# Physics A level Transition Booklet

Science Department

PARK HALL
ACADEMY

Name: _____

## What is Physics?

Physics is the study of matter, energy and motion. You will learn about the fundamental properties of the world around you, including: the constituents of matter, radiation, waves, materials and electricity. You will then have the opportunity to apply this knowledge to the medical world including medical imagine and the physics behind hearing.

Physics is a subject that can be enjoyed by all and encourages you to think deeper about the physical properties of the world around. The A-level course covers a large amount of content in detail. Use the booklet to explore some of the topics and develop your understanding. We hope you enjoy the tasks and feel free to ask if you have any further questions.

**We are pleased you are considering to study A level Physics with us and have put together this pack to help you prepare for the higher level of study required in Year 12. The jump from GCSE to A level is possibly the biggest in education so the more preparation the easier you will find it.**

**Why does bridging work?**
Preparation is crucial for studying A Level Physics. After completing these exercises, you will need to highlight any areas that you had trouble understanding. We are expecting you to put 100% effort into the tasks to show your commitment to the study you have chosen to do. Do not try to fit the answers on these pages – you need to create your own material.

This work is for YOUR benefit so you can do it in whatever format you like (mind maps, list of answers, labelled diagrams, flashcards etc.).

We want you to be successful at A-level Physics and what this takes at GCSE is different to what is required at A-level. Although you have fewer subjects, there are different skills post-16 and the volume of work is greater due to the increased demand of depth and detail.

Bridging work should help you to gauge your current understanding of the subject and introduce you to the depth of understanding that is required for study at advanced level.

# Contents

## 1. Overview of the course:

This is a two-year course which ends with **three** exam papers.

A-levels are still awarded A*-E.

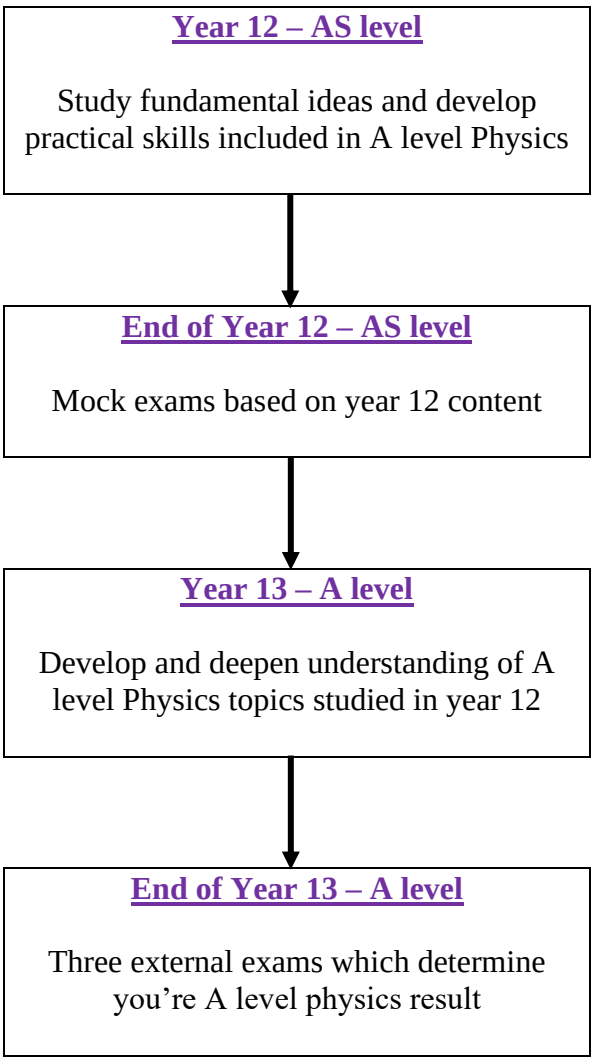
Throughout the two year's you will complete a variety of experiments which will improve your practical skills in preparation for the exam. These skills are also assessed in the classroom (but do not directly contribute to your mark) however they must be successfully achieved in order to complete the practical element of the course.

At the end of year 12 you will sit mock exams of the content covered up to that point, however this will not contribute to your overall mark.

Topics we will cover will include:

1) Measurements and their errors
2) Particles and radiation
3) Waves
4) Mechanics and materials
5) Electricity
6) Further mechanics and thermal physics
7) Fields and their consequences
8) Nuclear physics

Below is a flow diagram showing you how the course progress:



## 2. Expectations of the course

**Attendance**

1. Attend every lesson
2. Arrive on time
3. Ensure any assignments due are complete and presentable – no excuses

**Equipment**

4. Bring the following equipment every lesson:
    a. An A4 clip file
    b. pre-punched A4 paper for your notes
    c. plastic wallets for handouts
    d. pen, pencil, ruler (30cm is best), protractor, compasses
    e. Scientific calculator

**Private study & Assignments**

5. Plan to spend roughly an equal time studying physics outside class as inside.
6. Some of this time will be for assignments ('homework'), the rest for reading around the subject, practicing questions, writing up practical's and improving your notes.
7. Record homework and deadlines clearly.
8. Expect homework at the end of every session – if you are not sure what it is ask.
9. Make a note of anything you get stuck on or do not understand.
10. Don't always work alone – working with a physics partner can be very effective (not one person copying another, but discussing and thinking a problem out together)

**In Class**

11. **Be proactive**: ask for help if there is anything you don't understand, don't let an idea remain vague ask, think and question until it becomes clear – it will!
12. **Interact**: put your hand up & ask questions as much as possible – don't leave it to others.
13. **Be efficient**: don't waste time chatting or being off task – you will drag yourself and others down if you do.
14. **Listen**: pick up on all the tips and advice then put them into practise, don't ignore them.

## 3. Task 1: So why study Physics

Many people study Physics simply for the enjoyment stemming from their own curiosity to deepen their understanding of the world around them. However, Physics A level provides many career and further study opportunities. A short but not exhaustive list of some of these opportunities have been listed below.

| Career Opportunities | Further Study Opportunities |
|---|---|
| Healthcare scientist, medical physics | Mathematics |
| Engineering – structural, acoustic etc | Physics |
| Astrophysicist | Mechanical or Civil Engineering |
| Renewable energy | Computer Science |
| Systems developer | Business |
| Research scientist | Economics |

**We would like you to write us a few paragraphs about why you have chosen Physics A level.**

Please include answers to:

- What have you enjoyed at GCSE that made you chose this?
- What are you looking forward to learning about?
- What do you think might prove challenging?
- Do you have any thoughts on a career yet?

**The role of Physics on society**

Physics allows us to understand the world around us and therefore dictates the quality of life we have. Without physicists our lives would be completely different, we wouldn't have what we now think of as simple electricity. Engineers wouldn't be able to build anything from the computer you are currently using to the Apollo 11 spacecraft that took Neil Armstrong and Buzz Aldrin to the moon.

**We would like you to write us one side of A4 about the role of Physics on society**

This can be about the development of a specific technology such as the light bulb, a computer etc, or about a physics topic such as the development of the model atom, the birth and death of stars etc. The key thing is to choose something **YOU** are interested in and to read around your interest.

As well as telling us about the science please include:

- Why you chose this topic
- Where you got your information

## 4. Online resources

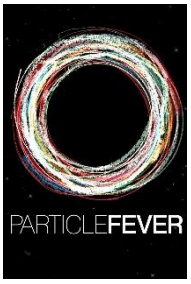
Instagram:
@physicsfun
@OxfordPhysics

Twitter:
@NaturePhysics
@PhysicsNews
@OrgPhysics

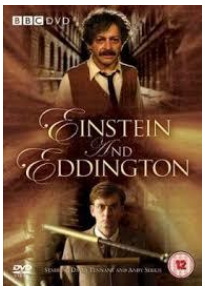
## 5. Reading/Watching lists

**Films and documentaries:**

1) Particle Fever (2013)



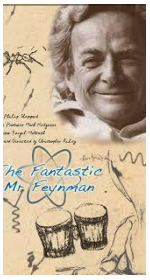

2) Einstein and Eddington (2008)



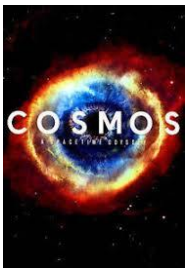

3) The theory of Everything (2014)


4) Interstellar (2014)

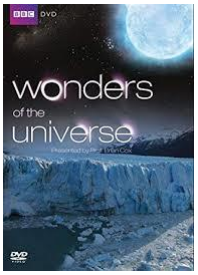

5) The Fantastic Mr Feynman (2013)



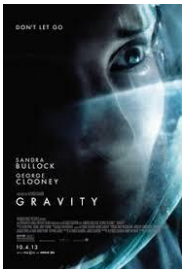

6) Cosmos: A Spacetime Odyssey (2014)




7) Wonders of the Universe (2011)




8) Gravity (2013)




9) Apollo 11 (2019)

## 6. Task 2: Research

A level physics requires you to complete independent research and to be able to apply that knowledge to topics learnt in lesson. Research and note taking is a skill and therefore this section is designed to help you to practise this skill whilst developing an interest in an area of physics

Watch this video which takes you through the Cornell notes taking system:
https://www.youtube.com/watch?v=ErSjc1PEGKE

a) http://home.cern/about

CERN encompasses the Large Hadron Collider (LHC) and is the largest collaborative science experiment ever undertaken. Find out about it here and make a page of suitable notes on the accelerator.

b) http://joshworth.com/dev/pixelspace/pixelspace_solarsystem.html

The solar system is massive and its scale is hard to comprehend. Have a look at this award winning website and make a page of suitable notes.

c) https://phet.colorado.edu/en/simulations/category/html

PhET create online Physics simulations when you can complete some simple experiments online. Open up the resistance of a wire html5 simulation. Conduct a simple experiment and make a one page summary of the experiment and your findings.

d) http://climate.nasa.gov/

NASA's Jet Propulsion Laboratory has lots of information on Climate Change and Engineering Solutions to combat it. Have a look and make notes on an article of your choice.

e) http://www.livescience.com/46558-laws-of-motion.html

Newton's Laws of Motion are fundamental laws for the motion of all the object we can see around us. Use this website and the suggested further reading links on the webpage to make your own 1 page of notes on the topics.

## 7. Interesting Reads

The books suggested below are aimed at people are generally interested in physics. Rather than providing textbooks to read, below is a list of books that spark intrigue and interest surrounding various physics topics.

1. Surely You're Joking Mr Feynman: Adventures of a Curious Character

ISBN - 009917331X - Richard Feynman was a Nobel Prize winning Physicist. By reading this book you will get insight into his life's work including the creation of the first atomic bomb and his bongo playing adventures and his work in the field of particle physics.

https://www.waterstones.com/books/search/term/surely+youre+joking+mr+feynman++adventures+of+a+curious+character

2. Moondust: In Search of the Men Who Fell to Earth

ISBN – 1408802384 - One of the greatest scientific achievements of all time was putting mankind on the surface of the moon. Only 12 men made the trip to the surface, at the time of writing the book only 9 are still with us. The book does an excellent job of using the personal accounts of the 9 remaining astronauts and many others involved in the space program at looking at the whole space-race era, with hopefully a new era of space flight about to begin as we push on to put mankind on Mars in the next couple of decades.

https://www.waterstones.com/books/search/term/moondust++in+search+of+the+men+who+fell+to+earth

3. Quantum Theory Cannot Hurt You: Understanding the Mind-Blowing Building Blocks of the Universe

ISBN - 057131502X - This book provides an excellent insight into some of the more exotic areas of Physics that require no prior knowledge. In your first year of A-Level study you will meet the quantum world for the first time. This book will fill you with interesting facts and handy analogies to whip out to impress your peers!

https://www.waterstones.com/book/quantum-theory-cannot-hurt-you/marcuschown/9780571315024

4. A Short History of Nearly Everything

ISBN – 0552997048 - A modern classic. Popular science writing at its best. A Short History of Nearly Everything Bill Bryson's quest to find out everything that has happened from the Big Bang to the rise of civilization - how we got from there, being nothing at all, to here, being us. Hopefully by reading it you will gain an awe-inspiring feeling of how everything in the universe is connected by some fundamental laws.

https://www.waterstones.com/books/search/term/a+short+history+of+nearly+everything

5. Thing Explainer: Complicated Stuff in Simple Words

ISBN – 1408802384 - This final recommendation is a bit of a wild-card – a book of illustrated cartoon diagrams that should appeal to the scientific side of everyone. Written by the creator of online comic XTCD (a great source of science humour) is a book of blueprints from everyday objects such as a biro to the Saturn V rocket and an atom bomb, each one meticulously explained BUT only with the most common 1000 words in the English Language. This would be an excellent coffee table book in the home of every scientist.

https://www.waterstones.com/book/thing-explainer/randall-munroe/9781473620919

## 8. TASK 3: Physics in the News

Physics can be applied to many more aspects of life than most realise.

**We would like you to write us one side of A4 about a part of Physics that's been in the news over the last couple of years.**

Below is a few ideas of Physics articles that may gain your interest. However, the key thing is for you to choose something **YOU** find interesting.

As well as telling us about the science please include:

- Why you chose this topic
- Where you got your information

1) Pi Day: How to calculate pi using a cardboard tube and a load of balls
https://www.newscientist.com/article/2237334-pi-day-how-to-calculate-pi-using-a-cardboard-tube-and-a-load-of-balls/

2) What you experience may not exist inside the strange truth of reality
https://www.newscientist.com/article/mg24532670-800-what-you-experience-may-not-exist-inside-the-strange-truth-of-reality/

3) Your decision making ability is a superpower physics can't explain
https://www.newscientist.com/article/mg24532690-700-your-decision-making-ability-is-a-superpower-physics-cant-explain/

4) We may have spotted a parallel universe going backwards in time
https://www.newscientist.com/article/mg24532770-400-we-may-have-spotted-a-parallel-universe-going-backwards-in-time/

5) We've figured out why bubbles make a pop sound when they burst
https://www.newscientist.com/article/2238125-weve-figured-out-why-bubbles-make-a-pop-sound-when-they-burst/

6) Can time travel survive a theory of everything?
https://www.sciencenews.org/article/can-time-travel-survive-theory-of-everything

7) How materials science has changed humankind – for better and worse
https://www.sciencenews.org/article/how-materials-science-tech-has-changed-humankind-better-worse

8) How to make the best fried rice, according to physics
https://www.sciencenews.org/article/how-make-best-fried-rice-according-physics-video

## 9. TASK 4: Maths Skills

PARK HALL ACADEMY

# A level Physics Transition
# *Maths Skills*

**YOU MAY USE A CALCULATOR THROUGHOUT**

Name: ……

**Please complete as much of this booklet as possible, including the self-assessment below, then hand in during the first week of teaching in September.**

| ***Confidence:***<br>***A = all parts correct and understood***<br>***C = some parts correct and mostly understood***<br>***E = few parts correct or poorly understood*** | **Self Assessment** | | |
|---|---|---|---|
| | **Mark** | **Confidence (A-E)** | **ISSUES / COMMENTS** |
| 1. Unit Prefixes – complete table + questions | ……/38 | | |
| 2. (a) SI system of units – complete table<br>(b) Derived units – complete table | ……/11 | | |
| 3. Standard Form | ……/18 | | |
| 4. Rules for Significant Figures - read | | | |
| 5. Rearranging Equations | ……/10 | | |
| 6. Showing your Working – read | | | |
| 7. Bringing it all together – How many of these challenging questions did you crack? | ……/10 | | |

FEEDBACK:

# 1. Unit 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 | | |
| | | $\times 10^{9}$ | |
| M | | | × 1,000,000 |
| k | | | × 1000 |
| (None) | - - - | - - - | × 1 |
| m | | | |
| | micro | | / 1,000,000 |
| n | | | |
| | | $\times 10^{-12}$ | |
| f | | | |

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

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

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

   g. 0.005 A =
   h. 30000 s =
   i. $5 \times 10^{5}$ m =
   j. 1001 m =
   k. 0.006 V =
   l. 2,100,000 N =

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

   a. 34 nm = ..... mm
   b. 0.012 s = ..... μs
   c. 4.5 MJ = ..... kJ

# 2. UNITS (a) The SI system of units

- **Look up the following terms and write a few sentences about each:**

| | |
|---|---|
| Physical Quantities | |
| SI Units | |
| Base Units | |
| Derived Units | |

- **In physics all units can be derived from six base units. Research how the base units are defined.**

| **Base Quantity** | **Base Unit** | **Definition** (Note: you do not need to learn these definitions) |
|---|---|---|
| Length | metre (m) | |
| Mass | kilogram (kg) | |
| Time | second (s) | |
| Temperature | kelvin (K) | |
| Current | ampere (A) | |

# 2. UNITS (b) Derived units

In physics all non-base quantities are called **derived quantities** and are defined by equations.
E.g. (a) Define speed. (b) Define charge.

**(a) speed = distance / time** **(b) charge = current × time.**

The units of these new quantities are **derived units** and are established from these same equations. So,

**(b) The unit of speed = unit of distance / unit of time = m / s = $\underline{\mathbf{m{\cdot}s^{-1}}}$ (‘**metres per second’)*

**(c) The unit of charge = the unit of current × the unit of time = $\underline{\mathbf{A{\cdot}s}}$ (‘**amp second’)

*NOTE: At A level we write divided units, such as ‘metres <u>per second</u>’ as $ms^{-1}$ **not** m/s.

In the SI system, many of these derived units get their own name. For example, the SI unit of charge is the coulomb ©. So we can say that one coulomb is equal to one amp second.

Or **C = A s**

Any SI unit can be expressed in terms of base units. To find the base units work though the defining equations one by one, unit you end up with the base units. For example, what are the base units of a Joule? This requires two steps:

- Energy (Work) = Force × distance moved, So one joule = one newton metre (**J = N·m**)
- Force is defined from F = m a, so one newton = one kilogram metre per second squared (or **$N = kg{\cdot}m{\cdot}s^{-2}$**)
- Therefore, a joule = **N m** = (**$kg{\cdot}m{\cdot}s^{-2}$**) **m = $\underline{kg{\cdot}m^2{\cdot}s^{-2}}$**

**1. Complete the table below.**
Try working these out rather than looking them up. You can use the earlier answers to help with the harder ones.

| **Derived quantity** | **Defining equation** | **Standard SI unit (if applicable)** | **Equivalent base units** |
|---|---|---|---|
| speed | S = d / t | n/a | $m{\cdot}s^{-1}$ |
| momentum | p = m v | n/a | $kg{\cdot}m{\cdot}s^{-1}$ |
| acceleration | a = (v – u) / t | n/a | |
| Force | F = m a | newton (N) | |
| Power | power = work/time<br>P = W/t | | |
| frequency | frequency = 1/time period<br>f = 1 / T | | $s^{-1}$ |
| Charge | charge = current × time<br>Q = I t | coulomb © | A·s |
| potential difference | voltage = work/charge<br>V = W/Q | | |
| resistance | R = V / I | | |
| specific heat capacity | SHC = Energy / (mass × temperature change)<br>c = Q / (m × θ) | | |

# 3. MATHS – Powers of 10 and standard form (aka scientific notation)

You need to be able to use your calculator to work in standard form or use power of ten notation to replace unit suffixes.

[Tip: you should use the [x10$^x$] button on your calculator for entering powers of ten.]

1. Rewrite these numbers in standard form, removing any unit prefixes:

a) 3141 ……

b) .00055 ……

c) 2.0002 ……

d) 120000 *(2sf)* ……

e) 120000 *(6sf)* ……

f) $843 \times 10^4$ ……

g) 1.5 μm ……

h) $12.0 \times 10^{-2}$ nm ……

i) 999 MJ ……

j) 245 mg ……

k) 16 pF ……

l) 97.237 GN ……

All of the equations we use in Physics require variables to be converted to standard SI units. This means any prefixes must first be removed. For example to calculate resistance in ohms (Ω) you divide the p.d. in volts (V) by the current in amps (A), If current = 8.0 mA (milliamps) and the voltage was 12 kV (kilovolts) the correct calculation would be:

$$R = V/I = 12 \times 10^3 / 8.0 \times 10^{-3} = 1.5 \times 10^6\ \Omega$$

*Try the above on your calculator before you continue.*

2. Calculate the following showing your working, giving the answers in appropriate units. (This means removing suffixes, except for grams which need to be converted to kg)

a) Area ($m^2$) = 120 mm × 250 mm

b) Area ($m^2$) = 2.4 m × 60 cm

c) Density ($kg \cdot m^{-3}$) = 48 g ／12 $cm^3$

d) Charge in coulombs, Q=I t
= 3.0 × kA × 20 μs

*e)* Speed squared, $v^2 = (16\ m \cdot s^{-1})^2$

f) Force, F = m a = 923000g × 9.8 $m \cdot s^{-2}$

# 4. 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
   - 6000000000000002 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
   - 0.00000000000000000000000000000000000052 also has two sig figs!

5. 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 **<u>27 $cm^2$</u>** (i.e. 2 sig fig) because the width (2.4) was only given to 2 sig fig.

# 5. Rearranging Equations

**Rearrange these equations to express them in the terms that follow:**

**1.** $v = x / t$ **a.** $x = ?$ **b.** $t = ?$

**2.** $F = m\,a$ **a.** $m = ?$ **b.** $a = ?$

**3.** $a = (v - u) / t$ **a.** $t = ?$ **b.** $v = ?$ **c.** $u = ?$

**4.** $v^2 = u^2 + 2as$ **a.** $v = ?$ **b.** $a = ?$ **c.** $u = ?$

**5.** $s = ut + \frac{1}{2}\,a\,t^2$ **a.** $u = ?$ **b.** $a = ?$ **c.** $t = ?$

# 6. Showing your Working

*When answering physics questions you need to lay out your working clearly showing all the steps, working left to right and top to bottom. Your final answer should be found to the bottom right of your working and should be underlined. Below is an example for you to base your own answer style on.*

Ch6, Q4

A white snooker ball with a kinetic energy of 15J collides with a red ball. On impact the white ball stops, transferring all of its KE to the red ball. The mass of the red ball is 120 g. What would be the velocity of the red ball immediately following the collision?

STEPS: Equation being used → rearrange → values inserted → calculated answer → units → sig fig

$$KE = \frac{1}{2}mv^2 \quad \therefore \quad \frac{2KE}{m} = v^2 \quad \therefore \quad v = \sqrt{\frac{2\times 15J}{0.12\text{kg}}}$$

$$= 15.8\,\text{ms}^{-1} \quad \underline{= 16\,\text{ms}^{-1}(2sf)}$$

**EIGHT STEPS TO IMPROVE THE QUALITY OF YOUR WORKING**

- ☐ Show all steps
- ☐ Work left to right and top to bottom
- ☐ Rearrange equations before substituting values
- ☐ If a calculation is two step, underline the answer to the first step before proceeding as this may get marks
- ☐ Your writing should be small and neat. Don't scrawl.
- ☐ You should be able to easily check over your working to find mistakes
- ☐ Plan to use the available answer space wisely
- ☐ Try to leave space for correcting mistakes if you go wrong

# 7. Bringing it all together

**Brain-gym for the physics-muscle in your head (It hurts to start with, but gets easier with practise)**

These problems will challenge you to work with powers and units, rearrange equations and use your calculator carefully. Helpful formulae for volume and surface area are given on the last page, as are the answers.

Lay out your working clearly, work step by step, and check your answers. If you get one wrong, go back and try again. Do not be disheartened if they seem difficult to start with, persevere and seek help – you will improve. Importantly, have fun!

1. How many $mm^2$ are there in

   (a) $1cm^2$ ? .....

   (b) $1\ m^2$ ? .....

   (c) $1\ km^2$ ? .....

2. How many $cm^3$ are there in

   (a) $1mm^3$ ? .....

   (b) $1\ m^3$? .....

3. A piece of A4 paper is 212 × 297 mm. All measurements are to the nearest mm. Calculate its area in (a) $mm^2$, (b) $cm^2$, (c) $m^2$. Give answers to the correct number of significant figures.

.....

.....

a) Area = ..... $mm^2$

b) Area = .....$cm^2$

c) Area = ..... $m^2$

4. A plastic toy is supplied in a cubic box, 4.0 cm each side. How many of them pack into a carton 80 × 52 × 70 cm? (Students often get the wrong answer and can't see why. Visualise the actual problem don't just rely on maths!)

5. A copper atom has a diameter of 217 pm (pico-meters). How many of them would fit inside $1mm^3$ of copper to 3 sig. fig? (Tip: for simplicity, treat them as cubes of side 217 pm)

6. Water has a density of 1.0 g $cm^{-3}$. Express this in (a) kg $cm^{-3}$, (b) kg $m^{-3}$, (c) kg $mm^{-3}$

.....

.....

a) Density = ..... kg $cm^{-3}$

b) Density = ..... c kg $m^{-3}$

c) Density = .....kg $mm^{-3}$

7. A regular block of metal has sides 12.2 × 3.7 × 0.95 cm, and a mass of 107g.
Find its density in Kg $m^{-3}$ to a suitable number of significant figures.

8. A measuring cylinder is filled with 1.00 litres of water. The column of water inside forms a regular cylinder 32.0 cm high. What is (a) the area of the surface of the water (in $mm^2$)? (b) the internal diameter of the cylinder (in mm)?
*(TIP: Visualise the problem clearly. Draw a diagram if it helps. Use the equation or the volume of a cylinder)*

9. The diameter of the sun is $1.4 \times 10^6$ km. Its average density is 1.4 g $cm^{-3}$. What is its mass in kg?
*(TIP: The trick here is to convert the units carefully before you start)*

10. The total energy arriving in the Earth's upper atmosphere from the sun is $174 \times 10^{15}$ Watts. Given that the Earth's diameter is $12.8 \times 10^3$ km, what is the average intensity of this radiation in W $m^{-2}$?
*(TIP: Think about the units carefully. What does W $m^{-2}$ mean?)*

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**GEOMETRICAL EQUATIONS**

| | |
|---|---|
| *arc length* | $= r\theta$ |
| *circumference of circle* | $= 2\pi r$ |
| *area of circle* | $= \pi r^2$ |
| *surface area of cylinder* | $= 2\pi rh$ |
| *volume of cylinder* | $= \pi r^2 h$ |
| *area of sphere* | $= 4\pi r^2$ |
| *volume of sphere* | $= \frac{4}{3}\pi r^3$ |

## 10. TASK 5: Revise and Extend

# 1. Energy and Power

Look up definitions for each of the following quantities and write down the equations and any notes you think are helpful

Work

Kinetic Energy

Gravitational Energy

Elastic Potential Energy

Efficiency

Power (including electrical power)

# 2. Waves

At GCSE you have studied waves and we will go into more detail at A level. This section will allow you to revise the different types of waves, how/why they refract and what a transverse wave looks like.

Use the following links to review this topic.

https://www.physicsclassroom.com/class/waves/Lesson-1/Categories-of-Waves

http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/refr.html

1) Draw a diagram showing how a ray of light refracts towards the normal line as it enters a glass block. Explain why the ray refracts towards the normal when it enters the block and away when it exits the block. (6 marks)

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2) Describe the difference between a longitudinal and transverse wave and give an example of each. (4 marks)

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3) Draw a diagram of a transverse wave. Label the wavelength and amplitude (3 marks)

# End of Booklet

Go back through your booklet and assess how confident you are for each section and add a comment.