Physics 113 - Fall 2013 - Solutions to PS 1

1) 1-2

(a) 214 → 3

(b) 81.60 → 4

(c) 7.03 → 3

(d) 0.03 → 1 (ZEROS ARE PLACEHOLDERS)

(e) 0.0086 → 2

(f) 3236 → 4

(g) 8700 → 2 (ZEROS ARE PLACEHOLDERS AGAIN)

2) 1-3

(a) $1.156 = 1.156 \times 10^{0}$

(b) $21.8 = 2.18 \times 10^{1}$

(c) $0.0068 = 6.8 \times 10^{-3}$

(d) $328.65 = 3.2865 \times 10^{2}$

(e) $0.219 = 2.19 \times 10^{-1}$

(f) $444 = 4.44 \times 10^{2}$

3) 1-6 | % UNCERTAINTY IS DEFINE AS

$$\% \text{ UNCERTAINTY} = \left(\frac{\text{UNCERTAINTY}}{\text{MEASURMENT}}\right) \times 100\%$$

(a) $\frac{0.2\text{ s}}{5\text{ s}} \times 100\% = 0.04 \times 100\% = 4\%$

(b) $\frac{0.2\text{ s}}{50\text{ s}} \times 100\% = 0.004 \times 100\% = 0.4\%$

(c) $\frac{0.2\text{ s}}{300\text{ s}} \times 100\% = 0.0007 \times 100\% = 0.07\%$

4) 1-11 | (a) $(286.6\text{ mm}) \cdot \left(\frac{1\text{ m}}{1000\text{ mm}}\right) = 0.2866\text{ m}$

(b) $(85\ \mu V) \cdot \left(\frac{1\text{ V}}{10^6\ \mu V}\right) = 0.000085\text{ V}$

(c) $(760\text{ mg}) \cdot \left(\frac{1\text{ kg}}{10^6\text{ mg}}\right) = 0.00076\text{ kg}$

(d) $(60.0\text{ ps}) \cdot \left(\frac{1\text{ s}}{10^{12}\text{ ps}}\right) = 0.000\,000\,000\,0600\text{ s}$

(e) $(22.5\text{ fm}) \cdot \left(\frac{1\text{ m}}{10^{15}\text{ fm}}\right) = 0.000\,000\,000\,000\,0225\text{ m}$

(f) $(2.50\text{ GV}) \cdot \left(\frac{10^9\text{ V}}{1\text{ GV}}\right) = 2{,}500{,}000{,}000\text{ V}$

5) 1-14 | $D = 93{,}000{,}000$ miles

THERE ARE 1609 meters IN 1 mile

SO

$(93{,}000{,}000\text{ mi}) \cdot \left(\frac{1609\text{ m}}{1\text{ mi}}\right) = 149{,}637{,}000{,}000$

BUT D ONLY HAD 2 SIGNIFICANT FIGURES

SO (a) $D = 1.5 \times 10^{11}\text{ m}$

(b) $D = 150$ GIGAMETERS

6) 1-15/

~~(a)~~ (a) $1\ yd = 3\ ft$ so

$1\ yd^2 = (3\ ft)^2 = 9\ ft^2$

THEN $\boxed{1\ ft^2 = 0.111\ yd^2}$

(b) SIMILARLY

$1\ m = 3.28\ ft$ so

$1\ m^2 = (3.28\ ft)^2 = 10.8\ ft^2$

SO $\boxed{1\ m^2 = 10.8\ ft^2}$

7) 1-16/

SINCE $d = vt$, WE KNOW THAT

$t = \frac{d}{v}$.

THEN $t = \frac{1\ km}{950\ km/hr} = 0.0011\ hr$

BUT SINCE $1\ hr = 3600\ s$

$t = (0.0011\ hr) \cdot \left(\frac{3600\ s}{1\ hr}\right) = \boxed{3.8\ s = t}$

8) 1-17/ $D = 1.0 \times 10^{-10}\ m$

(a) $1\ m = 39.37\ in$ so

$1.0 \times 10^{-10}\ m \cdot \left(\frac{39.37\ in}{1\ m}\right) = \boxed{3.9 \times 10^{-9}\ in}$

(b) SINCE $1\ cm = 10^{-2}\ m$ WE CAN DIVIDE THIS LENGTH BY THE LENGTH PER ATOM

$\frac{10^{-2}\ m}{1.0 \times 10^{-10}\ m} = \boxed{1.0 \times 10^{8}\ \text{ATOMS}}$

9) WE MUST MAKE SOME SIMPLE ASSUMPTIONS SO YOUR ANSWER MAY VARY.....

ASSUME A HEARTBEAT RATE OF 60 BEATS/min → 1 BEAT/s AND THAT THE AVERAGE HUMAN LIVES FOR 70 YEARS.. THEN

$$(70\,yr)\cdot\left(\frac{12\text{ month}}{1\,yr}\right)\cdot\left(\frac{30\text{ DAYS}}{1\text{ month}}\right)\left(\frac{24\,hr}{1\text{ DAY}}\right)\left(\frac{3600\,s}{1\,hr}\right)$$

$$= 2\times10^{9}\ s.$$

SO THE HUMAN HEART BEATS APPROXIMATELY 2×10^{9} TIMES DURING A LIFETIME.

10) 1-28

ASSUME THE FOOTBALL FIELD IS 100 m LONG BY 50 m WIDE THEN SINCE THE MOWER IS 0.5 m WIDE IT WOULD REQUIRE 100 TRIPS DOWN ITS LENGTH. SO $(100\,m)\cdot(100\text{ trips}) = 10{,}000\ m$ TOTAL AT A RATE OF 1 km/hr MEANS IT WOULD TAKE

~~10,000~~

$$\left(\frac{10\,km}{1\,km/hr}\right) = 10\ hrs$$

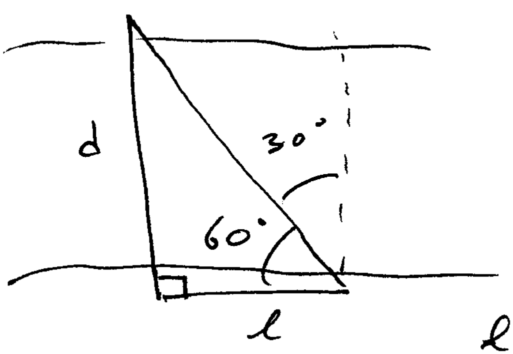
11) 1-45

THERE ARE 300,000,000 PEOPLE (3×10^8) IN THE USA. SUPPOSE THAT HALF OF THEM DRIVE CARS, AND THAT THEY AVERAGE 12,000 mi PER YEAR. IF THEY AVERAGE 20 MILES PER GALLON THEY CONSUME

$$\left(3\times10^8 \text{ PEOPLE}\right)\left(\frac{1 \text{ CAR}}{2 \text{ PEOPLE}}\right)\left(\frac{12{,}000 \text{ mi}}{1 \text{ yr}}\right)\left(\frac{1 \text{ gallon}}{20 \text{ mi}}\right)$$

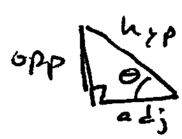
$$\approx 1\times10^{11} \text{ gallons/yr}$$

12) 1-57 (SOLUTION IN GIANCOLI'S MANUAL IS WEIRD FOR THIS ONE)



$$l = \left(\frac{0.8 \text{ m}}{1 \text{ STRIDE}}\right)\cdot\left(120 \text{ STRIDES}\right) = 96\text{m}$$

SINCE $\tan\theta = \frac{\text{OPP}}{\text{adj}}$ FOR



WE KNOW THAT

$$\tan 60^\circ = \frac{d}{l} \rightarrow d = l \tan 60^\circ$$

$$d = (96\text{m}) \tan 60^\circ \approx 166 \text{ m}$$