Physics A level Transition Task:

The Island VI Form - Hand in the completed tasks on your first lesson

Part 1: Algebraic manipulation

1. Simplify the following as far as possible

a) $3ab + 2a - 3b - ab$ b) $2x^2 + 3x - 4x + 5 + 6x^2$

c) $2a \times 3a$ d) $e^2 \times 4e^3$

e) $3ab \times 2a$ f) $\frac{2x^2}{x}$

g) $\frac{6ab}{2ac}$ h) $\frac{a+b}{c-b}$

2. Multiply out the following brackets, and simplify the answer as far as possible

a) $3a(2 - b)$ b) $x(3x - 4)$ c) $-4y(2 + 5y)$

d) $-3a^2(4b - a)$ e) $(x + 2)(x - 3)$ f) $(2x - 5)(x - 7)$

g) $(1 - 4x)(2 + 7x)$ h) $(x^2 + 2)(2x + 5)$

3. Rearrange each of the following to make the letter indicated the subject

a) $s = ut + \frac{1}{2} at^2$ u b) $F = \frac{GMm}{r^2}$ m

c) $F = \frac{GMm}{r^2}$ r d) $I = \frac{Q}{t}$ t

e) $T = 2\pi\sqrt{\frac{L}{g}}$ L f) $y = \frac{2-x}{3+x}$ x

g) $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ R_1 h) $2as = v^2 - u^2$ v

Part 2 Standard form

1. Convert these numbers into normal form.

a) 5.239×10^3 b) 4.543×10^4 c) 9.382×10^2 d) 6.665×10^6

e) 1.951×10^2 f) 1.905×10^5 g) 6.005×10^3

2. Convert these numbers into standard form.

a) 65345 b) 28748 c) 548454 d) 486856

e) 70241 f) 65865758 g) 765

3. Convert these numbers into normal form.

a) 8.34×10^{-3} b) 2.541×10^{-8} c) 1.01×10^{-5}

d) 8.88×10^{-1} e) 9×10^{-2} f) 5.05×10^{-9}

4. Convert these numbers to standard form.

a) 0.000567 b) 0.987 c) 0.0052

d) 0.0000605 e) 0.008 f) 0.0040302

5. Calculate, giving answers in standard form,

a) $(3.45 \times 10^{-5} + 9.5 \times 10^{-6}) \div 0.0024$

b) $(2.31 \times 10^{5} \times 3.98 \times 10^{-3}) + 0.0013$

Part 3 Making Estimates

1. Define the term Order of Magnitude

2. For the following, estimate to the nearest order of magnitude:

Example	Order of magnitude estimate
Height of a human in m	
Height of a human in cm	
Mass of a human in kg	
Weight of an apple in N	
Thickness of a piece of paper in m	
Height of a house in m	
Diameter of a dinner plate in m	
The length of a lesson in s	
Volume of a pencil in m^3	
Mass of a standard car in kg	

Wavelength of visible light in m	

3. Make order of magnitude estimates of the following quantities:

a. Surface area of a door in m^2

b. Volume of a raindrop in m^3

c. Density of wood in kgm^{-3}

Part 4 Units & Prefixes

Prefixes are written in front of units to indicate multiplication or division by multiples factors of 1000. So mega means x1,000,000. (One exception is 'centi', as in cm, which means divide by 100)

YOU MUST LEARN THE PREFIXES BY HEART AND BECOME ADEPT AT WORKING WITH THEM.

1. Complete the following table. (You will need to research some of the missing units).

Symbol		**Multiplier**	**Which means…**
	terra		
		$x10^9$	
M			x1,000,000
k			x1000
(None)	—------	—-------	x1
m			
	micro		➗ 1,000,000
n			
		$x10^{-12}$	
f			

2. Expand each of these quantities to write out the answer in full (i.e. without the prefixes)

a) 900mV =
b) 12MJ =
c) 1.67mm =
d) 3.456kg =
e) 700nm =
f) 0.72pA =

3. Write each of the following using an appropriate prefix:

g) 0.005A =
h) 30000s =
i) 5 x 105m =
j) 1001m =
k) 0.006V =
l) 2,100,000N =

4. Convert each of the following to the indicated units:

a) 34nm = ...mm

b) 0.012s = ...s

c) 4.5MJ = ...kJ

Part 5 Rules for significant figures (sig fig or sf)

Read from the left and start counting sig figs when you encounter the first non-zero digit

1. All non zero numbers are significant (meaning they count as sig figs)
    - 613 has three sig figs
    - 123456 has six sig figs
2. Zeros located between non-zero digits are significant (they count)
    - 5004 has four sig figs
    - 602 has three sig figs
    - 60000000000000002 has 16 sig figs!
3. Trailing zeros (those at the end) are significant only if the number contains a decimal point; otherwise they are insignificant (they don't count)
    - 5.640 has four sig figs
    - 120000. has six sig figs
    - 120000 has two sig figs – unless you're given additional information in the problem
4. Zeros to left of the first nonzero digit are insignificant (they don't count); they are only placeholders!
    - 0.000456 has three sig figs
    - 0.052 has two sig figs
    - 0.00000000000000000000000000000000052 also has two sig figs!

Rules for calculations

When you perform a calculation the answer should be given to the same number of significant figures as the weakest piece of data that was used in the calculation. For example if a piece of card is 11.3 cm long and 2.4 cm wide then the area = 27.12 cm^2 (on the calculator), but should be written as **27 cm^2** (i.e. 2 sig fig) because the width (2.4) was only given to 2 sig fig.

Practice Questions

1. State the number of sig figs in each of the following numbers:

(a) 0.0000055 g ..... (b) 1.6402 g ..... (c) 3.40×10^3 mL .....

2. Compare the following numbers: 370 000 v 3.70×10^6 (standard form)
Explain the advantage of giving an answer in standard form
.....
.....

3. Complete each of the following calculations using your calculator, giving your answer in standard form with the correct number of significant figures, with your answer in the units indicated.

(a) $\rho = m / V = 0.542\ g / 0.027\ cm^3 =$ .....$g \cdot cm^{-3}$

(b) $E = m\ c^2 = 231.5 \times 10^{-3} \times (3.00 \times 10^8)^2 =$ .....J

(c) Mean time = (23 + 20 + 21 + 22 + 25) / 5 = ...s

(d) Height difference = 2.32m – 2.07m = ...m

5. Complete the following calculations using a calculator, showing your working and giving an answer in standard form to the correct number of significant figures, in appropriate units:
a) $2.3 \times 6.5 / 3.7 \times (9.1)^2 =$

b) $(314)^3 / (9.9^2) =$

c) $(12 \times 45g) / 12\ cm^3 =$

d) $1.2\ x10^{-6} \times 1.5\ x10^{-4} =$

e) $(16\ m \cdot s^{-1})^2 =$

f) $923Kg \times 9.8\ m \cdot s^{-2} =$

Part 6: Recording data

Whilst carrying out a practical activity you need to write all your raw results into a table. Don't wait until the end, discard anomalies and then write it up in neat.

Tables should have column heading and units in this format quantity/unit e.g. length /mm

All results in a column should have the same precision and if you have repeated the experiment you should calculate a mean to the same precision as the data.

Below are link to practical handbooks so you can familiarise yourself with expectations.

https://filestore.aqa.org.uk/resources/physics/AQA-7407-7408-PHBK.PDF

Below is a table of results from an experiment where a ball was rolled down a ramp of different lengths. A ruler and stop clock were used.

1) Identify the errors the student has made.

	Time			
Length/cm	**Trial 1**	**Trial 2**	**Trial 3**	**Mean**
10	1.45	1.48	1.46	1.463
22	2.78	2.72	2.74	2.747
30	4.05	4.01	4.03	4.03
41	5.46	5.47	5.46	5.463
51	7.02	6.96	6.98	6.98
65	8.24	9.68	8.24	8.72
70	9.01	9.02	9.0	9.01

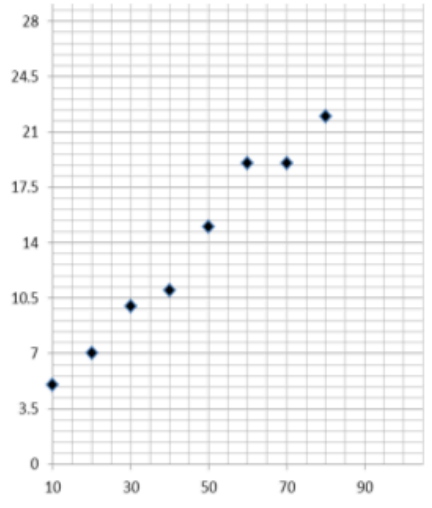
Part 7: Graphs

After a practical activity the next step is to draw a graph that will be useful to you. Drawing a graph is a skill you should be familiar with already but you need to be extremely vigilant at A level. Before you draw your graph to need to identify a suitable scale to draw taking the following into consideration:

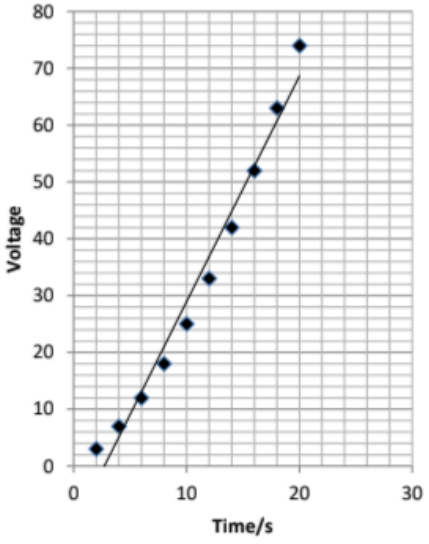
- the maximum and minimum values of each variable
- whether 0.0 should be included as a data point; graphs don't need to show the origin, a false origin can be used if your data doesn't start near zero.
- the plots should cover at least half of the grid supplied for the graph.
- the axes should use a sensible scale e.g. multiples of 1,2, 5 etc)

1) Identify how the following graphs could be improved

Graph 1



Graph 2



Further Activities

It is important to ensure you have secure GCSE knowledge. Ensure you have looked at areas of strength and weakness and have the skills ready to progress.
You may want to use the following to review knowledge:
1. Seneca Learning
2. Isaac Physics
Thank you for completing this booklet. If you have any further questions, please feel free to contact me. See you in September.

Mr Palmer