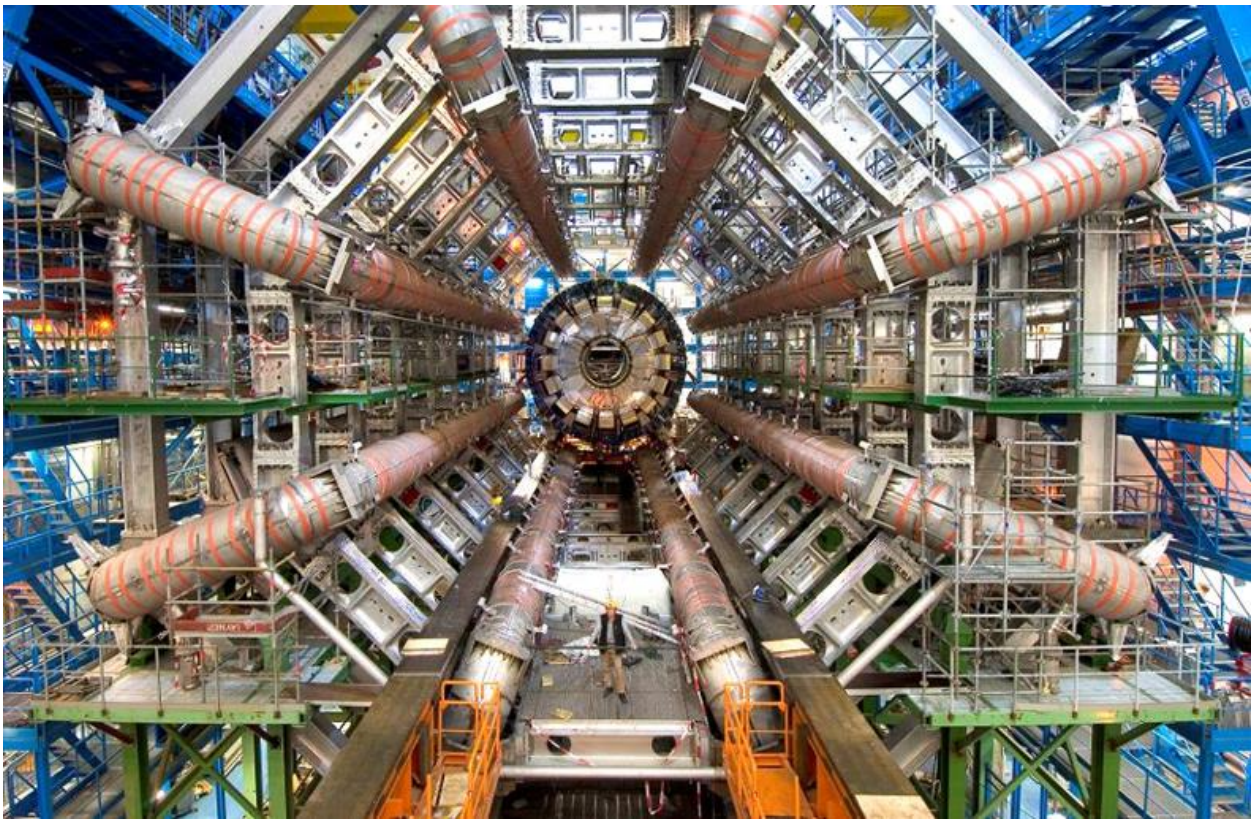
Sixth Form Pre-Induction work.

Physics.



Task one: How well do you know your symbols and units?

What are the symbols and units for the following quantities?

Quantity	Symbol	Units
mass		
resistance		
temperature		
time		
weight		
acceleration		
area		
force		
current		
potential difference		
charge		
pressure		
Wavelength		
displacement		
velocity		
Gravitational field strength		
energy		
power		

Task two: Conversions.

Formulas use **SI** (Système International) **units** based on seven **base units**:

- **Distance** – metre (m);
- **Mass** – kilogram (kg);
- **Time** – second (s);
- **Temperatur**e – Kelvin (K);
- **Current** – ampere (A);
- **Amount of substance** – mole (mol);
- **Intensity of light** – candela (cd) [which you will not come across at A-level.]

It is good practice to convert your quantities into SI units. Many units may be prefixed e.g. **milli**metre. The table overleaf shows some common prefixes.

Prefix	*Symbol*	*Meaning*	*Example*
Femto	**f**	$\times 10^{-15}$	**1 fm**
Pico	**p**	$\times 10^{-12}$	**1 pF**
Nano	**n**	$\times 10^{-9}$	**1 nF**
Micro	**μ**	$\times 10^{-6}$	**1 μg**
Milli	**m**	$\times 10^{-3}$	**1 mm**
Centi	**c**	$\times 10^{-2}$	**1 cm**
Kilo	**k**	$\times 10^{3}$	**1 km**
Mega	**M**	$\times 10^{6}$	**1 MΩ**
Giga	**G**	$\times 10^{9}$	**1 GWh**
Tera	**T**	$\times 10^{12}$	**1 TB**

Convert the following to SI units. Show all working out and remember to state your units as often units will receive a mark on the paper. **REMEMBER, conversions must be done BEFORE the calculation.**

15 cm	
500 g	
3 km	
35 mV	
220 nF	

Task three: Standard form.

Standard form comes in very handy when using very large or very small numbers. It consists of a number between 1 and 100 multiplied by a power of 10.

Recap: Look at this number: **7 478 000 000 000**

Start counting from here to get the power of 10.

There are 12 digits after the first digit, so we can write the number in standard form as:

$$7.478 \times 10^{12}$$

For fractions we count how far back the first digit is from the decimal point:

0.00000000375

There are nine places from the decimal point, so it is:

$$3.75 \times 10^{-9}$$

Convert these numbers to standard form:	
86	
381	
45300	
1 500 000 000	
0.03	
0.00045	
0.0000000782	

Task four: Rearranging equations.

Rearrange the following equations. Note which quantity is to be the subject.

Equation	Subject	Answer
$V = IR$	R	
$p = mv$	v	
$Q = CV$	C	

Now try a few harder ones…

Equation	Subject	Answer
$pV = nRT$	V	
$Ep = mg\Delta h$	Δh (**Δh is a single term**)	
$V = \frac{-GM}{r}$	G	
$\lambda = \frac{ws}{D}$	D	

Task five: Graph skills.

Graphs are a very important way to display your data. Here are some key points to consider about graphs…

1. Always use a sharp pencil and a ruler.
2. Draw the axes in, don't just write numbers at the side of the paper.
3. **Label** the axes with the quantity **and the units**
4. When you plot *Quantity 1* **against** *Quantity 2*, you put *Quantity 2* on the horizontal axis.
5. Look for the highest value in each range. You **calibrate** (put numbers on) your axes to the nearest convenient step above your highest value.
6. Use a sensible scale – your graph should be as large as possible.
7. **Plot** your points with **crosses** (+ or ×).
8. Join your points with a line, but not dot-to-dot! It is possible that your results may show a curve so don't be worried!!

Use the data below to plot a graph of Reactance against Frequency. Remember the rules!

Frequency (Hz)	*Reactance (Ω)*
500	100
1000	200
1500	310
2000	396
2500	420
3000	600
4000	820
5000	1040

What is the value of the reactance at a frequency of 4200 Hz?

What frequency gives a value of reactance of 700 ohms?

- Reading values off the graph is called **interpolating**.
- When we extend the graph, we are **extrapolating**.

Work out the gradient of your graph. **Show on your graph** how you got the gradient.
Often examiners will ask for the units of the gradient, what are the units of your gradient?

Plot the following data and join the points with a line of best fit. Note that there is an anomalous result.

Voltage (V)	***Power (W)***
0	0
2.5	2.0
5.0	4.1
7.5	18.4
10.0	31.8
12.5	52.1
15.0	72.6
17.5	100
20.0	128

Which point is the anomalous result? Show how to identify this on a graph.

How can you avoid anomalies?

Define the following words mean in relation to graphs and data?

Reliable:

_____

_____

Valid:

_____

_____

Why do we draw a line of best fit?

_____

_____

_____

Task six:

Write a short paragraph about something that interests you in Physics.