SPH4U0 Data Analysis Quiz Name:______________________ Total: ____/24 marks [K/U]

1. Give the number of significant digits in each of the following measurements: [3]

a) 0.00065 g= __2__ b) 36 000 __2__ c) 1.250 mL __4__

2. You are performing a pendulum experiment and determine that 5 cycles of the pendulum occur in a time of 8.6 s. Your group decides that your time measurement uncertainty is +/- 0.2 seconds and that the time measurement has 2 significant digits. Your lab partners begin to squabble about the significant digits in the number of cycles. One partner says it has 1 significant digit while your other partner says it has "infinite" significant digits. Who is correct? Please explain. [2]

"5 cycles" is a count not a measurement so it has "infinite" significant digits. All of the measurement uncertainty would be associated with the time measurement.

3. Do the following calculations, rounding off answers to the appropriate number of significant digits. Include correct units in your answer. [2]

a) 13.0 cm x 1.425 cm x 22.6 cm=

$418.665\ cm^3$

$\approx 419\ cm^3$ (to 3 sig digs)

b) 25.5 m + 12.85 m -3.125 m

$= 35.225\ m$

$= 35.2\ m$ (to 1 decimal place)

4. Perform the following units conversions, expressing your final answer in scientific notation if necessary. Show your work. [6]

a) 16.8 m/s= ? km/h

1 h = 3600 s, 1 km = 1000 m

$\frac{16.8\ m}{s} \times \frac{3600\ s}{1\ h} \times \frac{1\ km}{1000\ m}$

$= 60.5\ km/h$

b) 125 mm³= ? cm³

$(1\ cm)^3 = (10\ mm)^3$

$\frac{125\ mm^3}{1} \times \frac{1\ cm^3}{10^3\ mm^3}$

$= 1.25 \times 10^2 \times 10^{-3}\ cm^3$

$= 1.25 \times 10^{-1}\ cm^3$

c) 85 km/h = ? m/s

$\frac{85\ km}{h} \times \frac{1\ h}{3600\ s} \times \frac{1000\ m}{1\ km}$

$= 23.6\ m/s$

$\approx 24\ m/s$

5. Combine the measured values below as shown by the given formula and determine the absolute **absolute uncertainty** in the final value. Include the appropriate number of significant digits in your answer. [4]

a) Density=? D= mass/volume mass = 15.5 g ± 0.2 g volume = 2.65 cm³ ± 0.05 cm³

$\Delta m\% = \frac{0.2\ g}{15.5\ g} \times 100\% = 1.29\%$ $\Delta V\% = \frac{0.05}{2.65} \times 100\% = 1.89\%$

$D = \frac{m}{Vol} = \frac{15.5\ g}{2.65\ cm^3} \pm (\Delta m\% + \Delta Vol\%)$

$= 5.849\ g/cm^3 \pm 3.18\%$

$= 5.8\ g/cm^3 \pm 0.2\ g/cm^3$

b) Perimeter = ? Perimeter = $L_1 + L_2 + L_3$ L_1= 4.6± 0.1 cm L_2=12.9 ± 0.2 cm L_3 = 7.4 ± .1 cm

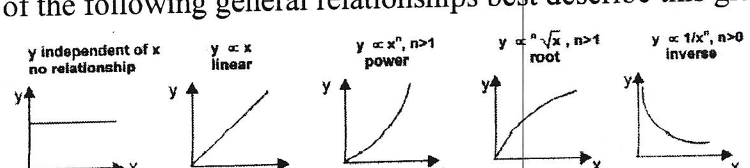
Per = 4.6 + 12.9 + 7.4 ± (0.1 + 0.2 + 0.1) cm

= 24.9 ± 0.4 cm

6. The table below shows the result of an experiment to investigate the variation of electric field intensity (E) with distance (D) from a point charge. Graph the relationship on the graph paper provided. [3]

Distance (m)	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
Electric Field Intensity (N/C)	225.0	100.0	56.0	36.0	25.0	18.4	14.1	11.1	9.0

Which of the following general relationships best describe this graph? Explain your choice. [1]



Inverse – the graph is non linear with a steep decline followed by a less rapid decline that approaches zero asymptotically.

Describe the steps in the graphical analysis process you would use to determine the expression for the full mathematical relationship that describes this graph. [3]

- First test the hypothesis that I ∝ 1/distance by plotting field intensity versus the inverse of distance. If this is the correct relationship it will appear linear and the constant of proportionality can be determined from the slope. If the [illegible] not linear test: $I \propto 1/d^2$, $I \propto 1/d^3$, etc.