Wymondham High Academy Trust

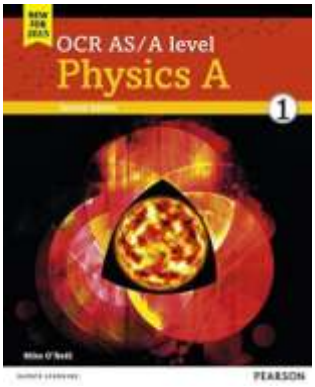
A Level Physics

Introductory notes and summer work

2016/17

NAME: _____

A level Physics Textbook:



For the Year 12 work you will be provided with a textbook, for use throughout the course. This is to be returned to us at the end of the course in good condition. If the book is returned to us damaged you may be charged the full price of a new book.

Websites and apps:

There are many websites worth putting in your favourites folder as well as apps to use.

Reviewing learning and revision

- www.wyhighphysics.wix.com/physics (Our Physics website)
- www.cyberphysics.co.uk (great notes and summary questions)
- http://www.s-cool.co.uk/a-level/physics (summary notes and questions)
- http://physicsnet.co.uk/a-level-physics-as-a2/ (summary notes)
- https://www.khanacademy.org/science/physics (tutorial videos for Physics)
- www.youtube.com (just do a search)
- http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html (higher level notes, Pre-U and graduate level)

Course information

We will be running the OCR course and the course content can be found in the specification here:

- http://ocr.org.uk/qualifications/as-a-level-gce-physics-a-h156-h556-from-2015/ (from page 8 but it is not particularly user friendly)
- http://ocr.org.uk/qualifications/as-a-level-gce-physics-a-h156-h556-from-2015/ (overview of course content – see the summary brochures link)

Past papers and mark schemes (very important revision tool) can be found here (similar content although the structure will be very different):

- http://ocr.org.uk/qualifications/as-a-level-gce-physics-a-h158-h558/

Information for studying Physics

The Physics course is a problem solving based course using the interpretation and application of learnt knowledge and understanding to unfamiliar situations, there will be a large portion of mathematics in every paper (at least 40%).

Physics content

It would be extremely useful for you to review the following areas from GCSE Physics and complete the summer tasks:

- Electricity
- Energy
- Forces
- Materials

Mathematics

Maths is used to help explain and understand the way the world around us works, whilst there have been many excellent physicists who have had a difficulty in maths – notably Michael Faraday – the course does require you to have a good GCSE (grade B or above) level of the mathematical skills and AS Maths enhances your achievement in A level Physics. Below is a list of the typical mathematics you will be required to understand and some tasks for you to complete.

You must be able to:

- Rearrange equations (known as transposition of formulae)
- Use trigonometry for right angled triangles
- Give answers to the correct number of significant figures or decimal places
- Use standard form notation and understand powers of 10 (i.e. 2.3×10^4)
- Know scientific prefixes to replace standard form (i.e. k, kilo for 10^3)
- Plot graphs and draw lines of best fit
- Find gradients and y – intercepts
- Use and apply $y = mx + c$
- Logarithms (AS Maths used in A2 Physics)

The Physics department have resources for students that have areas of weakness in maths – it is the students' responsibility to ask for these or attend support sessions on maths.

Physics Tasks

1. Complete this table.

Key Term	Definition/Explanation
Compression	
Tension	
Efficiency	
Work	
Energy	
Projectile	
Uniform motion	
Force	
Rate	
Equilibrium	
Linear	
Non linear	
Vector	
Scalar	
Displacement	
Distance	
Acceleration	
Velocity	
Speed	
Potential Difference	
Current	
Charge	
Resistance	
Nucleus	
Nucleon	
Isotope	

2. Prefixes are often used when very big or small numbers are being dealt with, it means they are less likely to be misread for calculations. An example would be 30MJ which is 30000000J. What do these words stand for as Physics prefixes and how are they written as a symbol?

   milli, micro, nano, pico, kilo, mega, giga, tera?

Units

Physics formulae 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.]

3. Many physics formulae will give you the right answer ONLY if you put the quantities into the correct SI units. This means that you have to convert. You will often find units that are prefixed, for example kilometre. Convert the following:
   a. 15cm
   b. 500g
   c. 2km
   d. 35mV
   e. 5.4GW
   f. 220nF

4. Rearrange (or transpose) the following equations (you are not expected to know these)
   a. $E = \frac{FL}{Ax}$ make F the subject
   b. $\sin\theta = b$ make θ the subject
   c. $a^2 + b^2 = c^2$ make b the subject
   d. $A = \pi r^2$ make r the subject
   e. $s = ut + \frac{1}{2}at^2$ make a the subject
   f. $E = \frac{FL}{Ax}$ make x the subject
   g. $v = u + at$ make a the subject
   h. $s = ut + \frac{1}{2}at^2$ make t the subject

5. This little character is about to walk into a common bear trap by failing to correctly convert into SI units. Converting areas and volumes causes a lot of problems.

$1\ m^2 \neq 100\ cm^2$.

$1\ m^2 = 100\ cm \times 100\ cm = 10\,000\ cm^2 = 10^4\ cm^2$

Convert the following:	
1 m^2 =	mm^2
0.45 mm^2 =	m^2
1 cm^3 =	m^3
22.4 dm^3 =	m^3

6. Put the following numbers into standard form:

    a. 3200
    b. 5 600 000
    c. 2 800 000 000 000
    d. 0.000000000000341
    e. 0.00000342

Too Many Significant Figures

Consider this calculation:

$$V_{rms} = \frac{13.6}{\sqrt{2}}$$

Your calculator will give the answer as V_{rms} = 9.6166526 V

There is no reason at all in A-level Physics to write any answer to any more than 3 significant figures. Three significant figures is claiming accuracy to about one part in 1000. Blindly writing your calculator answer is claiming that you can be accurate to one part in 100 million, which is absurd.

If the data in the question are given to a minimum of 2 significant figures then your answer should be to 2 significant figures although usually they give the benefit of the doubt and allow one extra (unless specifically asked). The **examination mark schemes** give answer such as this:

Vrms = 9.62 V (3 s.f.)

Vrms = 9.6 V (2 s.f.) more correct

Do any **rounding** up or down at the end of a calculation. If you do any rounding up or down in the middle, you could end up with rounding errors.

7. Use your calculator to do the following calculations. Write your answers to no more than three significant figures.

(a) $\frac{3.4 \times 10^{-3}}{235} \times 6.0 \times 10^{23}$	
(b) $\frac{27.3^2 - 24.8^2}{\sqrt{38}}$	
(c) 1.4509^3	
(d) sin 56.4	
(e) $\cos^{-1} 0.4231$	
(f) $\tan^{-1} 2.143$	
(g) $\sin^{-1} 1.00052$	
(h) Reciprocal of 2.34×10^5	
(i) $\log_{10} 200$	
(j) 45 sin 10	

Plotting graphs

On their own, numbers do not mean a lot. A table of numbers can be confusing. A graph allows us to see a picture of how the numbers relate to each other.

1. Always use a sharp pencil and a ruler.
2. Draw the axes
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 (factors of 2, 5, 10 not 3, 4, 6, 7 etc).
7. **Plot** your points with **crosses** (+ or ×). Points get lost.
8. Join your points with a line, but not dot-to-dot!

It can be difficult to decide whether a set of results is a straight line or a curve. If it's clearly a straight line, draw your **line of best fit** with a ruler. If the graph is a curve, then try to make a smooth curve. A flexi-curve can help you with this.

If a point is way out from the rest, then it's probably an **anomalous result**. If you can, recheck the data or do that part of the experiment again. If not, ignore it.

8. Plot the following data on a graph of Power against voltage adding a line of best fit.
   Find the gradient (give the units if you can).
   Are there any anomalies? How can you tell?

Voltage (V)	***Power (W)***
0	0
2.5	4
5.0	8
7.5	12
10.0	16
12.5	25
15.0	24
17.5	27
20.0	32

What I did well:	
What I need to work on:	

This work is to be put at the start of your Physics folder and will be marked by your Physics teacher at the start of the year so please bring it completed to lesson 1, in preparation for your test.

Enjoy you summer break.

Mr Hyland, Mrs Oakes, & Mrs Ludbrook