P510/3 physics practical (*manipulation of data*)

(write ***the solutions in the last three pages of your work books***)

1. The results below were obtained in in an experiment to determine Young's modulus, E, of the material of the metre rule.
   t = 5.98mm, b = 2.52cm
   For l_1 = 0.950m P_0= 0.434m, P= 0.130m

a) Find the depression $y_1 = P_0 - P$.
   For l_2= 0.900m P_0= 0.374m, P= 0.110m.

b) Find the depression $y_1 = P_0 - P$.

3 $E_1 = \frac{2Mg}{bt^3}\left(\frac{l_1}{y_1} + \frac{l_2}{y_2}\right)$ 3

c) Calculate Young's modulus, E_1, from the expression where
   M= 0.200kg and $g = 9.81 ms^{-2}$.

d)

l(m)	P_0(cm)	P(cm)
0.900	19.6	28.5
0.800	19.3	25.1
0.700	18.9	22.9
0.600	18.7	21.0
0.500	18.6	20.1
0.400	18.5	19.3

Draw table including values of $x = (P - P_0)$ in metres, $log_{10}x$ and $log_{10}l$.

e) Plot a graph of $log_{10}x$ against $log_{10}l$.

f) Read and record the intercept, C on the $log_{10}l$ a-xis

g) Calculate Young's modulus, E_2, from the expression, $C = log_{10}\left(\frac{mg}{4E_2bt^3}\right)$
   where m= 0.500kg and $g = 9.81 ms^{-2}$.

h) Calculate Young's modulus , E from the expression $E = \frac{1}{2}(E_1 + E_2)$

2. The results below were obtained in an experiment to determine the resistance per metre of the material of the wire.
   l_1= 30.0cm l_2= 70.0cm I_1= 0.72A I_2= 0.42A
   V_1= 1.65V V_2= 1.95V

a) Calculate the resistance per metre, r_1, of the material of the wire from the expression, $r_1 = \frac{1}{2}\left(\frac{V_1}{I_1 l_1} + \frac{V_2}{I_2 l_2}\right)$

b)

x(m)	l(cm)
0.200	25.5
0.300	30.5
0.400	37.4
0.500	42.4
0.600	46.9
0.700	51.9

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c) Draw table including values of $\frac{1}{x}$ and $\frac{1}{l}$.

d) Plot a graph of $\frac{1}{l}$ against $\frac{1}{x}$.

e) Find the slope, S of the graph.

f) Calculate the resistance per metre, r_2, from the expression, $r_2 = \frac{R_S}{S}$ where R_S= 5.0Ω.

g) Calculate the resistance per metre, r, from the expression, $r = \frac{r_1 + r_2}{2}$.

END