**Physics Bridging Work**

This work is aimed at students who are interested in taking Physics at AS or A Level. The aim of this pack is to develop the knowledge and skills that are essential for success when studying Physics past GCSE level.

Physics covers many different areas at A Level, and so in addition to the skills work there are a variety of links that you can follow to explore topics in more detail. The second half of the bridging work is the activities to develop skills necessary to succeed at A Level Physics.

**Videos**

These YouTube channels are great at covering all sorts of Physics ideas and questions:

Kurzgesagt: <https://www.youtube.com/user/Kurzgesagt> (my favourite videos are; Black Holes Explained, The Fermi Paradox, Nuclear Energy Explained)

Minute Physics: <http://www.youtube.com/user/minutephysics> (my favourite videos are; Why is the Solar System Flat? Common Physics Misconceptions, 3 Simple Ways to Time Travel)

PhD Comics: [www.youtube.com/user/phdcomics/videos](file:///C:/Users/Home/Downloads/www.youtube.com/user/phdcomics/videos  )(my favourite videos are; The Higgs Boson Explained, What is Dark Matter, Exoplanets)

Crash Course: <https://www.youtube.com/user/crashcourse> (my favourite videos are; Quantum Mechanics, Nuclear Physics, Newton’s Laws)

**Videos by AS-Level Topic**

**Particles (Y12)**

A Crash Course is Particle Physics by Brian Cox pt 1 and 2

<https://www.youtube.com/watch?v=HVxBdMxgVX0>

<https://www.youtube.com/watch?v=WGWlT8SqXLM>

What’s the Smallest Thing in the Universe? TED

<https://www.youtube.com/watch?v=ehHoOYqAT_U>

**Waves (Y12)**

Travelling Waves – CrashCourse

<https://www.youtube.com/watch?v=TfYCnOvNnFU>

Waves – Science Shorts (covers quite a lot of high-level ideas)

<https://www.youtube.com/watch?v=h5KBL1BPX1A>

**Electricity (Y12)**

What is Electricity? Into the Ordinary (covers just the GCSE basics)

<https://www.youtube.com/watch?v=ru032Mfsfig>

Electric Charge – CrashCourse

<https://www.youtube.com/watch?v=TFlVWf8JX4A>

**Mechanics (forces and motion) (Y12)**

Vectors and 2D Motion – CrashCourse

<https://www.youtube.com/watch?v=w3BhzYI6zXU>

Newton’s Laws – CrashCourse

<https://www.youtube.com/watch?v=kKKM8Y-u7ds>

Motion in a Straight Line – CrashCourse

<https://www.youtube.com/watch?v=ZM8ECpBuQYE>

**Videos by A-Level Topic**

**Nuclear (Y13)**

Nuclear Physics – CrashCourse

<https://www.youtube.com/watch?v=lUhJL7o6_cA>

Nuclear Chemistry – CrashCourse

<https://www.youtube.com/watch?v=KWAsz59F8gA>

Nuclear Power Explained parts 1, 2, 3– Kurzgesagt

<https://www.youtube.com/watch?v=rcOFV4y5z8c>

<https://www.youtube.com/watch?v=HEYbgyL5n1g>

<https://www.youtube.com/watch?v=pVbLlnmxIbY>

Fusion Power Explained – Kurzgesagt

<https://www.youtube.com/watch?v=mZsaaturR6E>

**Fields (this is the hardest Physics topic and is studied in Y13)**

Magnetism Crash Course – CrashCourse

<https://www.youtube.com/watch?v=s94suB5uLWw>

Electric Fields – CrashCourse

<https://www.youtube.com/watch?v=mdulzEfQXDE>

Newtonian Gravity – CrashCourse

<https://www.youtube.com/watch?v=7gf6YpdvtE0>

**Astrophysics**

Astrophysics and Cosmology – CrashCourse

<https://www.youtube.com/watch?v=VYxYuaDvdM0>

Life Cycle of a Star – Institute of Physics

<https://www.youtube.com/watch?v=PM9CQDlQI0A>

Stars: CrashCourse

<https://www.youtube.com/watch?v=ld75W1dz-h0>

Black Holes Explained – Kurzgesagt

<https://www.youtube.com/watch?v=e-P5IFTqB98>

The Beginning of Everything – Kurzgesagt

<https://www.youtube.com/watch?v=wNDGgL73ihY>

**Physics A-Level Bridging Work**

Knowledge

Please select at least 2 of the following topics to create a piece of work that explains the topic in detail. This can be done handwritten or on the computer, and it aimed to develop your note making and explanation skills. All the topics are relevant to A Level Physics, and so the more of these you cover, the better prepared you will be for your A-Level studies.

1. Explain how our understanding of the model of the atom has changed over time. Include any experiments and how their results informed the changes to the models.
2. Write a piece of information that covers three types of nuclear radiation: Alpha, Beta and Gamma. This should include how each type of radiation changes the nucleus, how ionising and penetrating each is, and any uses for the radiation.
3. Make a piece of work that covers transverse and longitudinal waves. This should include a definition of each, labelled diagrams, examples of each type of waves and properties of the waves (what speed can they travel at? Can they be reflected?)
4. Write an explanation for potential difference, current and resistance rules in series and parallel circuits. This should include the units for each, any relevant equations, the equipment used to measure each and the rules for working them out.
5. Explain how the forces on a parachutist changes during their fall and the factors that affect the size of the terminal velocity.
6. Draw and label the energy changes that take place for a swinging pendulum. You should state when each type of energy is at its maximum and minimum, and where and how energy is lost.
7. Explain how electrical energy is generated at a nuclear power station. This should include how nuclear fission releases thermal energy, and how energy is transferred into electrical energy in the power station.
8. Describe the possible life cycles that a star can have based on its size. This should include lower mass stars, like our sun, that become white dwarfs, and higher mass stars that can become neutron stars, supernovae and black holes.

The following pages are looking at skills you will need to be confident with for A-Level Physics. If you are unsure of how to complete these please e-mail a member of the Physics department (Mr A Huxley, Mr S Davies, Mr B Coombs).

|  |  |
| --- | --- |
| Skills | Prefixes |

*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 | 1015 | 1000000000000000 |  | ↓ x1000 |
| T | tera | 1012 | 1000000000000 | ↑ ÷ 1000 | ↓ x1000 |
| G | giga | 109 | 1000000000 | ↑ ÷ 1000 | ↓ x1000 |
| M | mega | 106 | 1000000 | ↑ ÷ 1000 | ↓ x1000 |
| k | kilo | 103 | 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 |  |  |  |  |
| 96.21 |  |  |  |  |
| 0.773 |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **m** | **km** | **mm** | **Mm** | **Gm** |
| 12873 |  |  |  |  |
| 0.295 |  |  |  |  |
| 57.23 |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **kg** | **Mg** | **mg** | **g** | **Gg** |
| 94.76 |  |  |  |  |
| 0.000765 |  |  |  |  |
| 823.46 |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A** | | **mA** | **μA** | **nA** | **kA** |
| 0.000000678 | |  |  |  |  |
| 3.56 | |  |  |  |  |
| Skills | | Means and Anomalous Results | | | | | |
| S.DAVIES | |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **Mean** | |
| 4152 | 2996 | 4018 |  |  |
| 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 | 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 |  | 0.07 |  |
| 2.0 |  | 82.42 |  | 2.483 x 104 |  | 69324.8 |  |
| 2.00 |  | 750000 |  | 2.483 |  | 0.0063 |  |
| 0.136 |  | 310 |  | 5906.4291 |  | 9.81 x 104 |  |
| 0.34 |  | 3.10 x 102 |  | 200000 |  | 6717 |  |
| 54.1 |  | 3.1 x 102 |  | 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 |  |  |

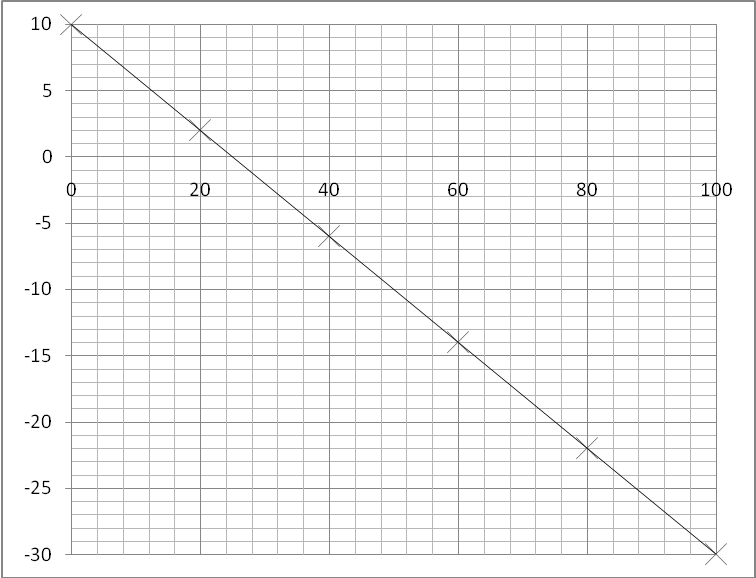
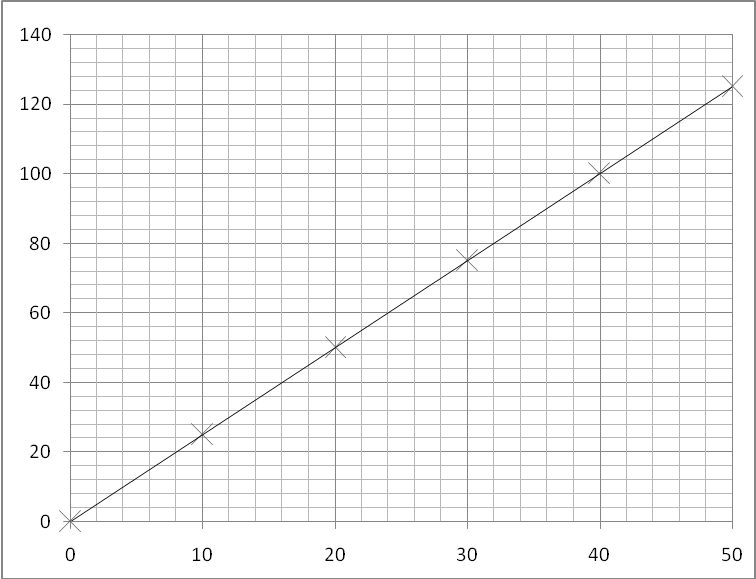
*Divide value1 by value 2 then write the answer to the appropriate number of significant figures*

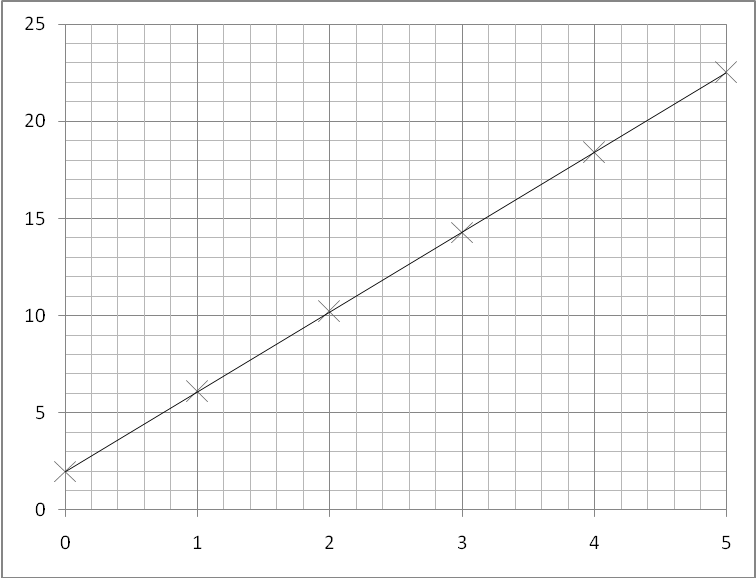
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Value 1** | | | **Value 2** | **Total Value** | **Total to correct sig figs** | |
| 5.3 | | | 748 |  |  | |
| 3781 | | | 6.434 |  |  | |
| 91 x 102 | | | 180 |  |  | |
| 5.56 | | | 22 x 10-3 |  |  | |
| 3.142 | | | 8.314 |  |  | |
| Skills | Lines of Best Fit | | | |

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

|  |  |
| --- | --- |
| Skills | Gradients |

*Calculate the gradients of the graphs below. Work out the equation for the line.*

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|  |  |
| --- | --- |
| Skills | Gradient Equations |

*Complete the table below about graphs and gradients*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equation** | **Graph** | **Rearrange Equation** | **Gradient** | **Intercept** |
|  | y plotted on the y axis |  | *m* | *c* |
| x plotted on the x axis |
|  | y axis = *V* |  | *R* | 0 |
| x axis = *I* |
|  | y axis = *t* |  |  |  |
| x axis = *Q* |
|  | y axis = *l* |  |  |  |
| x axis = *R* |
|  | y axis = *V* |  |  |  |
| x axis = *I* |
|  | y axis = *E/t* |  |  |  |
| x axis = *V* |
|  | y axis = *EK* |  |  |  |
| x axis = *f* |
|  | y axis = 1*/v* |  |  |  |
| x axis = *m* |
|  | y axis = *mg* |  |  |  |
| x axis = *EP* |
|  | y axis = *e* |  |  |  |
| x axis = 1*/F* |
|  | y axis = 1*/λ* |  |  |  |
| x axis = *f* |
|  | y axis = *a* |  |  |  |
| x axis = 1*/t* |
|  | y axis = *v2* |  |  |  |
| x axis = *s* |
|  | y axis = *v* |  |  |  |
| x axis = *s* |
|  | y axis = *λ* |  |  |  |