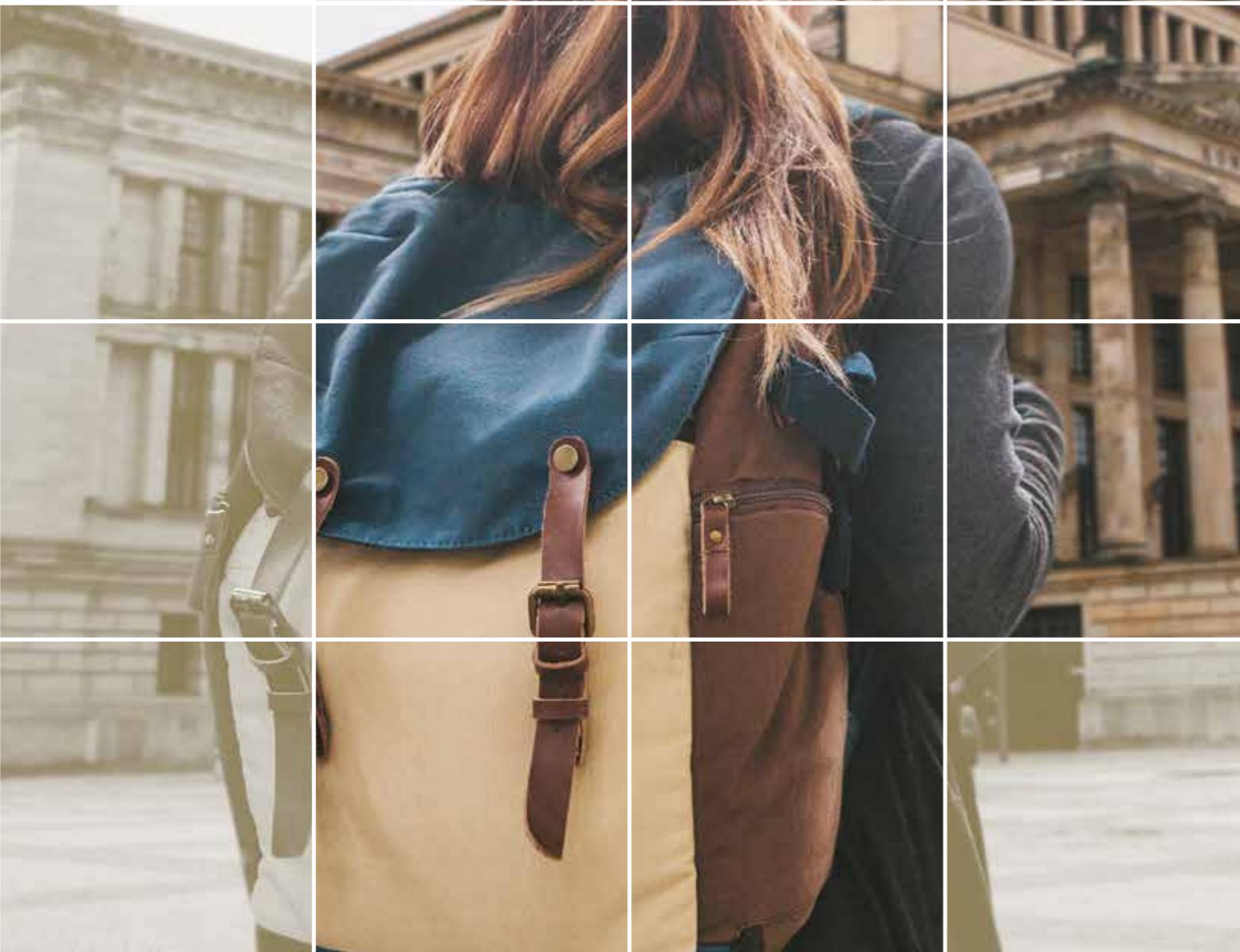




HARROW  
SCHOOL  
ONLINE

## ELECTIVE PROGRAMME 2020/21





## INTRODUCTION TO OUR ELECTIVE PROGRAMME

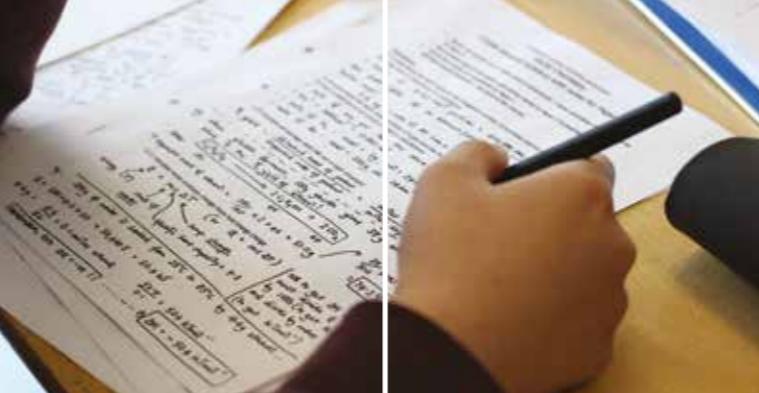
The elective programme at Harrow School Online is designed to give our pupils the opportunity to explore areas of scholarship above and beyond the syllabus of their A Level courses. It affords our teachers the freedom to introduce subjects which are interesting, relevant or useful, and provides our pupils a choice over what they learn. The programme promotes independent learning, extension work, lateral thinking and problem-solving skills.

Many of our courses do not culminate in examinations. Pupils taking these courses are encouraged to discover the joy of learning for pleasure and for the sake of expanding their knowledge of the world. Others prepare pupils for an examination. Some of these examinations are required for university applications, including examinations required for studying medicine, engineering, mathematics and natural sciences at leading UK universities. Others prepare pupils for professional examinations, such as Financial Advisor examinations from the Chartered Institute of Securities and Investments. We also offer pupils the opportunity to take an Extended Project Qualification through our elective programme; an internationally recognised qualification which many universities in the UK credit alongside A levels. For pupils intending to apply to a leading university in the US, we offer test preparation courses for the ACT and SAT, for an additional fee.

All full-time pupils are expected to take at least one elective per term. Electives are taught in one forty-five minute live lesson per week, with one associated homework per week. Pupils may take as many elective courses as they wish, their timetable permitting. Most courses are structured to last a single term, but some run across multiple terms. Pupils are required to submit their elective choices for year 12 by the beginning of the Autumn term. Electives that do not culminate in an examination will run dependent on minimum pupil numbers, but those that result in examination will always be offered if requested.

**Heather Rhodes**  
**Principal**





## NUMBER THEORY

<b>When</b>	Autumn Term, year 12
<b>Teacher</b>	Mr James Ashton (Harrow School, Head of Mathematics)
<b>Course Length</b>	10 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	None
<b>Requirements</b>	Pupils taking this course are required to be taking Mathematics or Further Mathematics at A level.

### COURSE OUTLINE

The Number Theory course will introduce you to modular arithmetic and how to solve modular equations, both linear and quadratic. It will cover several different algorithms and theorems and look at multiplicative functions, divisibility and coprime integers. It will tie in with the solving of equations that is covered in the Mathematics AS level, and will appeal to everyone who enjoys playing with numbers and problem solving.

## GEOGEBRA CLUB

<b>When</b>	Autumn Term, year 12
<b>Teacher</b>	Mrs Laurie Phippard (Mathematics Teacher)
<b>Course Length</b>	10 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	None
<b>Requirements</b>	Pupils taking this course are required to be taking Mathematics or Further Mathematics at A level.

### COURSE OUTLINE

Explore dynamic geometry and graphing using Geogebra software. Hints and 'how to's are introduced in each weekly session to support you as you experiment using apps already available online and start to write your own. Artistic, programming and algebraic talents are supported, encouraged and developed.



## CYPHER CHALLENGE

<b>When</b>	Spring Term, year 12
<b>Teacher</b>	Mrs Laurie Phippard (Mathematics Teacher)
<b>Course Length</b>	10 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	None
<b>Requirements</b>	Pupils taking this course are required to be taking Mathematics or Further Mathematics at A level.

### COURSE OUTLINE

Become an ACE code-breaker and prepare to meet the National Cypher Challenge! This elective will prepare you to attempt the early rounds of the UK National Cypher Challenge - 10 weeks of challenge cyphers to decode (1 challenge per week). The elective runs in Spring term to prepare you for this competition which is held over the Easter holidays and into the first half of the summer term. Training sessions will introduce standard cyphers and technology that can help with code-breaking including using Excel. This is open to all students who are keen to attempt the challenge or interested in learning about code breaking.

## THE CHEMISTRY OF ART

<b>When</b>	Autumn Term, year 12
<b>Teacher</b>	Mr Crispin Davis (Chemistry Teacher)
<b>Course Length</b>	10 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	None
<b>Requirements</b>	None

### COURSE OUTLINE

Explore how the artists created their masterpieces, from the 14th century to the modern day. What were the developments in the canvases and paints they used? How do chemistry and physics play a part in these developments and our experience of art.



## SPECIAL RELATIVITY

<b>When</b>	Autumn Term, year 12
<b>Teacher</b>	Mr Lampros Andrinopoulos (Physics Teacher)
<b>Course Length</b>	10 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	None
<b>Requirements</b>	Pupils taking this course are required to be taking Physics at A level.

### COURSE OUTLINE

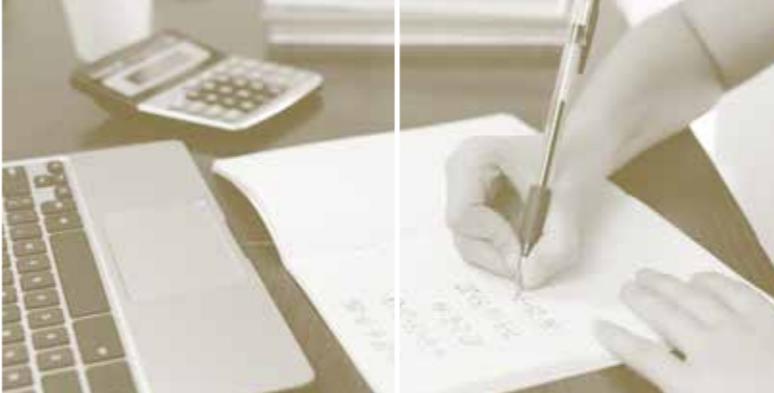
In this course you will learn about Einstein's exciting and ground-breaking Special Theory of Relativity. We will start by looking at frames of reference and Galilean transformations, then explore the idea that space and time are intertwined (space-time) and that the speed at which an object is moving affects time and length. We will discuss Lorentz transformations and derive formulas for time dilation and length contraction. Simultaneity of events and various "paradoxes" will be discussed in detail, such as the "twins paradox". You will then find out about the importance and applications of Special Relativity to particle physics. Finally, we will then look at relativistic momentum and mass-energy relations.

## ADVANCED QUANTUM PHYSICS

<b>When</b>	Spring Term, year 12
<b>Teacher</b>	Mr Lampros Andrinopoulos (Physics Teacher)
<b>Course Length</b>	10 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	None
<b>Requirements</b>	Pupils taking this course are required to be taking Physics at A level.

### COURSE OUTLINE

In this course you will find explore some ideas that you would have already encountered in year 12 Physics and go beyond them. We will start by recapping wave particle duality and quantisation of energy. We will then look at explaining energy levels using a rectangular one-dimensional "potential well" and then discuss the quantum atom and the Bohr model and derive energy levels for the hydrogen atom using this model. You will learn about the concept of the wavefunction and the Copenhagen interpretation, Everett's many-world theory and Feynman's sum over histories theory. You will also learn about Schrodinger's cat thought experiment and its use in explaining quantum phenomena. Finally, we will look at Heisenberg's uncertainty principle and its importance.



## GENERAL RELATIVITY

<b>When</b>	Autumn Term, year 13
<b>Teacher</b>	Mr Lampros Andrinopoulos (Physics Teacher)
<b>Course Length</b>	10 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	None
<b>Requirements</b>	Pupils taking this course are required to be taking Physics at A level.

### COURSE OUTLINE

General theory of relativity is one of the most important theories in Physics, which is a marked improvement on Newton's theory of gravitation. We will start by looking at the equivalence principle and then move onto gravitational time dilation, curved space-time and geodesics. We will then look at the various applications of the theory to Astrophysics and Cosmology, such as gravitational lensing and the geometry of the Universe and black holes.

## INTRODUCTION TO STOCKBROKING

<b>When</b>	Autumn Term, year 12
<b>Teacher</b>	Mr Jonathan Shields (Economics Teacher)
<b>Course Length</b>	10 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	This course leads onto the Spring term elective course, Introduction to Investment, CISI level 3 award. A professional exam in stockbroking from the Chartered Institute for Securities & Investment (CISI) can be taken at the end of the second part of this course.
<b>Requirements</b>	Pupils taking this course are required to be taking Mathematics, Further Mathematics or Economics at A level.

### COURSE OUTLINE

This elective will provide you with an introduction to the competency required by the financial services industry. Topics include the Economic Environment, Financial Markets, Bonds, Derivatives, Investment Funds, Life Insurance and Taxation. This elective can be chosen by a student who is interested in the basics of investment or the management of their own personal finances. It dovetails into two stock market investment competitions that you are invited to take part in.



## INTRODUCTION TO INVESTMENT (CISI LEVEL 3 AWARD)

<b>When</b>	Spring term and end of Summer term, year 12,
<b>Teacher</b>	Mr Jonathan Shields (Economics Teacher)
<b>Course Length</b>	14 weeks, plus 40-50 hours of additional study time if taking the exam
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	Introduction to Investment, CISI level 3 award
<b>Requirements</b>	Pupils taking this course are required to have taken the Introduction to Stockbroking Elective.

### COURSE OUTLINE

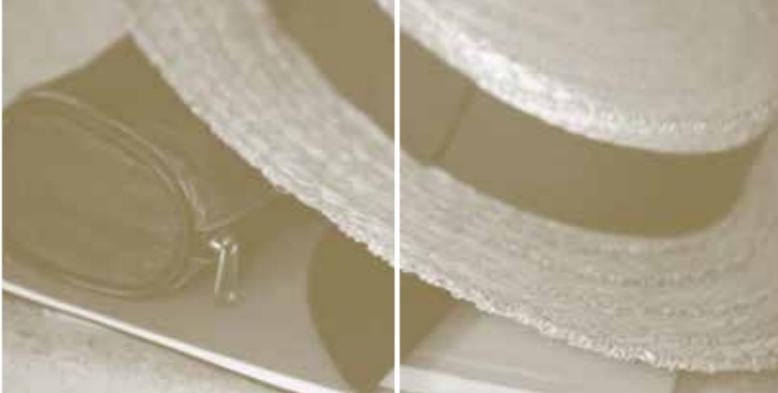
This elective continues on the foundations taught in the Introduction to Stockbroking elective. There is the option at the end of the elective to sit a professional examination in investment that will give you an internationally recognised entry level qualification with the Chartered Institute for Securities and Investment (CISI). This is something which would be unique amongst 16-18 year-old students. A professional qualification (50 question multiple choice exam) can be taken for £80 at any one of the CISI test centres around the globe.

## FINANCIAL ASSET MANAGEMENT (CISI LEVEL 3 AWARD)

<b>When</b>	Autumn term and start of spring term, year 13
<b>Teacher</b>	Mr Jonathan Shields (Economics Teacher)
<b>Course Length</b>	16 weeks, plus 40-50 hours of additional study time if taking the exam
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	Certificate in Asset Servicing, CISI Level 3 technical unit
<b>Requirements</b>	Pupils taking this course are required to have taken the Introduction to Investment Elective.

### COURSE OUTLINE

This elective focuses specifically on financial securities, building on the material learnt in the CISI Level 3 Introduction to Investment certificate. In this course you will learn, in greater detail, how assets such as equities, warrants and bonds are traded. This elective will provide you with a very high level of technical detail on the process, regulatory requirements and taxation treatment of purchasing financial securities on behalf of clients. There is the option of sitting a technical examination at the end of this elective that will part qualify you, at entry level, as a financial securities trader. A professional qualification (50 question multiple choice exam) can be taken for £80 at any one of the CISI test centres around the globe.



## ENGLISH LANGUAGE SUPPORT & PTE PREPARATION

<b>When</b>	Year 12
<b>Teacher</b>	Ms Heather Rhodes (Principal)
<b>Course Length</b>	Between 10 and 24 weeks, depending on pupil need.
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	PTE-Academic, widely accepted by English-medium universities as proof of English language ability.
<b>Requirements</b>	Pupils taking this course will have English as an additional language and will not yet have achieved a grade of 7 in IELTS (across every band) or 65 in PTE.

### COURSE OUTLINE

The level of your academic English is vital for success at A level and beyond, and even if you have fluent spoken English you may find you need to improve the accuracy of your written English and develop the breadth of your vocabulary. In this elective we will look at a range of skills in English, including academic writing, reading speed and comprehension, and expressing yourself clearly and effectively in spoken English. And prepare you for the PTE-Academic exam, with a view to taking it as soon as you have reached a sufficient ability level, ideally, at the latest, by the end of year 12.



## STEP & MAT PREPARATION

<b>When</b>	Spring term and end of Summer term, year 12, and the first half of Autumn term, year 13
<b>Teacher</b>	Mrs Laurie Phippard (Mathematics Teacher)
<b>Course Length</b>	20 weeks
<b>Homework</b>	1 hour + per week
<b>Examination</b>	Pre-STEP and MAT preparation
<b>Requirements</b>	Pupils taking this course are required to be taking Mathematics or Further Mathematics at A level.

### COURSE OUTLINE

This elective is aimed at those interested in applying to leading UK universities for a Mathematics or Computer Science degree. The MAT (Mathematics Admissions Test) exam is taken in late October of year 13 and is required by universities including Oxford and Imperial. The STEP (Sixth Term Examination Paper) Mathematics exam is taken at the end of year 13 and is required by universities including Cambridge and Warwick. This course will lay the foundations for preparing for both of these examinations.





## STEP MATHEMATICS PREPARATION

<b>When</b>	Year 13
<b>Teacher</b>	Mrs Laurie Phippard (Mathematics Teacher)
<b>Course Length</b>	15 weeks
<b>Homework</b>	2 hours + per week
<b>Examination</b>	Preparation for STEP Mathematics examinations
<b>Requirements</b>	Pupils taking this course are required to be taking Mathematics or Further Mathematics at A level and to have taken the STEP & MAT Preparation Elective in year 12.

### COURSE OUTLINE

This elective prepares pupils to take parts I, II or III of the STEP exam at the end of year 13. STEP Mathematics is a well-established mathematics examination designed to test candidates on questions that are similar in style to undergraduate mathematics and is used by the University of Cambridge and the University of Warwick. Questions may test a candidate's ability to apply mathematical knowledge in novel and unfamiliar ways and will often require knowledge of several different specification topics. Solutions will frequently require insight, ingenuity, persistence and the ability to work through substantial sequences of algebraic manipulation.

## EXTENDED PROJECT QUALIFICATION

<b>When</b>	Spring term and end of Summer term, year 12, and Autumn term, year 13
<b>Teacher</b>	Mr Crispin Davis (Chemistry Teacher)
<b>Course Length</b>	25 lessons over three terms
<b>Homework</b>	Approximately an hour a week plus 40-80 hours to complete your project across the three terms
<b>Examination</b>	Pearson Edexcel Level 3 Extended Project Qualification (EPQ)
<b>Requirements</b>	There are no requirements for entry to this elective, but pupils should be mindful of the time commitment involved.

### COURSE OUTLINE

The Extended Project is designed to develop learners' critical, reflective, problem-solving and independent learning skills, and supports pupils with the transition to higher education or the world of work. Pupils select a project topic which expands their learning in their field of study, in a related area, or an area that is relevant to their own personal interests. There are four types of projects available: a dissertation, an investigation/field study, a performance or an artefact. The live lessons on this elective course guide pupils through the skills needed to plan, execute and evaluate their projects, including research skills, project management skills and presentation skills. Pupils are additionally required to make regular one-to-one appointments with the Extended Project course teacher, who will act as a catalyst and facilitator of their research process. Pupils are assessed on their ability to plan, manage, complete and review their project. Projects are submitted for moderation in January 2022.

Extended projects are recognised by leading universities in the UK and in some cases admissions tutors may make a reduced offer to applicants that involves successful completion of the Extended Project. Pupils can draw upon their experience of undertaking the project when writing their personal statement, and a successfully completed Extended Project is often taken into account if a pupil narrowly misses the grades outlined in a university offer to them.



## UCAT & BMAT PREPARATION

<b>When</b>	Spring term and end of Summer term, year 12, and the first half of Autumn term, year 13
<b>Teacher</b>	Mr Crispin Davis (Chemistry Teacher)
<b>Course Length</b>	20 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	Preparation for the UCAT and BMAT examinations
<b>Requirements</b>	Pupils taking this course are required to be taking Chemistry at A level.

### COURSE OUTLINE

This elective is aimed at those interested in applying to leading UK universities for a degree in medicine. The University Clinical Aptitude Test (UCAT) is an exam which is used in the selection process by the majority of UK university Medical and Dental Schools, including the University of Warwick and Kings College London. The BioMedical Admissions Test (BMAT) is used for a similar purpose by around ten UK universities, including the University of Oxford and the University of Cambridge. This elective helps you to develop your ability to apply scientific and mathematical knowledge, as well as problem solving, critical thinking and written communication skills in preparing for both of these examinations.



## PAT & NSAA PHYSICS PREPARATION

<b>When</b>	Spring term and end of Summer term, year 12, and the first half of Autumn term, year 13
<b>Teacher</b>	Mr Lampros Andrinopoulos (Physics Teacher)
<b>Course Length</b>	20 weeks
<b>Homework</b>	Approximately half an hour a week
<b>Examination</b>	Preparation for the PAT and NSAA Physics examinations
<b>Requirements</b>	Pupils taking this course are required to be taking Physics at A level.

### COURSE OUTLINE

This elective is aimed at those interested in applying to Oxford or Cambridge for a degree in physics. The Physics Aptitude Test (PAT) is a requirement for everyone who applies to study Physics or Physics and Philosophy at Oxford. The Natural Sciences Admissions Assessment (NSAA) is a written exam for prospective Cambridge natural sciences and veterinary sciences applicants, including a subject specialism in Physics. This preparation course helps you to develop your ability to apply your knowledge and understanding of physics when answering the challenging questions in these examinations.





## SAT OR ACT PREPARATION

<b>When</b>	Year 12
<b>Teacher</b>	External Provider
<b>Course Length</b>	Between 11 and 25 weeks, depending on pupil need.
<b>Live Lessons</b>	This elective requires two one-hour live lessons per week.
<b>Homework</b>	2+ hours per week
<b>Examination</b>	Preparation for the SAT Reasoning Test or ACT Test, and for SAT Subject Tests.
<b>Requirements</b>	This elective requires a significant time commitment. There is a cost involved in taking these preparation courses and the associated exams.

### COURSE OUTLINE

This elective is aimed at those interested in applying to a university in the US. Pupils take a diagnostic test to assess whether they are better suited to taking the SAT Reasoning Test or the ACT test. Both are long multiple-choice tests covering reading, writing and mathematics, with the ACT additionally covering science. These exams are used by university admissions departments in the US to help inform their decisions about candidate applications. Our external provider works with pupils interested in preparing for the SAT or ACT exam, and can additionally support pupils needing to prepare for a SAT subject test.

