



Tudor Grange Academy Redditch

# A Level Year 1 Physics Y12 Preparatory Task Summer Work

Name: \_\_\_\_\_

This work will form a good foundation for your understanding of measurements and practical work.

## Welcome to A level Physics!

The Physics Department is very pleased to have you starting with us and we look forward to a great two years as you take on one of the most challenging and rewarding of the A levels.

This summer work will get you ready for a good start in September. You can tackle these tasks in any order.

Please have your work ready in the first week of the year as it will form the basis for the early lessons!

### Contents

1	Definitions and Units	It is important to have the right words to describe the situations you work in. Complete this task on paper. You will probably need to research the definitions on the internet before you apply them to the questions.
2	Prefixes	Dealing with very large or very small numbers is what physicists are very good at. You need to get your head around these. Converting millimetres to metres or other similar changes will come naturally to you very soon.
3	Means and Anomalous Results	A physicist has to be able to cope with multiple measurements. This will build on the controlled assessment work you have done at GCSE. <i>WATCH OUT!</i> You are to calculate the mean (average) for all the numbers <i>twice</i> , once using all the results and once after removing any anomalous results.
4	Significant Figures	It really is bad form to write down every single digit that your calculator says an answers is (e.g. 534.782303). Learning to have the confidence to include only the most significant digits is a key skill that is tested in the exams. <i>TIP:</i> When you multiply or divide your answer should be given to the least sf (significant figures) of the numbers you used.
5	Points plotting	Use a sharp pencil or a propelling pencil is better as it will keep its sharpness better. Put all the lines on the same axes.
6	Lines of best fit	You will have to make the call as to whether it's a line or a curve.

# Skills to succeed

- Curiosity and a desire to understand
- Diligence in completing tasks
- Resilience when the answer doesn't come first time
- Independence – seeking out support from text books or online before giving up
- Confident in maths
  - Basic algebra – rearranging equations
  - Use of the standard form
- Accuracy and clarity in communication, written and spoken, and the presentation of data
- The ability to apply new learning to a different context e.g. answering exam questions will mean working out what is being asked and a strategy to find the answer. Often there will be more than one way to get the right answer.
- Problem solving

## Personal Learning Checklist – Introductory Task

		Covered	Revised	Confident
	<b>Introductory Tasks</b>			
	Recall the fundamental units and their SI units			
	Recall the common prefixes for units and their value			
	Convert units between different prefixes and standard form			
	Recall the different types of error and the resolution of various instruments and scales			
	Explain the difference between <ul style="list-style-type: none"> <li>• precision and accuracy.</li> <li>• repeatability and reproducibility.</li> </ul>			
	Plot data accurately			

Define the following words:

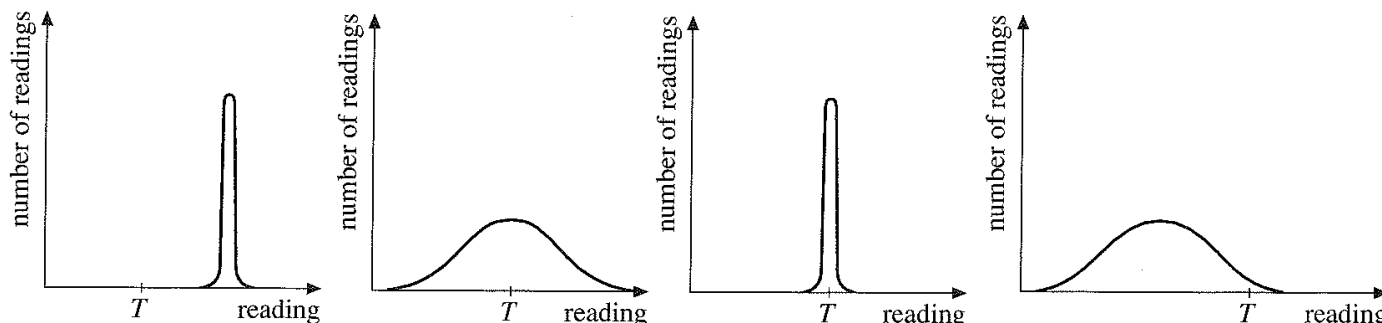
Independent variable	Accuracy	Zero error
Dependent variable	Precision	Mean value
Control variable	Reliability	Anomalous results
Continuous variable	Calibration	Line of best fit
Discrete variable	Random error	Gradient
Categoric variable	Systematic error	Y-Intercept

1. How do you improve the precision of a reading?
2. How do you improve the reliability of your results?
3. If a weighing scale read 20g when nothing was placed on it how would you describe it?
4. If you used this to find the masses of different samples of metal what type of error would it produce?
5. How could you calculate the true value for each of the masses?
6. How do you calculate a mean value of 4 readings?
7. If all your readings are to 2 significant figures how many sig fig can your mean value be? Why?
8. Which type of variable would the following be classed as:
 

a) Height in cm?	i) Favourite chocolate bar?
b) Gender?	j) Current in Amps?
c) Dress size?	k) Smelliness?
d) Attractiveness?	l) Age in days?
e) Distance in m?	m) pH?
f) Brightness?	n) Pressure in Pa?
g) Volume of CO <sub>2</sub> produced in m <sup>3</sup> ?	o) Loudness?
h) Temperature in Fahrenheit?	p) T-Shirt size?

If  $T$  represents the true value which of the graphs below represents:

- |                              |                                  |
|------------------------------|----------------------------------|
| A. Precise and accurate?     | C. Accurate but not precise?     |
| B. Precise but not accurate? | D. Neither accurate nor precise? |



## Units

By using internet research e.g. the National Physics Laboratory ([NPL](http://www.npl.co.uk)) produce notes on:

1. The base units in the SI system (there are 7 but you can ignore light intensity – candela)
2. Derived SI units e.g. volume is m<sup>3</sup>

Skills	<h1 style="margin: 0;">Prefixes</h1>
2	

*In Physics we have to deal with quantities from the very large to the very small. A prefix is something that goes in front of a unit and acts as a multiplier. This sheet will give you practice at converting figures between prefixes.*

Symbol	Name	What it means		How to convert	
P	peta	$10^{15}$	1000000000000000		↓ x1000
T	tera	$10^{12}$	1000000000000	↑ ÷ 1000	↓ x1000
G	giga	$10^9$	1000000000	↑ ÷ 1000	↓ x1000
M	mega	$10^6$	1000000	↑ ÷ 1000	↓ x1000
k	kilo	$10^3$	1000	↑ ÷ 1000	↓ x1000
			1	↑ ÷ 1000	↓ x1000
m	milli	$10^{-3}$	0.001	↑ ÷ 1000	↓ x1000
μ	micro	$10^{-6}$	0.000001	↑ ÷ 1000	↓ x1000
n	nano	$10^{-9}$	0.000000001	↑ ÷ 1000	↓ x1000
p	pico	$10^{-12}$	0.000000000001	↑ ÷ 1000	↓ x1000
f	femto	$10^{-15}$	0.000000000000001	↑ ÷ 1000	

Convert the figures into the prefixes required.

s	ms	μs	ns	ps
134.6	134600 or $1.346 \times 10^5$	134 600 000 or $1.346 \times 10^8$	134 600 000 000 or $1.346 \times 10^{11}$	134 600 000 000 000 or $1.346 \times 10^{14}$
96.21				
0.773				

m	km	mm	Mm	Gm
12873	12.873	12 873 000 or $1.2873 \times 10^7$	0.012873 or $1.2873 \times 10^{-2}$	0.000012873 or $1.2873 \times 10^{-5}$
0.295				
57.23				

kg	Mg	mg	g	Gg
94.76				
0.000765				
823.46				

A	mA	μA	nA	kA
0.000000678				
3.56				
0.00092				

Skills	<h1>Means and Anomalous Results</h1>
3	

*For each set of values calculate the mean and then calculate the mean ignoring any anomalous results.*

1	2	3	Mean	
4152	2996	4018	3722	4085
935.5	925.8	926.7		
16.2	19.1	17.4		
80.1316	80.1324	80.1466		
2229	2011	1610		
127.664	127.416	127.489		
55.88	11.97	37.59		
3.767	3.763	3.751		
375.5	511.5	463.4		
1048	888	1655		
0.507	0.415	0.230		
27145	25157	26017		
1450	1014	2238		
9104.32	10529.45	9160.97		

1	2	3	4	Mean	
63.10	62.97	62.53	62.99		
465.98	463.40	466.96	155.56		
3.61	7.39	3.55	3.64		
73.71	70.98	74.19	72.38		
2.058	1.566	2.078	1.787		
416	402	189	986		
700653	739762	742471	726161		
2670887	2670901	2669942	2670733		
110.4	260.1	1044.2	488.8		

1	2	3	4	5	Mean	
140	220	90	180	140		
56300	41200	58600	48300	53800		
0.186	0.341	0.276	0.216	0.314		
1.427	0.235	0.488	1.922	1.620		
34	62	46	12	39		
326.19	360.22	314.20	352.22	400.18		
1.4	5.3	2.7	3.9	2.6		

Skills	<h1 style="margin: 0;">Significant Figures</h1>
4	

*For each value state how many significant figures it is stated to.*

Value	Sig Figs	Value	Sig Figs	Value	Sig Figs	Value	Sig Figs
2	1	1066	4	1800.45	6	0.07	
2.0		82.42		$2.483 \times 10^4$		69324.8	
2.00		750000		2.483		0.0063	
0.136		310		5906.4291		$9.81 \times 10^4$	
0.34		$3.10 \times 10^2$		200000		6717	
54.1		$3.1 \times 10^2$		12.711		0.91	

*Add the values below then write the answer to the appropriate number of significant figures*

Value 1	Value 2	Value 3	Total Value	Total to correct sig figs
51.4	1.67	3.23		
7146	-32.54	12.8		
20.8	18.72	0.851		
1.4693	10.18	-1.062		
9.07	0.56	3.14		
739762	26017	2.058		
8.15	0.002	106		
132.303	4.123	53800		
152	0.8	0.55		
0.1142	4922388	132000		

*Multiply the values below then write the answer to the appropriate number of significant figures*

Value 1	Value 2	Total Value	Total to correct sig figs
0.91	1.23		
8.764	7.63		
2.6	31.7		
937	40.01		
0.722	634.23		

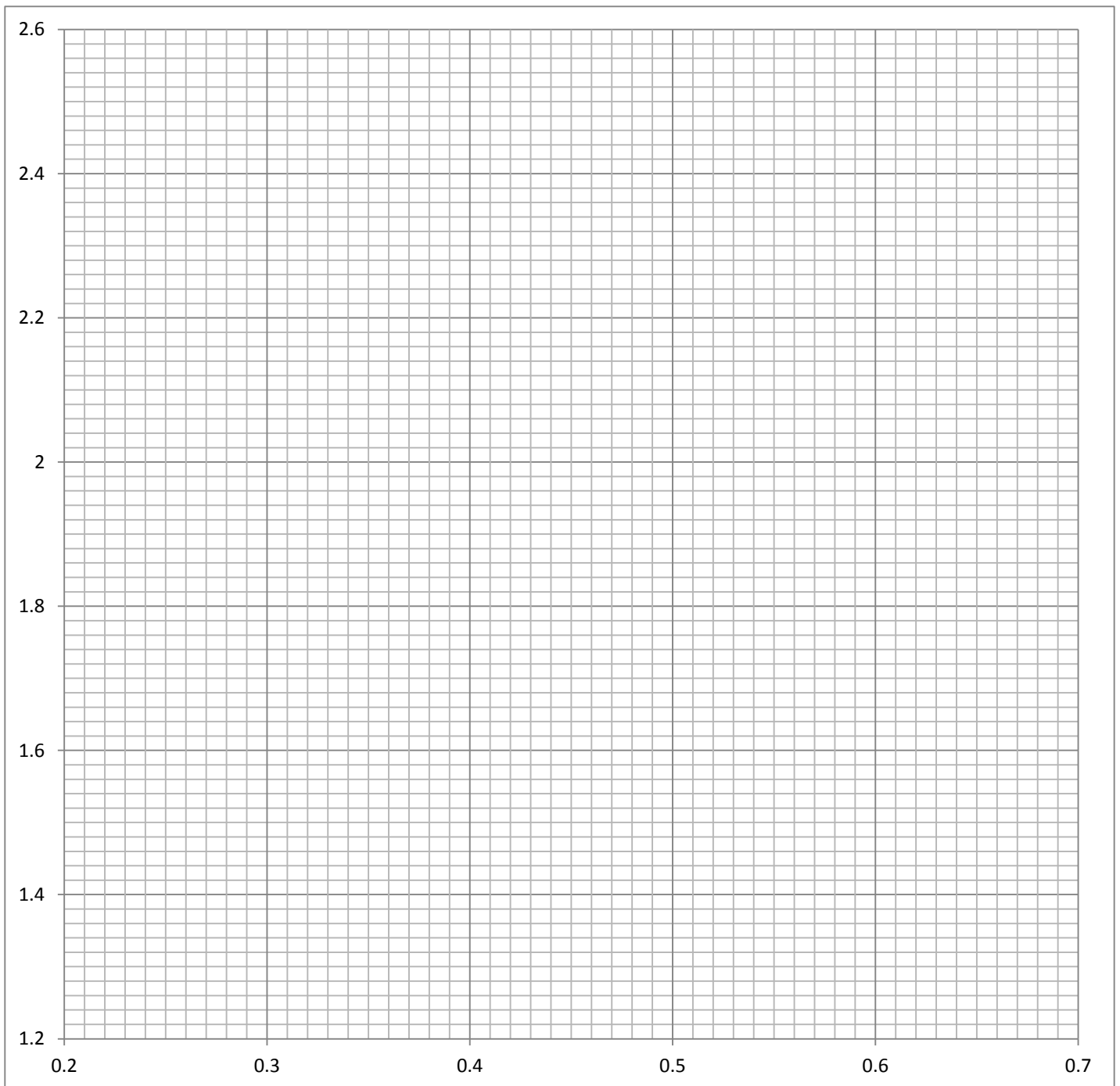
*Divide value1 by value 2 then write the answer to the appropriate number of significant figures*

Value 1	Value 2	Total Value	Total to correct sig figs
5.3	748		
3781	6.434		
$91 \times 10^2$	180		
5.56	$22 \times 10^{-3}$		
3.142	8.314		

Skills	Points Plotting
5	

*You are going to practice plotting points on a graph. This skill carries up to 3 marks in the ISA.*

x axis	y axis	x axis	y axis	x axis	y axis
0.44	2.44	0.34	1.75	0.67	2.12
0.27	1.39	0.49	1.99	0.58	1.64
0.39	2.13	0.26	2.22	0.65	2.52
0.62	1.23	0.31	2.49	0.29	1.92
0.37	1.52	0.52	2.36	0.45	1.47
0.22	2.56	0.61	2.23	0.53	1.27
0.42	1.84	0.64	1.83	0.24	1.71
0.48	1.70	0.55	2.15	0.67	1.45





# Lines of Best Fit

Draw a line of best fit for each of the graphs.

