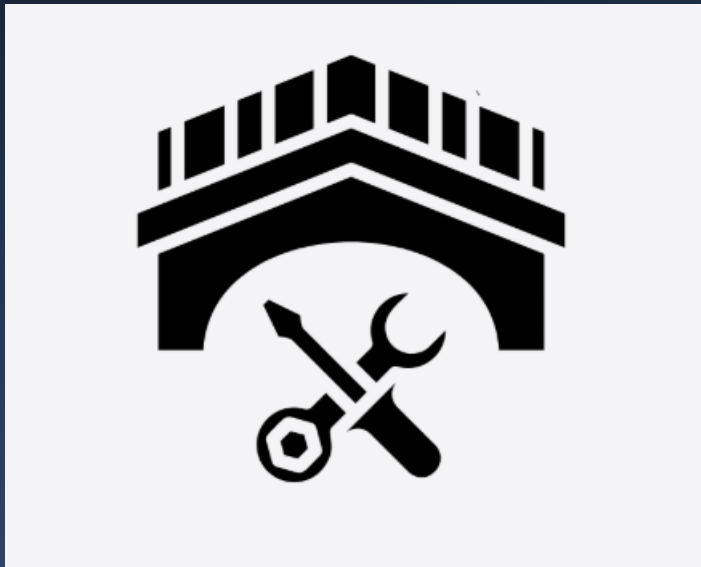


YEAR 12 – BRIDGING UNITS

A-Level Physics



ST HILDA'S
COLLEGE

The 6th Form
@ St Hilda's

bridging
units

Name:

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This is a fantastic opportunity to expand your understanding of Physics as you prepare for enrolment and for starting A-Level Physics in September.

The work in this section will take you around 2 hours so plan your time to best suit you.

How do I complete and submit my task?	Complete the tasks on paper/handwritten or digitally and bring a copy either paper or electronically to your lesson, also take this to your first lesson in September.	
Introduction to your Bridging Task	Maths skills for Physics The task below will help us gauge your current understanding of the mathematical techniques from GCSE and Uncertainties that you'll use in Physics, both in the examinations and for the required practicals throughout the course. Practical applications In our experiments during the course, we look behind the theory we learn and how these topics relate to a real-world scenarios.	
Resources to help you with the Bridging Task	Maths skills Physics: You will need a scientific calculator and possibly your notes from GCSE Maths. This video may also help: https://www.youtube.com/watch?v=ayjtBJ0UcgE  Here are some useful website links: https://www.cyberphysics.co.uk/general_pages/si_prefixes.html https://www.bbc.co.uk/bitesize/guides/zgbgk7/revision/4 https://www.mathsisfun.com/algebra/trigonometry.html https://isaacphysics.org/concepts/cp_uncertainties?stage=all For the Diffraction Practical (Task 2) the following links may be helpful Video: https://www.youtube.com/watch?v=71Rp-jG6Eek https://www.youtube.com/watch?v=eW5VGGJuWtQ  	Cyber Physics:  BBC Bitesize:  Trigonometry:  Uncertainties: 
Preparation for September	Physics is one of the toughest A Levels you could have chosen! The students who work the hardest do the best. Over the course you will have 5 hours of lessons a week that will cover all the theory and practical skills you will need. You will be given homework questions nearly every lesson and these will be expected to be completed by the next lesson in most cases.	

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	At A Level you are expected to be spending 5 hours per week out of class completing homework, reviewing your work and reading around the subject. In addition to the lessons you will receive, there is plenty of support available: • Teachers: Your teacher is your first point of call as they are the experts – you will have 1 experienced teacher who will always offer their time when they are available to help you in and out of lessons. • Notes and differentiated questions: We have produced a full set of notes that accompany each lesson. These notes are targeted to the lesson objectives that we have written and have HW questions that tie into the learning outcomes. You will be expected to print these off or ask us to, and organise these in a folder and add any extra notes that you write in or out of lessons and bring these along to lessons where we will check these regularly. To succeed in organisation for your course you will need: - 1 or 2 A4 Lever arch file folders - Subject file dividers - Paper - A scientific calculator - Maths set - Pens, pencils, highlighters etc.	
	Extension Task	
MOOCs	<u>MOOCs are Massive Open On-line Courses</u> You might enrol on these online courses and complete the following to push you a little further (this is optional). This is a great course to help you get ready for learning at A-Level and look great on your UCAS application! MOOC example: Learning How to Learn - the following MOOC is a 3 session study guide on how to improve your own personal learning https://www.coursera.org/learn/learning-how-to-learn-youth Subject Specific MOOCs: Unifrog – Go to Unifrog and find the exploring pathways section. Find a MOOC – search for the courses that might interest you – please be aware some of these fill up fast or may require funding, but most are free. The earlier you do this - the better!	
Physics Olympiad Challenge	These challenges will stretch your physics knowledge and make you think outside the box. Try some of the past paper questions here. The Intermediate Physics Challenge is aimed at the top end GCSE students. Go even further and try the Senior Physics Challenge, aimed at the top end Y12 students.	 

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Physics A level Bridging Work Task 1

Maths skills for physics

Please complete the following in the spaces provided.

Standard form and Indices

1. Express as a power of ten:

a. $10000 = \dots\dots\dots$

b. $0.004 = \dots\dots\dots$

2. Convert to 'normal' form:

a. $8.95 \times 10^3 = \dots\dots\dots$

b. $3.75 \times 10^{-2} = \dots\dots\dots$

3. Answer the following to 3 significant figures:

a. $(2.22 \times 10^5) \times (3.33 \times 10^6) = \dots\dots\dots$

b. $(8.81 \times 10^8) \times (7.71 \times 10^7) = \dots\dots\dots$

5.61×10^6

4. $x^{1/2}$ can also be written as: $\dots\dots\dots$

Prefixes and multipliers

5. What is the multiplier for the following prefixes?

milli m =

Mega M =

6. Convert the following into metres:

250cm =

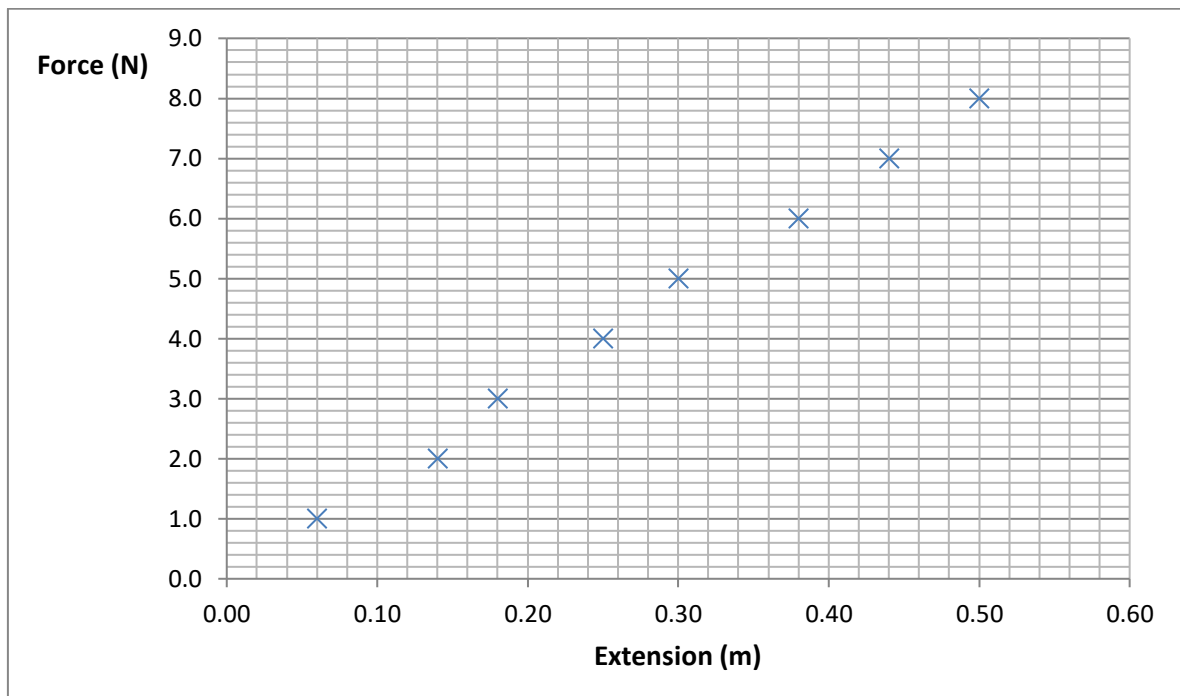
0.25km =

Graphs

7. What is the equation for a straight line graph?

.....

8. Draw the line of best fit and find the gradient of this graph:



Gradient =

.....

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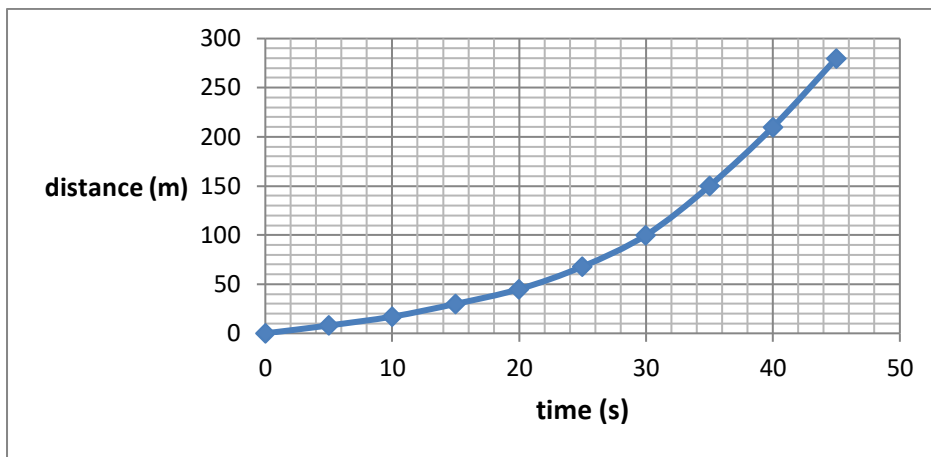
9. The graph below shows the motion of a runner for the first 40 seconds of a race.

a. What can you say about his speed?

.....
.....

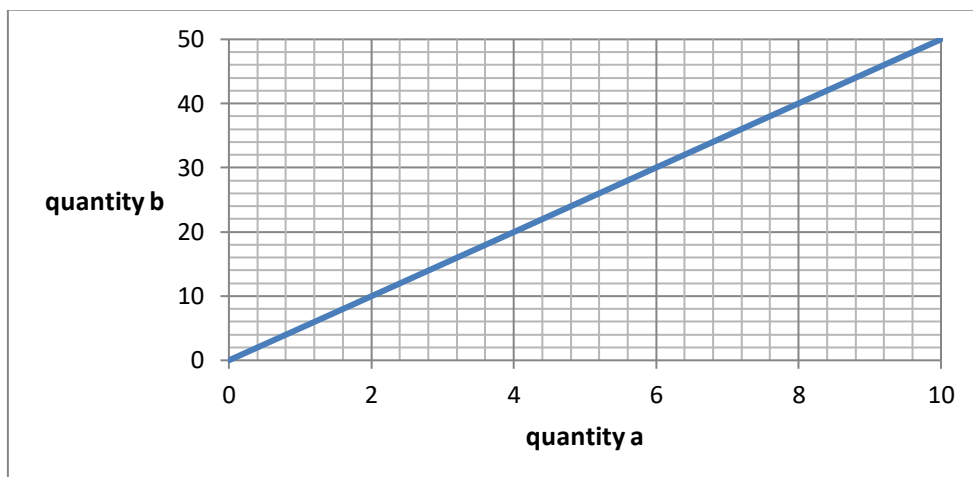
b. Use the graph to find his speed at time 30s

.....



10. What can you say about the relationship between quantity **a** and quantity **b**?

.....
.....



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Using Formulae

11. Find the answers to the following. Ensure you show all workings.

a. $PV = nRT$ Find T if: $P = 1700 \text{ Pa}$ $V = 3.0 \text{ V}$ $n = 2.5$ $R = 8.3$

.....

.....

b. $v^2 = u^2 + 2as$ Find v if: $u = 15$ $a = 1.5$ $s = 150$

.....

.....

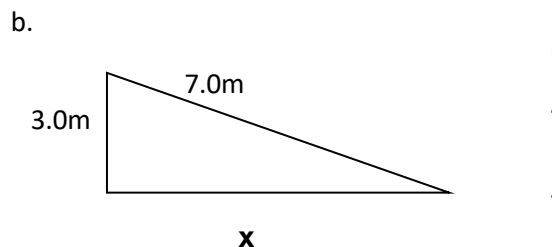
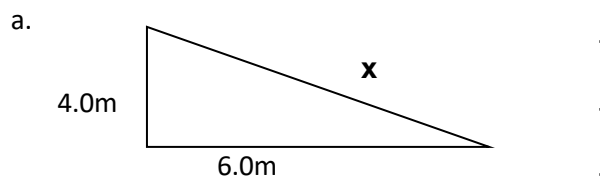
c. $E_k = \frac{1}{2} mv^2$ Find v if: $E_k = 1000$ $m = 170$

.....

.....

Pythagoras

12. Find the length of the side labelled **x** :

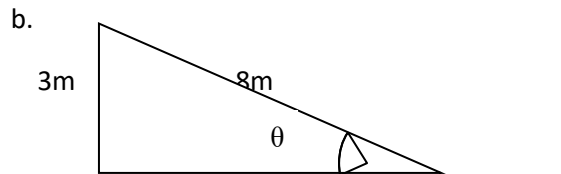
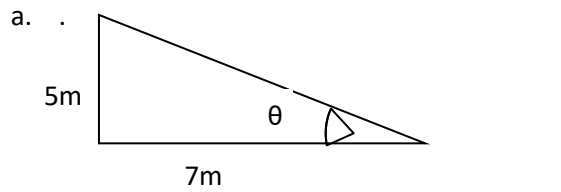


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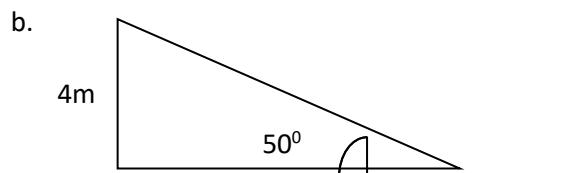
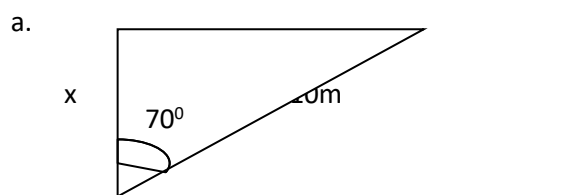
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Trigonometry

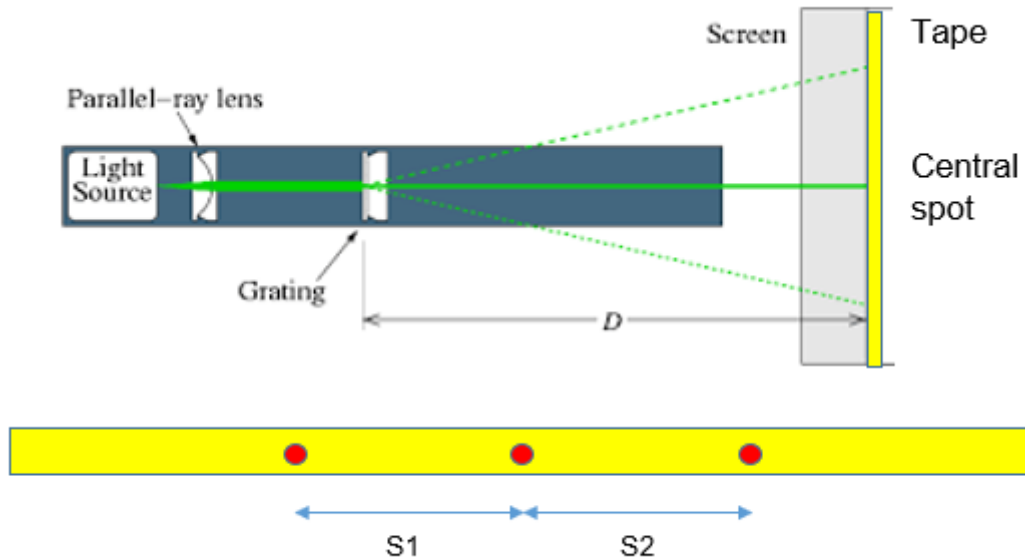
13. Find angle θ . The lengths of two sides are given.



14. Find length x . The length of one side and one angle are given.



Uncertainty in experiments



A ruler is only accurate to the nearest millimetre so the distance 1mm larger or smaller than the measured value this 1mm error is known as the absolute uncertainty of the measurement this is written as $\pm 1\text{mm}$.

Example $1.000\text{ m measurement} + 0.001\text{m of uncertainty} = \text{Maximum value of } 1.001\text{m}$

15) A student uses a meter ruler to measure D and measures 0.895 meters . The ruler has an uncertainty of 0.001m .

What is the maximum distance possible?

What is the minimum distance possible?

16) The student uses the same meter ruler (uncertainty 0.001m) to measure the distance $S1$ and measures the distance as 91mm .

What is the largest distance for $S1$ possible?

What is the smallest distance for $S1$ possible?

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17) What is the Percentage uncertainty for S1?

Example (For D)

$$\frac{\text{(The uncertainty in the measurement)}}{\text{(the measurement)}} \times 100 = \frac{0.001}{1.000} \times 100 = 0.1\%$$

Your Turn (For S1)

.....

.....

18) What is the percentage uncertainty of the following?

i) $6.8V \pm 0.2V$

.....

Answer: $6.8V \pm \dots\dots\dots\%$

ii) $16.8m \pm 0.2m$

.....

Answer: $16.8m \pm \dots\dots\dots\%$

iii) $1.2V \pm 0.1V$

.....

Answer: $1.2V \pm \dots\dots\dots\%$

Physics A level Bridging Work Task 2

Practical application of physics

Why is the Diffraction seen with a diffraction grating?

You need to research and produce a report on how a diffraction works. The report must be about 750 words.

In your report you should include the keywords:

Diffraction, Phase, Antiphase, Constructive Interference, Destructive Interference, Superposition and Path difference.

1. Introduction (which includes the aim of the report)
2. Define each of the relevant specialist terminology (keywords) seen above.
3. A suitable labelled diagram for constructive and destructive interference (which must be referenced in your report)
4. An explanation of the physics principles involved in the experiment (Including an equation and what phase difference is required for constructive and destructive interference.)
5. References / bibliography

The report can be handwritten or word processed.

Videos that may help you

[Path Difference, Constructive & Destructive Interference - A Level Physics](#)

<https://www.youtube.com/watch?v=WRgf2r0WEHQ>

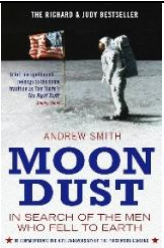
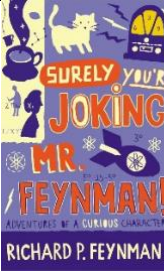
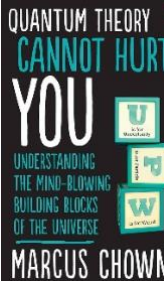
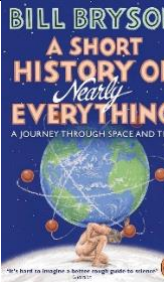
[Measuring Wavelength of Light with a Diffraction Grating - PRACTICAL - A Level Physics](#)

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

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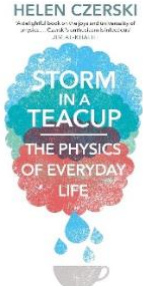
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Further Reading:

<i>Moondust – In Search of the Men Who Fell to Earth</i>		This book uses the personal accounts of 9 astronauts and many others involved in the space program, looking at the whole space-race era
<i>Surely You're Joking Mr Feynman - Adventures of a Curious Character</i>		By reading this book you will get insight into his life's work including the creation of the first atomic bomb and his work in the field of particle physics
<i>Quantum Theory Cannot Hurt You: Understanding the Mind-Blowing Building Blocks of the Universe</i>		Any physics book by Marcus Chown is an excellent insight into some of the more exotic areas of physics that require no prior knowledge
<i>A Short History of Nearly Everything</i>		A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will refamiliarise you with common concepts and introduce you to some of the more colourful characters from the history of science
<i>Thing Explainer: Complicated Stuff in Simple Words Written</i>		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
<i>Why the Universe Exists: How particle physics unlocks the secrets of everything (New Scientist Instant Expert)</i>		If the recent discovery of the Higgs boson piqued your interest, then Why The Universe Exists will take you deeper into the world of particle physics, with leading physicists and New Scientist exploring how the universe functions at the smallest scales

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<i>Storm in a Teacup – the Physics of Everyday Life</i>		A highly regarded, bestselling science book that uses mundane everyday objects (like milk in tea and popping popcorn) to explain complex physical principles
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TV Recommendations:

1. Moon (2009) - With only three weeks left in his three year contract, Sam Bell is getting anxious to finally return to Earth. He is the only occupant of a Moon-based manufacturing facility along with his computer and assistant, GERTY. When he has an accident however, he awakens to find that he is not alone.
2. Gravity (2013) - Two astronauts work together to survive after an accident which leaves them stranded in space.
3. Interstellar (2014) - A team of explorers travel through a wormhole in space in an attempt to ensure humanity's survival.
4. The Imitation Game (2014) - Based on a true story. During World War II, the English mathematical genius Alan Turing tries to crack the German Enigma code with help from fellow mathematicians.
5. Apollo 13 (1995) - Based on a true story. NASA must devise a strategy to return Apollo 13 to Earth safely after the spacecraft undergoes massive internal damage putting the lives of the three astronauts on board in jeopardy.
6. From mach-20 glider to hummingbird drone - "What would you attempt to do if you knew you could not fail?" asks Regina Dugan, then director of DARPA, the Defense Advanced Research Projects Agency. In this talk, she describes some of the extraordinary projects that her agency has created.
https://www.ted.com/talks/regina_dugan_from_mach_20_glider_to_hummingbird_drone/up-next?language=en
7. Is our universe the only universe? - Brian Greene shows how the unanswered questions of physics (starting with a big one: What caused the Big Bang?) have led to the theory that our own universe is just one of many in the "multiverse."
https://www.ted.com/talks/brian_greene_is_our_universe_the_only_universe?language=en
8. The fascinating physics of everyday life - Physicist Helen Czerski presents various concepts in physics you can become familiar with using everyday things found in your kitchen.
https://www.ted.com/talks/helen_czerski_the_fascinating_physics_of_everyday_life/up-next?language=en

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9. We need nuclear power to solve climate change - Joe Lassiter is focused on developing clean, secure and carbon-neutral supplies of reliable, low-cost energy. His analysis of the world's energy realities puts a powerful lens on the touchy issue of nuclear power.
https://www.ted.com/talks/joe_lassiter_we_need_nuclear_power_to_solve_climate_change/up-next?language=en