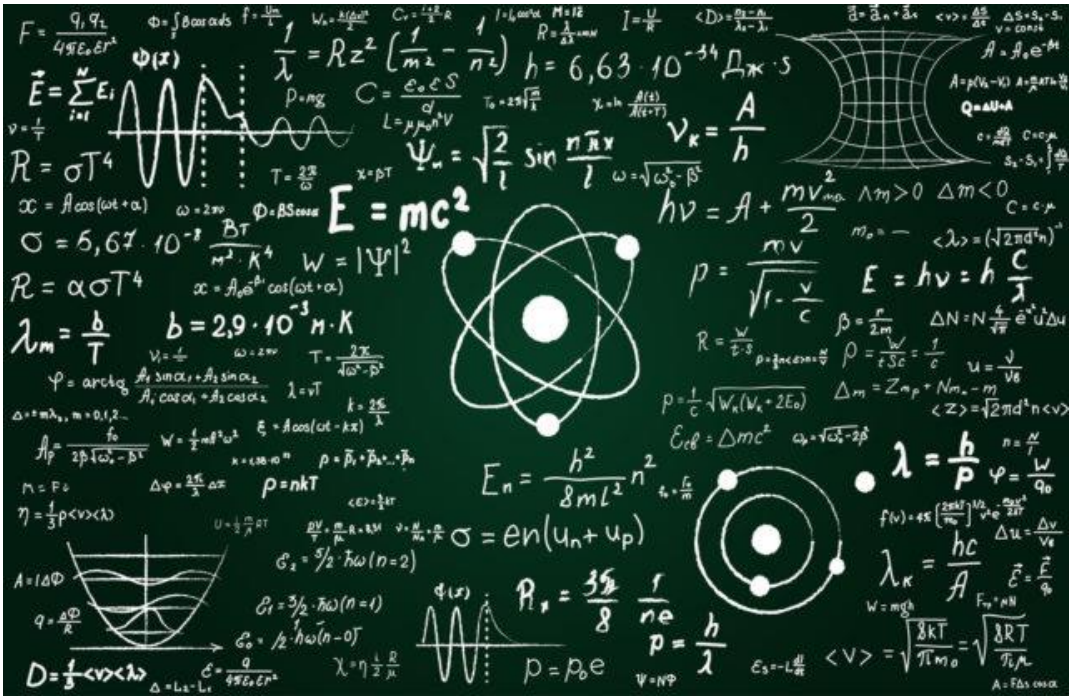
## Exam board: OCR

# Physics
# A level
# Transition booklet




| | | |
|---|---|---|
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This booklet will assist you in getting better prepared to study A Level Physics at Ashlawn school. You must work through the booklet and self assess to identify the topics/areas for improvement. Write a brief comment on your progress in the comments box as you complete each topic.This help will inform you with what you must revise prior to beginning the AS Physics course. Bring your copy of the completed booklet to your first A Level Physics lesson along with your prepared presentation.

## The A Level course

| Content Overview | Assessment Overview | |
|---|---|---|
| Content is split into six teaching modules:<br>• Module 1 – Development of practical skills in physics<br>• Module 2 – Foundations of physics<br>• Module 3 – Forces and motion<br>• Module 4 – Electrons, waves and photons<br>• Module 5 – Newtonian world and astrophysics<br>• Module 6 – Particles and medical physics<br>Component 01 assesses content from modules 1, 2, 3 and 5.<br>Component 02 assesses content from modules 1, 2, 4 and 6.<br>Component 03 assesses content from all modules (1 to 6). | Modelling physics (01)<br>100 marks<br>2 hours 15 minutes<br>written paper | **37%**<br>of total A level |
| | Exploring physics (02)<br>100 marks<br>2 hours 15 minutes<br>written paper | **37%**<br>of total A level |
| | Unified physics (03)<br>70 marks<br>1 hour 30 minutes<br>written paper | **26%**<br>of total A level |
| | Practical Endorsement in physics<br>(04)<br>(non exam assessment) | Reported separately<br>(see Section 5g) |

You can find the full specification by following this link
https://www.ocr.org.uk/Images/171726-specification-accredited-a-level-gce-physics-a-h556.pdf

# Year 12 induction summer homework

## Task 1:

Your task is to plan and prepare a 5 minute presentation on Electricity. An accompanying powerpoint/google slide is necessary.

Electricity

Must include the following information:

- What is potential difference?
- What is current?
- What is resistance?
- How are these concepts related?
- How do these concepts behave in series and parallel circuits?
- Are there any models/analogies which can be used to highlight your point.

The presentation should be pitched at the level of an A Level student and should therefore be as detailed and accurate as possible. You may also wish to include any information which you feel is relevant but not mentioned above.

The aim of this homework is so that your future teacher can identify misconceptions early and to ensure that students have a firm understanding of a key concept before starting the course.

A selection of presentations will be made to the class in the first week of term.

If you have any questions about this homework, please email kennedys@ashlawn.org.uk

## Task 2: complete the following topics in the booklet

| Topic | Title | Completed (date) | Comments.<br>Do you need more practice?<br>Are you confident with this area?<br>What areas of weakness have you identified? |
|---|---|---|---|
| 1 | Prefixes and units | | |
| 2 | Significant Figures | | |
| 3 | Converting Length, Area and Volume | | |
| 4 | Rearranging Equations | | |

| AS Physics | # 1. Prefixes and units |
|---|---|
| Skills | |

*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 units required.

| | | | |
|---|---|---|---|
| 6 km | = | $6 \times 10^{3}$ | m |
| 54 MN | = | | N |
| 0.086 µV | = | | V |

Convert these figures to suitable prefixed units.

| | | | | |
|---|---|---|---|---|
| 640 | GV | = | $640 \times 10^{9}$ | V |
| | | = | $0.5 \times 10^{-6}$ | A |
| | | = | $93.09 \times 10^{9}$ | m |

| | | | | | |
|---|---|---|---|---|---|
| 753 GPa | = | | Pa | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | kN | = | 32 x $10^5$ N |

Convert the figures into the prefixes required.

| **s** | **ms** | **µs** | **ns** | **ps** |
|---|---|---|---|---|
| 0.00045 | 0.45 | 450 | 450 000<br>or 450 x$10^3$ | 450 x $10^6$ |
| 0.000000789 | | | | |
| 0.000 000 000 64 | | | | |

| **mm** | **m** | **km** | **µm** | **Mm** |
|---|---|---|---|---|
| 1287360 | | | | |
| 295 | | | | |

AS Physics

Skills

# 2. Significant Figures

1. **All non-zero numbers ARE significant.** The number 33.2 has THREE significant figures because all of the digits present are non-zero.

2. **Zeros between two non-zero digits ARE significant.** 2051 has FOUR significant figures. The zero is between 2 and 5

3. **Leading zeros are NOT significant.** They're nothing more than "place holders." The number 0.54 has only TWO significant figures. 0.0032 also has TWO significant figures. All of the zeros are leading.

4. **Trailing zeros when a decimal is shown ARE significant.** There are FOUR significant figures in 92.00 and there are FOUR significant figures in 230.0.

5. **Trailing zeros in a whole number with no decimal shown are NOT significant.** Writing just "540" indicates that the zero is NOT significant, and there are only TWO significant figures in this value.

**(THIS CAN CAUSE PROBLEMS!!! WE SHOULD USE POINT 8 FOR CLARITY, BUT OFTEN DON'T - 2/3 significant figures is accepted in IAL final answers - eg 500/260 = 1.9 to 2 sf. Better $5.0 \times 10^2 / 2.6 \times 10^2 = 1.9$)**

8. **For a number in scientific notation: N x $10^x$, all digits comprising N ARE significant by the first 5 rules; "10" and "x" are NOT significant.** $5.02 \times 10^4$ has THREE significant figures.

*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 | | 1066 | | 1800.45 | | 0.070 | |
| 2.0 | | 82.42 | | $2.483 \times 10^4$ | | 69324.8 | |
| 500 | | 750000 | | 0.0006 | | 0.0063 | |
| 0.136 | | 310 | | 5906.4291 | | $9.81 \times 10^4$ | |
| 0.0300 | | $3.10 \times 10^4$ | | 200000 | | 40000.00 | |
| 54.1 | | $3.1 \times 10^2$ | | 12.711 | | $0.0004 \times 10^4$ | |

***When adding or subtracting numbers***

Round the final answer to the **least precise** number of decimal places in the original values.

Eg. 0.88 + 10.2 – 5.776 (= 5.304) = **5.3** (to 1d.p. , since 10.2 only contains 1 decimal place)

(Khan Academy- Addition/ subtraction with sig fig excellent video- make sure you watch .)

*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 | | |
| 152 | 0.8 | 0.55 | | |

***When multiplying or dividing numbers***

Round the final answer to the **least** number of significant figures found in the initial values.

E.g. 4.02 x 3.1 ÷ 0.114 = (109.315…) = **110** (to 2s.f. as 3.1 only has 2 significant figures.

*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 value 1 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 | 6.50 | | |
| $91 \times 10^2$ | 180 | | |
| 5.56 | $22 \times 10^{-3}$ | | |

***When calculating a mean***

1) Remove any **obvious** anomalies (circle these in the table)
2) Calculate the mean with the remaining values, and record this to the **least** number of decimal places in the included values

E.g. Average 8.0, 10.00 and 145.60:
1) Remove 145.60
2) The average of 8.0 and 10.00 is **9.0** (to 1 d.p.)

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

| Value 1 | Value 2 | Value 3 | Mean Value | Mean to correct sig figs |
|---|---|---|---|---|
| 1 | 1 | 2 | | |
| 435 | 299 | 437 | | |
| 5.00 | 6.0 | 29.50 | | |
| 5.038 | 4.925 | 4.900 | | |
| 720.00 | 728.0 | 725 | | |
| 0.00040 | 0.00039 | 0.000380 | | |
| 31 | 30.314 | 29.7 | | |

| AS Physics | 4. Rearranging Equations |
|---|---|
| Skills | |

*Rearrange each equation into the subject shown in the middle column.*

| Equation | | Rearrange Equation |
|---|---|---|
| $V = IR$ | $R$ | |
| $I = \frac{Q}{t}$ | t | |
| $\rho = \frac{RA}{l}$ | $A$ | |
| $\varepsilon = V + Ir$ | $r$ | |
| $s = \frac{(u+v)}{2}t$ | $u$ | |

| Equation | | Rearrange Equation |
|---|---|---|
| $hf = \phi + E_K$ | $f$ | |
| $E_P = mgh$ | g | |
| $E = \frac{1}{2}Fe$ | $F$ | |
| $v^2 = u^2 + 2as$ | $u$ | |

| | | |
|---|---|---|
| $T = 2\pi\sqrt{\frac{m}{k}}$ | $m$ | |