2A/B PHYSICS
ASSIGNMENT 1: MEASUREMENT

NAME: SOLUTIONS DUE DATE: _____ /44

1. What is the difference between a ***fundamental unit*** and a ***derived unit***? Give an example of each.

FUNDAMENTAL: basis of all measurements in science. e.g. m, s, kg, A, K, mol, cd (1)

DERIVED: combination of fundamental units. e.g. ms^{-1}, ms^{-2}, $kgms^{-1}$, ---. (1)

(2)

2. Write the following in ***scientific notation***. Include the units.

(a) 6.43 μm 6.43×10^{-6} m (b) 293 mm 2.93×10^{2} mm

(c) 0.0085 C 8.5×10^{-3} C (d) 28.4×10^{-7} s 2.84×10^{-6} s

(e) 89.42 nanoseconds 8.942×10^{-8} s or 8.942×10^{1} ns (f) 0.0000412 GJ 4.12×10^{4} J or 4.12×10^{-5} GJ

(6)

3. Convert the following to ***standard units***, using scientific notation where possible.

(a) 0.021 mm 2.1×10^{-5} m (b) 4953 million kilometres 4.953×10^{12} m

(c) 26.4 μs 2.64×10^{-5} s (d) 34.4 m^2 3.44×10^{1} m^2

(e) 4.85×10^{-3} mm^3 4.85×10^{-12} m^3 (f) 756 cm^2 7.56×10^{-2} m^2

(6)

4. How many significant figures are in the following numbers?

(a) 1.003 4 (b) 0.0021 2 (c) 4.61×10^{-4} 3

(d) 2×10^{3} 1 (e) 20000 1 (f) 3000.0 5

(6)

5. Perform the following calculations, giving your answers to the correct number of significant figures.

(a) 21.6 + 41.24 + 28 91 (2)

(b) $\dfrac{(61.4)(2.4 \times 10^{-4})}{(3.016 \times 10^{-9})}$ 4.9×10^{6} (2)

(c) $\dfrac{(28.65 + 7.4 - 3.105)}{(2.649 \times 10^{3})} = \dfrac{33.0}{2.649 \times 10^{3}} = 1.25 \times 10^{-2}$ (2)

(6)

6. A group of students measured a glass rectangular block with the dimensions 10.52 cm x 20.2 cm x 3.2 cm.

(a) Write the dimensions individually, giving the ***absolute uncertainty*** and ***percentage uncertainty***.

length: $20.2 \pm 0.1\ cm = 20.2\ cm \pm 0.5\ \%$

width: $10.52 \pm 0.01\ cm = 10.52\ cm \pm 0.1\ \%$

height: $3.2 \pm 0.1\ cm = 3.2\ cm \pm 3.1\ \%$.

(6)

(b) Calculate the volume of the block, giving your answer in scientific notation with the correct number of significant figures and standard units. Include the absolute uncertainty involved.

$V = l \times w \times h$

$= (0.202)(0.1052)(3.2 \times 10^{-2})$

$= 6.8 \times 10^{-4}\ m^3 \pm 3.7\ \%$

$= 6.8 \times 10^{-4} \pm 2.5 \times 10^{-5}\ m^3$

(3)

7. A group of students investigated the relationship between the volume of a confined gas and its pressure. They understood that the relationship was given by:

$$P = \frac{k}{V},$$

where P = pressure (cm of Hg)
V = volume (Litres)
k = constant.

Their results are given in the table below.

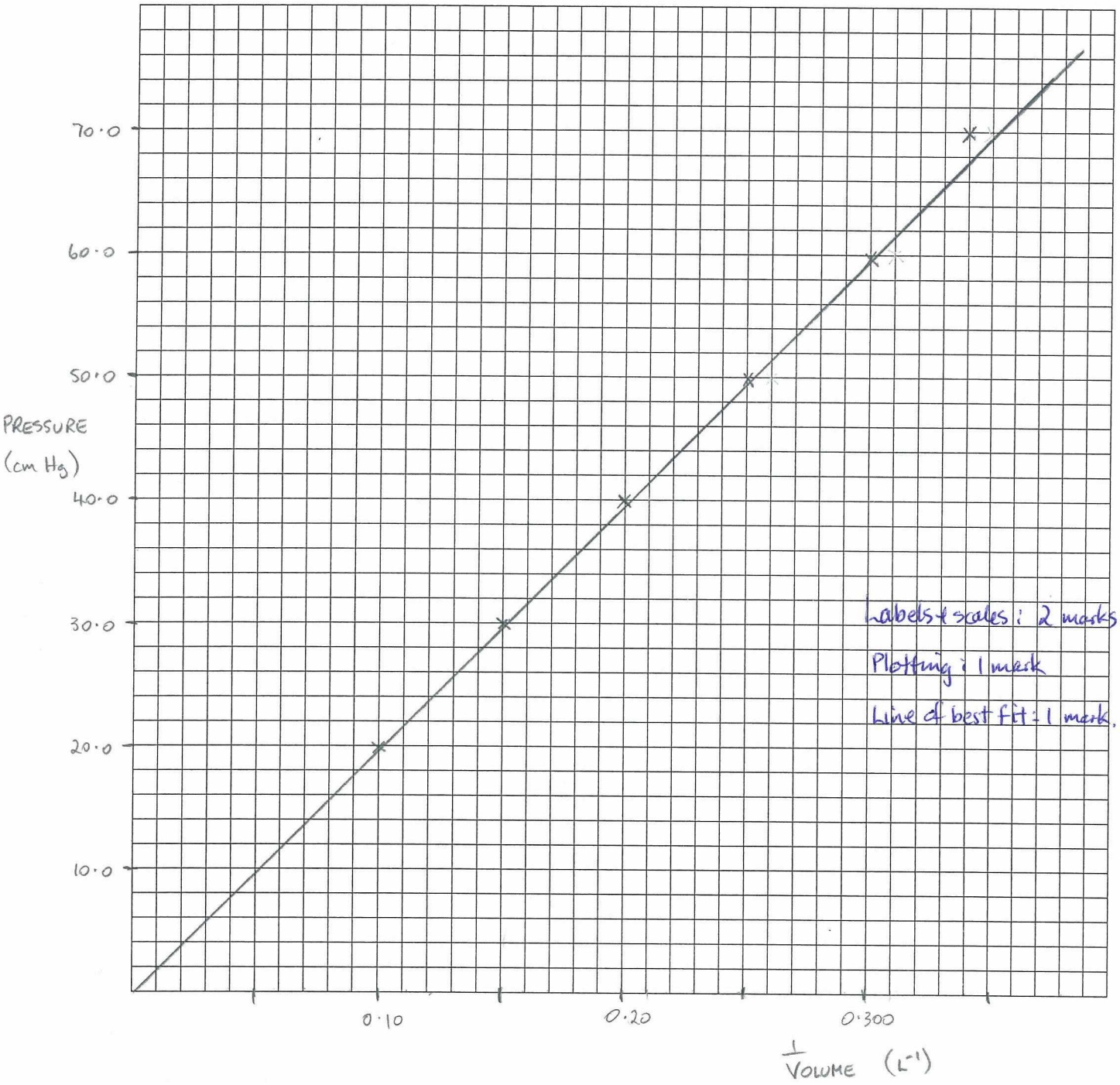
Pressure (cm of Hg)	Volume (L)	$\frac{1}{V}$ (L^{-1})
20.0	10.0	0.100
30.0	6.7	0.149
40.0	5.0	0.200
50.0	4.0	0.250
60.0	3.3	0.303
70.0	2.9	0.345

(a) Manipulate the data to generate a straight-line graph. Record your data in the vacant column.

(2)

(b) Either graph the data on the grid provided, or use your calculator to generate a line of best fit.

Equation: $P = \frac{1.92 \times 10^2}{V} + 1.22$ (4)



(c) Use the graph to determine the value of the constant k.

$\text{gradient} = \frac{(75.0 - 0)}{(0.38 - 0)} = 2.0 \times 10^2$ cm Hg L (2)

$P = \frac{k}{V}$

$\Rightarrow k = PV$

$= \text{gradient}$

$= 2.0 \times 10^2$ cm Hg L (1)

(3)