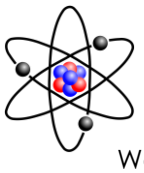
sixthform THOMAS ALLEYNE'S

Opportunity Progress Individuality

Summer Bridging Work 2019

Subject: A-Level Physics	**Exam Board:** OCR



Welcome to A-level Physics. We are delighted that you are considering A-level Physics as an option in Year 12. To demonstrate your commitment to the course and to prepare you for September, you must complete the following tasks to the best of your ability. These tasks are compulsory and must be completed prior to your first Physics lesson in Year 12.

We expect you spend at least 3 hours completing the tasks outlined in this pack. The activities have been designed to help you begin to develop some of the key skills you will need for A-level Physics.

Learning Objectives:

- To find the number of photons emitted by a laser per second by carrying out experiments carefully
- To be able to link several key ideas together to be able to solve problems
- To become familiar with the units and quantities used in A level physics

Contacts for Support:

Mr Melland

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

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OVERVERVIEW OF A LEVEL PHYSICS

The A Level in Physics A specification content is divided into six teaching modules. Each module is introduced with a summary of the physics it contains and each topic is also introduced with a short summary text. The assessable content is divided into two columns: **Learning outcomes** and **Additional guidance**.

The Learning outcomes may all be assessed in the examinations (with the exception of some of the skills in module **1.2** which will be assessed directly through the Practical Endorsement). The Additional guidance column is included to provide further advice on delivery and the expected skills required from learners.

References to HSW (Section 5d) are included in the guidance to highlight opportunities to encourage a wider understanding of science.

The mathematical requirements in Section 5e are also referenced by the prefix *M* to link the mathematical skills required for A Level Physics to examples of the physics content where those mathematical skills could be linked to learning.

The specification has been designed to be co-teachable with the standalone AS Level in Physics A qualification. The first four modules comprise the AS in Physics A course and learners studying the A level continue with the content of modules 5 and 6 in year 13.

The Data, Formulae and Relationships booklet in Section 5c will be available in examinations and learners are expected to become familiar with this booklet throughout the course.

A summary of the content for the A level course is as follows:

Module 1 – Development of practical skills in physics

1.1 Practical skills assessed in a written examination
1.2 Practical skills assessed in the practical endorsement

Module 2 – Foundations of physics

2.1 Physical quantities and units
2.2 Making measurements and analysing data
2.3 Nature of quantities

Module 3 – Forces and motion

3.1 Motion
3.2 Forces in action
3.3 Work, energy and power
3.4 Materials
3.5 Newton's laws of motion and momentum

Module 4 – Electrons, waves and photons

4.1 Charge and current
4.2 Energy, power and resistance
4.3 Electrical circuits
4.4 Waves
4.5 Quantum physics

Module 5 – Newtonian world and astrophysics

5.1 Thermal physics
5.2 Circular motion
5.3 Oscillations
5.4 Gravitational fields
5.5 Astrophysics and cosmology

Module 6 – Particles and medical physics

6.1 Capacitors
6.2 Electric fields
6.3 Electromagnetism
6.4 Nuclear and particle physics
6.5 Medical imaging

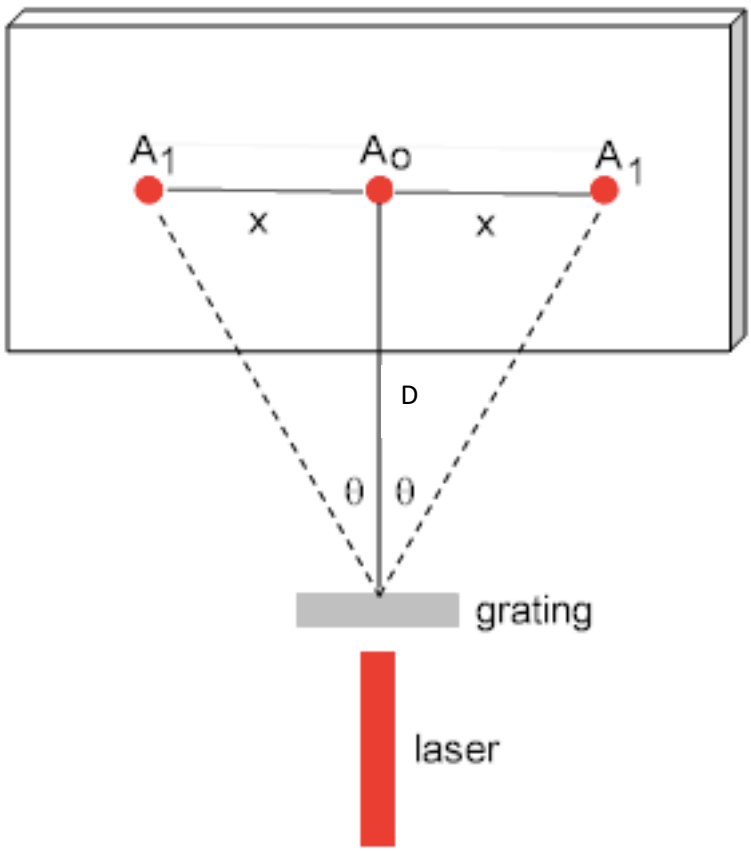
Task 1 – find the wavelength of your laser

NEVER LOOK DIRECTLY AT A LASER

NEVER SHINE A LASER AT ANYONE ELSE

Follow the instructions. You may need a separate sheet to record your data and for workings but record your answers on this sheet.

1. Clamp the laser using a clamp and stand
2. Place the diffraction grating in front of the laser
3. Place the screen at least a metre from the diffraction grating
4. Identify the central maxima (A_0 on the diagram)



5. Measure the distance from grating to the screen (D) and x accurately
6. Calculate the angle θ

Diffraction Grating Formula

$$n\lambda = d\sin\theta$$

n=1, λ is wavelength, d line separation, θ angle

7. Calculate the wavelength of the light (you will need to rearrange the equation). To find the separation distance you will need to convert the lines per mm given on the grating into line separation in m.

Wavelength 1_____

8. Now adjust the equipment so that the second order line (A_2) is visible. Repeat steps 1-7 to get a second value for the wavelength and take a mean.

Wavelength 2_____

Mean wavelength_____

How does your value compare to the accepted value for this colour of light?

Task 2 – find the number of photons emitted per second

The laser light is a wave but can also be considered a particle called a photon.

The energy of a photon is given by E = hf (h=6.6 x 10^{-34}Js, f = frequency)

You find the frequency by using the wave equation c=fλ. (c=3×10^{8} m/s)

So now you can find the energy of one photon.

Find the power of the laser (it's stamped on the side). Now power = energy/ time, so if we are dealing with one second, what is the energy equal to?

Energy = _____

Now you have the total energy and the energy of one photon. How many photons have been emitted per second?

No. of photons per second = _____

Task 3 - Units and Unit Analysis

Below is a list of all the main quantities you are likely to come across

Fill in all the symbols and units (eg distance is d or x, measured in units metres, m.)

Many of these will be new to you and you will need to research these.

Quantity	***Symbol***	**Unit**
Acceleration		
Activity (of nuclear radiation)		
Amount of substance		
Angle		
Area		
Avogadro constant		
Boltzmann constant		
Capacitance		
Charge		
Density		
Displacement		
Distance		
Electric current		
Electric field strength		
Electric potential (potential difference)		

Electromotive force		
Energy		
Force		
Frequency		
Gravitational constant		
Gravitational field strength		
Half-life		
Hubble constant		
Impulse		
Intensity		
Kinetic energy		
Length		
Magnetic flux		
Magnetic flux density		
Mass		
Moment of force		
Momentum		
Permittivity of free space		
Planck constant		
Power		
Pressure		
Resistance		
Resistivity		

Specific heat capacity		
Specific latent heat		
Speed		
Spring constant		
Strain		
Stress		
Time		
Velocity		
Volume		
Wavelength		
Weight		
Work		
Young modulus		