How far up to pt. A?

$d = v_i t - \frac{1}{2} a t^2 = 24.5 m/s (2.5 sec) - \frac{1}{2} (9.8 m/s^2)(2.5 sec)^2$

$d = 61.3 m - 30.6 m = \boxed{30.7 m = d}$