

AQA Physics

Students who embark on A-level physics should be able to apply their knowledge from GCSE physics to solve problems in familiar and less familiar contexts. The tasks in this summer work aim to improve your problem-solving skills and practical skills to give you a head start in A level Physics.

In year 12 Physics A level with AQA has 5 topics:

1. **Measurements and their errors**
2. **Particles and radiation**
3. **Waves**
4. **Mechanics and materials**
5. **Electricity**

In this summer work you will be given tasks to introduce you to each of these 5 topics. For each topic you will be set

- a) A short question in the form '**What is a....?**' for you to research independently. Use the internet to find out what you can. One useful website is Flipped around Physics which has useful notes and short videos on most topics [A level - FLIPPED AROUND PHYSICS](#) but you can find your own sources as well. Just write a couple of sentences stating what you find out. Remember to give the reference of any website or book you find useful.
- b) [A challenge](#). This may be a practical task for example. This is **optional** but try to do at least 2 challenges over the summer.
- c) [An assessed](#) task from Isaac Physics. This is **compulsory** and will be used to assess you at the start of the A level Physics course in September..

TASK 1 Set up an account for Isaac Physics

Some assignments have been set for you on isaacphysics.org. These problems can be completed online.

1. Create an account on www.isaacphysics.org/register Complete the registration page.
2. Click this link- www.isaacphysics.org/account Enter the school name (West Kirby Grammar School). As you start typing, the school name and address will appear.
3. Click the green "**Save**" button.

Join the group

Copy and paste this code-

VZ44X6

into the box labelled "Enter your code in here".

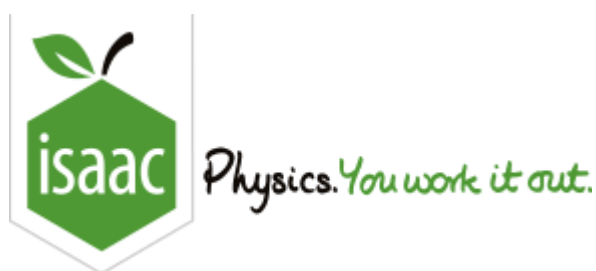
1. Click the "**Apply Code**" button.

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Or use the link#

<https://isaacphysics.org/account?authToken=VZ44X6>

There is a lot more to Isaac Physics than the assignments set for you. There are lots of questions that you can choose from to work on independently. This will help you to develop the skills you'll need to thrive on university courses in Physics, Maths and Engineering etc. On the events page you can find out about free Problem Solving workshops that are run. Remember to log in to Isaac Physics each time you use it. This is so you can see the assignments set for you and so your answers are saved and available for marking,



SUMMER WORK BY TOPIC

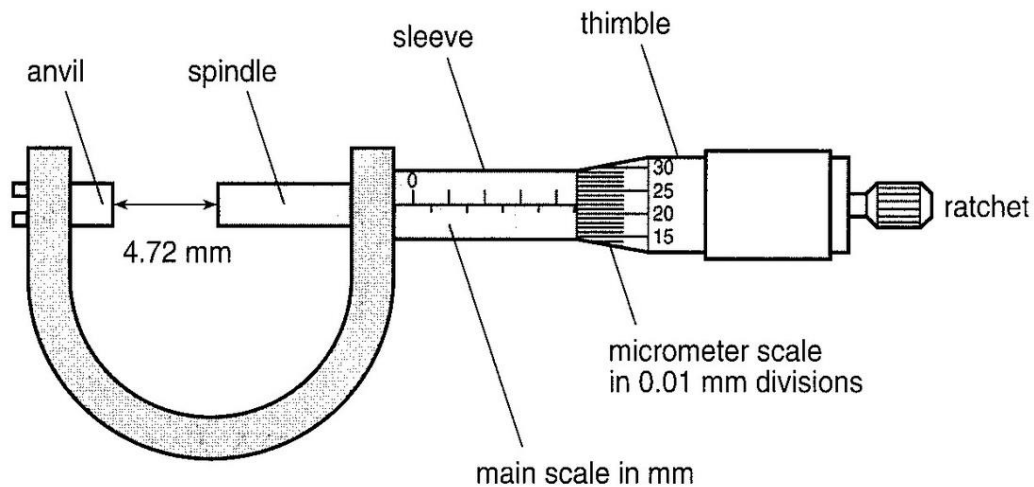
1. Measurements and their errors

a) What is a Vernier Scale?

b) Challenge 1: Measure the **thickness of a single sheet of A4 lined file paper**. The only equipment you can have is a mm ruler, and a pile of paper. Plan a method to make your measurement as accurate and precise as possible. Write up your experiment and find the % difference between your measured value and the quoted value. To find the quoted value look up your make of paper on Google. For example printer paper 80gsm is 0.065 mm thick on average. Try to measure the thickness of your sheet to at least 2 significant figures.

c) Assessed task: Isaac Physics Assignment: **Getting to Grips with significant figures**

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2. Particles and radiation

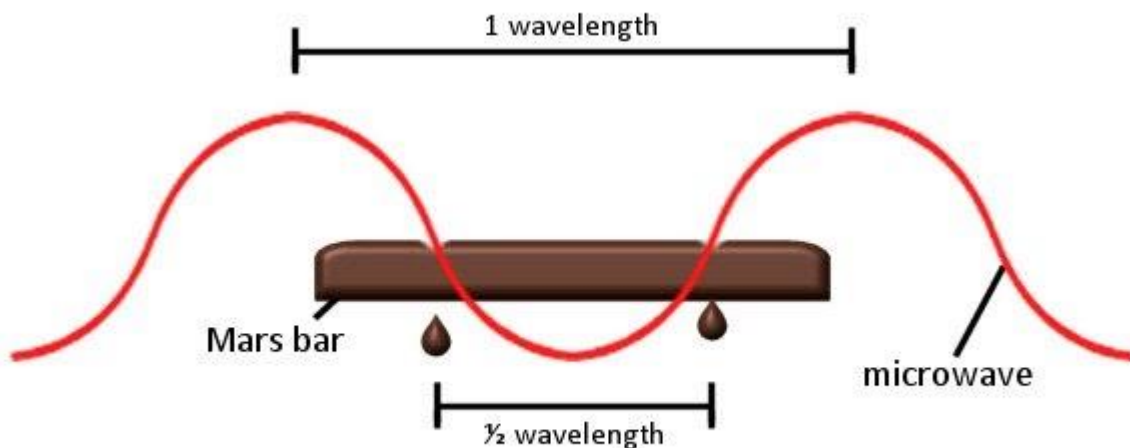
a) What is a de Broglie Wave?

b) Challenge 2: Find out about matter and antimatter including electrons and positrons. What happens when an antiparticle meets a particle? Write a short report on the use of antimatter in [PET scans for medical imaging](#). Remember to give the reference of any website or book you find useful.

c) Assessed task: Isaac Physics Assignment: **51 Atomic Numbers and Nomenclature**

3. Waves

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a) What is a Gravitational Wave?

b) Challenge 3: Measure the **speed of light using a microwave oven**. There are several YouTube videos and other sites which can tell you how to measure the speed of light using a microwave oven and a bar of chocolate (or cheese, or marshmallows). Investigate standing waves first using the seneca assignments and see if you can do this experiment. (Make sure you have permission first and use an upturned plate so that it is easy to clean afterwards.

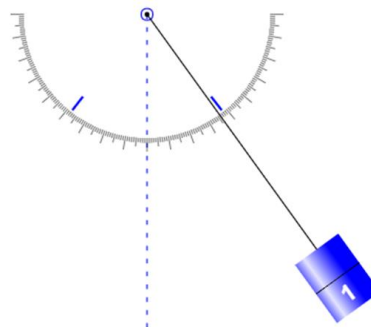
c) Assessed task: Isaac Physics Assignment: **38 Wave properties and basic equations**

4. Mechanics and materials

a) What is an impulse?

b) Challenge 4: Measure the **acceleration due to gravity, g**. The only equipment you can have is a mm ruler, a **simple pendulum** (a small mass on the end of a long string) and a stopwatch (eg one on a phone).. Plan a method to investigate how the length of the pendulum affects the time for one complete swing (time period, T) of the pendulum. Vary and measure the length, L with the ruler and measure the time period, T with your stopwatch. Plot a graph of T^2 against L and draw a straight line of best fit. You can use excel or do it by hand if you have graph paper. One of the formula you will meet at A level states that T and L are linked by the equation

$$T^2 = \frac{4\pi^2}{g}L$$



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Use your graph to find g and calculate the percentage difference between your measured value and the quoted value, $g = 9.81 \text{ m/s}^2$.

https://phet.colorado.edu/sims/html/pendulum-lab/latest/pendulum-lab_en.html

c) Assessed Task Isaac Physics Assignment: **Displacement and distance**
B1 Components of a vector

5. Electricity

a) What is a **superconductor**?

b) Challenge 5: Investigate the **behaviour of 2 filament lamps**, where one is brighter than the other. Build a circuit with 2 lamps in series and call the brighter lamp A and the dimmer lamp B. Now rebuild the circuit but with the 2 lamps in parallel. What do you notice about the brightness of the lamps now? You can build simple circuits like this using the simulation software:

<https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc>

Start by building a series circuit with 2 lamps and one cell. Click on one of the lamps to make its resistance larger than the other one. (eg 30 ohms and 10 ohms). This will be lamp A the brighter one. Now without changing the resistance change the circuit to a parallel one.

Investigate the behaviour and record your observations carefully. Can you explain this result? You can explore further eg use ammeters and voltmeters to measure the current and potential difference in each circuit. Why is lamp A brighter in the series circuit but dimmer in the parallel circuit?

c) Assessed Task: Isaac Physics Assignment: **27 Resistance and Power**

Use this table to record your progress:

Topic	Task	Tick if completed
1. Measurements and their errors	What is a Vernier scale?	
	Thickness of a sheet of A4 paper	
	Getting to grips with significant figures	
2. Particles and radiation	What is a de Broglie wave?	
	PET scan report	

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	51 Atomic Numbers and Nomenclature	
3. Waves	What is a gravitational wave?	
	Speed of light in a microwave oven	
	38 Wave properties and basic equations	
4. Mechanics and materials	What is an impulse?	
	Simple pendulum experiment	
	Displacement and Distance	
	B1 Components of a vector	
5. Electricity	What is a superconductor?	
	Investigating filament lamps	
	27 Resistance and Power	