

Upper Sixth: Independent Study over the Christmas Break

Please see below detailed instructions for all the tasks that we wish you to complete over the Christmas Break. After a busy first term, the pace at which we will be working is going to pick up even more as we move closer to the exams, so it is really important that you are:

- (A) Putting enough hours into your Independent Study
- (B) Revising past content as well as keeping on top of recent topics
- (C) Checking your understanding by with practise questions

When studying and revising you should be aiming to work in **short, efficient 20-30 minute bursts** before giving yourself a break. When working, avoid all distractions, turn off your phone and fully focus for this short amount of time to ensure the stuff you are doing is really having an impact.

Many of these tasks will be working towards the **end of January Mock exam**. It is important that you **target this assessment**, and use it as an opportunity to consolidate and revise all content covered so far in the course. Only by treating this seriously will you be able to realistically gauge where you are in terms of readiness for the exams in May/June.

<p>Job #1 (~2 hours)</p>	<p>Homework 5.2.1.B Ideal Gases (should already have been done) Complete, mark and correct the homework booklet assessing your understanding of Ideal Gas Laws.</p> <p>A pdf of the homework booklet can be found by clicking the link below and link to the markscheme and explanation video can be found below.</p> <p>5.2.1.B Ideal Gases Exam Questions 5.2.1.B Ideal Gases Exam Questions markscheme 5.2.1.B Ideal Gases Exam Questions explanation video</p>	<p>Completed? Y / N</p>
<p>Job #2 (~1 hour)</p>	<p>Isaac Physics Exercises (should already have been done) Isaac Physics G1: Kelvin Scale of Temperature Isaac Physics G3: Heat Capacity Isaac Physics G2: Ideal Gases</p>	<p>Completed? Y / N</p>
<p>Job #3 (~2 hours)</p>	<p>Particle Physics End of Unit Test This will take place either the first Friday (10/01) or first Monday (13/01) back after the half term break. Revise all content for this topic, using the resources shared with you already, most of which are available on the departmental website.</p> <p>http://www.aquinasphysics.com/621-probing-deep-into-matter.html</p>	<p>Completed? Y / N</p>
<p>Job #4 (~4 hours)</p>	<p>Complete L6 Revision Sheets You will have by now revised most of the content for the Lower Sixth topics. There are four topics remaining to do. Collect sheets for this and find past questions on these topics to complete to test your understanding.</p> <p>(1) Quantum Physics II:</p> <ul style="list-style-type: none"> • De Broglie equation and evidence for the electron behaving as a wave (electron diffraction) • Relationships between particle momentum, kinetic energy and wavelength from the de Broglie equation • The many paths interpretation of interference (quantum phasors, probability) 	<p>Completed? Y / N</p>

of arrival is proportional to (resultant amplitude)² of the phasors.

- Common phasor diagrams and link to intensity of light received at that point
- Explanations of interference effects with links to phasors (phasors “lining up” and phasors “curling up”)

(2) Digital Images & Image Processing

- Amount of information stored in image (pixels, bits, bytes)
- Using scales to estimate the size of objects & resolution of an image
- Image processing techniques (smoothing, noise reduction, edge detection, changing brightness, changing contrast - what is the equation for this one?)

(3) Lenses

- Explaining lenses in terms of refraction and adding curvature to wavefronts
- Lens Power and focal length definitions
- the Lens Equation (u is always negative)
- Magnification
- Finding the power of a lens practical (how to find the lens power / focal length from a graph of v against u and $1/v$ against $1/u$)
- Linking the lens equation & magnification to collecting images on digital cameras. Link to resolution (image size = size of one pixel on the CCD).

(4) Signalling & Polarisation

- Advantages of digital vs analogue signals
- Conversion of analogue to digital (sampling & leveling) - explain this process with labelled diagrams
- Nyquist's theorem (to choose sampling frequency) & Shannon's criteria (to choose no of levels needed)
- Link number of levels to bits per sample
- Sample resolution
- Transmission rate of information
- Polarisation of waves - what types of wave undergo polarisation? How do waves become polarised?
- Polarisation observations, explain rotation and link between angle of rotation and intensity of wave transmitted.

Complete the multiple choice packs

Complete the first attempt at ALL of the questions in the multiple choice packs handed to you in lesson.

[Pack 1: Questions from AS Papers](#) (pink cover)

You can complete all of the questions from this paper. Use this as a diagnostic tool. Are there topics or skills that have come up in the past that you are a bit rusty with and that you need to work on? Answers for these will be published when you return in January.

[Pack 2: Questions from A Level Papers](#) (white cover)

You will be able to answer all questions from the first year and also on the topics of:

5.1.2 Gravity & Circular Motion

5.1.3 Astronomy & Cosmology

5.2 Heat & Gases (the last two questions are on the topic we will complete immediately after returning in January)

6.1.2 Electric Fields

6.1.2 Particles in Magnetic Fields

6.2.1 Particle Physics

Please bring these packs in with you for the first lesson back for your teacher to look at your progress.

Job #5
(~5 hours)

Job #6	<p>Revise for the End-of-January Mock January Exam Past exam questions, by topic, to help with your revision can also be found on the departmental website: Aquinas Physics Past Exam Papers & Questions</p> <p>As mentioned before, it is vital that you treat this as a real exam and revise thoroughly. Only then will we have a realistic impression of where you are and the work that needs to be done over the spring to prepare yourself for the final exams.</p> <p>All time spent revising for this is time invested in practising skills and learning content for the future.</p>	<p>Completed?</p> <p>Y / N</p>
Job #7	<p>ENSURE ALL WORK IS UP TO DATE Check your progress tracking sheet (shared via Google Classroom) to see which you have completed, and which are marked MISSING. Also ensure any marked incomplete are finished or re-done to a suitable standard.</p> <p>Each exercise is hyperlinked on your progress tracking sheet. Simply click on the assignment name and you will be taken to the appropriate site. All exercises are also linked to from the appropriate pages on the departmental website</p>	<p>Completed?</p> <p>Y / N</p>