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# Introduction

Welcome to A Level Physics at Beechen Cliff School. This popular subject is taught with four hours of lessons per week, split between two teachers.

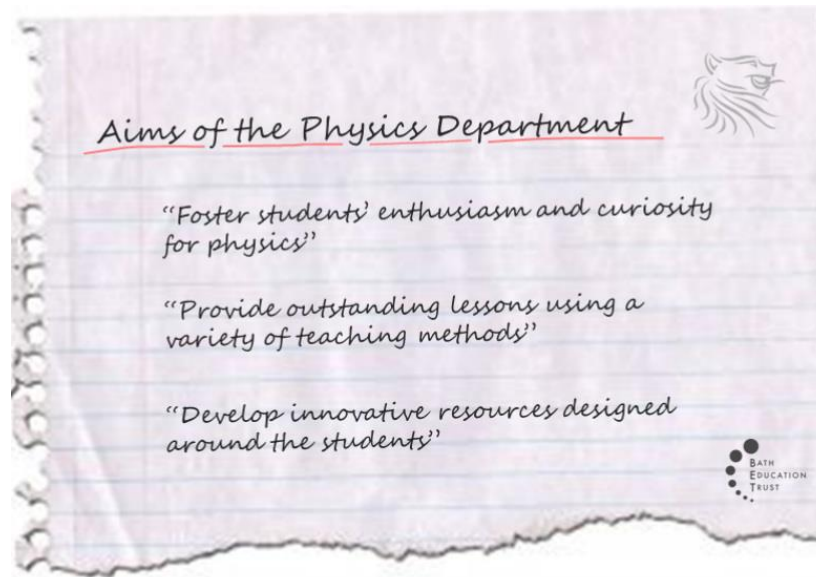
This academic, mathematical, practical and engaging course builds upon GCSE work in Year 12 with Mechanics, Electricity and an introduction to Quantum Effects. Year 13 students study Thermodynamics, Medical Applications, Particle Physics and Cosmology as part of the OCR Specification A course.

Mr L Matheson

Head of Physics

# Physics Student Handbook

twenty14/15



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# Physics Department

Physics is taught by a number of specialists at Beechen Cliff.

**Mr L Matheson** – Head of Physics/ Science GCSE Coordinator

Studied for a Master in Mechanical Engineering. With experience in the engineering industry working for a multi-national engineering consultancy, he also served in the Army before retraining as a teacher.

**Mr A Seal** – Head of Science Faculty

Masters of Geophysics, with experience of the oil and commodities industry who has taught physics across a range of courses at GCSE and A Level. He is also the Head of Faculty with responsibility for running the whole department.

**Mr P Watts** – Deputy Head of Beechen Cliff

With a degree in Physics and Music he then completed his Masters in Radiation and Environmental Protection at The University of Cardiff. As well as teaching Physics he is also the Deputy Head of Beechen Cliff School.

**Mr O Abbott** – Teacher of Physics/ KS3 Coordinator

An experienced teacher who started his career with a degree in Physics from The University of Cardiff. He is a keen rugby player and cricketer who is also responsible for students as part of the new boarding facility.

Physics at Beechen Cliff is taught in very well equipped facilities with all the major items of practical equipment used to demonstrate key concepts and allow students to carry out practical work in small groups. This is supported by the technical staff:

**Mrs J Lamb** – Senior Science Technician

Mrs Lamb leads an outstanding team of science technicians. She brings a wealth of experience from her time in industry and previous schools. She worked at Mullards on infrared optical devices and also has a patent in her name.

**Mr G Blacker** – Physics Technician

Mr Blacker trained as an engineer with a local company, eventually becoming the Chief Development Engineer. He has lectured with subject specialism in mathematics, control systems and theory of structures as well as working at the University of Bath as a member of the e-learning team. He now enjoys the challenge of building and making new equipment for the department.



## LAB SAFETY



Please do not enter science laboratories unsupervised. Many hazards are not obvious to those unfamiliar with these areas.

**In the event of a fire alarm please make your way to the designated area on the top playing fields using the nearest fire exit.**



# Course Structure

The course that you will be taught is called OCR Physics A – H158, H558 which is also known as OCR Specification A. This is split into a number of modules, G481 to G486.



Students in Year 12 complete modules that make up the Advanced Subsidiary General Certificate in Education (AS Level GCE). Those wishing to continue with the subject in Year 13 complete modules G484-G486 which certificate with an Advanced GCE (the full A Level). Full details of the content for each module are available from your teacher or through the [school website](#).

## AS Level – Year 12

Unit Title	Description of Content	Assessment Method and Weighting
<b>G481</b>	G481: Mechanics <ul style="list-style-type: none"> <li>• Motion</li> <li>• Forces in action</li> <li>• Work and Energy</li> </ul>	1 hour written exam AS Level – 30% A Level – 15%
<b>G482</b>	G482: Electrons, Waves and Photons <ul style="list-style-type: none"> <li>• Electric current</li> <li>• Resistance</li> <li>• DC Circuits</li> <li>• Waves</li> <li>• Quantum Physics</li> </ul>	1 hour 45 minute written exam AS Level – 50% A Level – 25%
<b>G483</b>	G483: Practical Skills in Physics 1 <ul style="list-style-type: none"> <li>• Qualitative</li> <li>• Quantitative</li> <li>• Evaluative</li> </ul>	Internal assessment AS Level – 20% A Level – 10%

## A2 Level – Year 13

Unit Title	Description of Content	Assessment Method and Weighting
<b>G484</b>	G484: The Newtonian World <ul style="list-style-type: none"> <li>• Newton's laws and momentum</li> <li>• Circular motion and oscillations</li> <li>• Thermal Physics</li> </ul>	1 hour 15 minute written exam A Level – 15%
<b>G485</b>	G485: Fields, Particles and Frontiers of Physics <ul style="list-style-type: none"> <li>• Electric and magnetic fields</li> <li>• Capacitors and exponential decay</li> <li>• Nuclear physics</li> <li>• Medical imaging</li> <li>• Modelling the universe</li> </ul>	2 hour written exam A Level – 25%
<b>G486</b>	G486: Practical Skills in Physics 2 <ul style="list-style-type: none"> <li>• Qualitative</li> <li>• Quantitative</li> <li>• Evaluative</li> </ul>	Internal assessment A Level – 10%

Physics A - H158, H558



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The OCR Website contain a wealth of information for students and parents; including the most up-to-date information for exam date alterations to the course content and answers to commonly asked questions.

## Data, Formulae and Relationships Booklet (Revised Version 2.1)

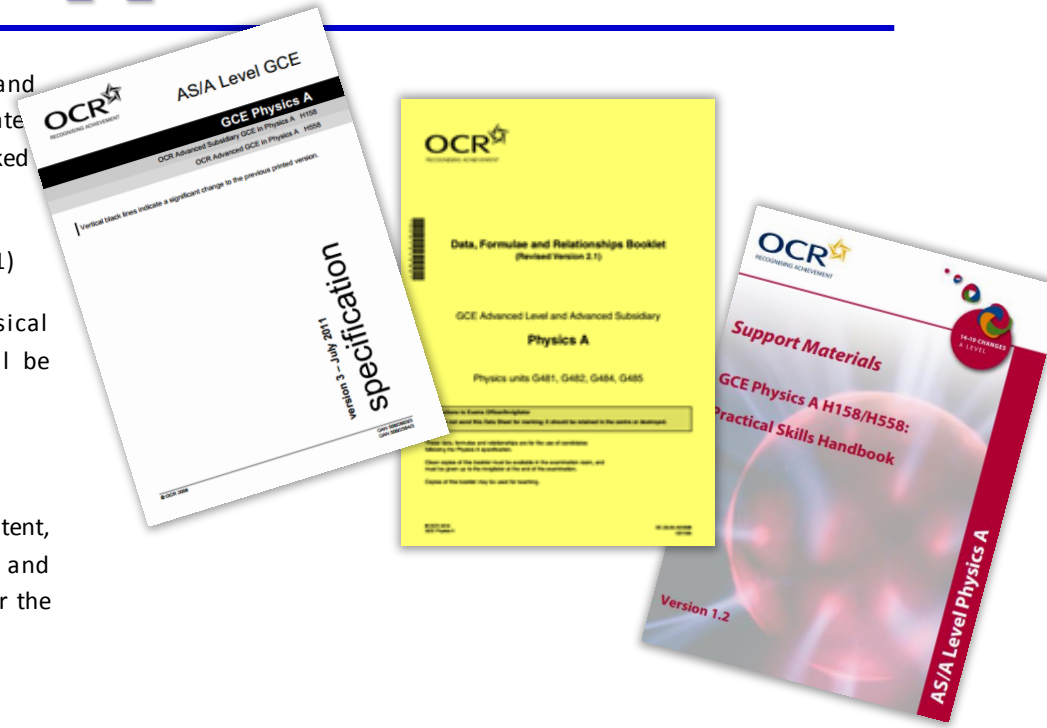
This essential booklet contains all the equation and physical constants you will need throughout the course, a copy will be issued to all students for use throughout the course.

## Full Course Specification (May 2013)

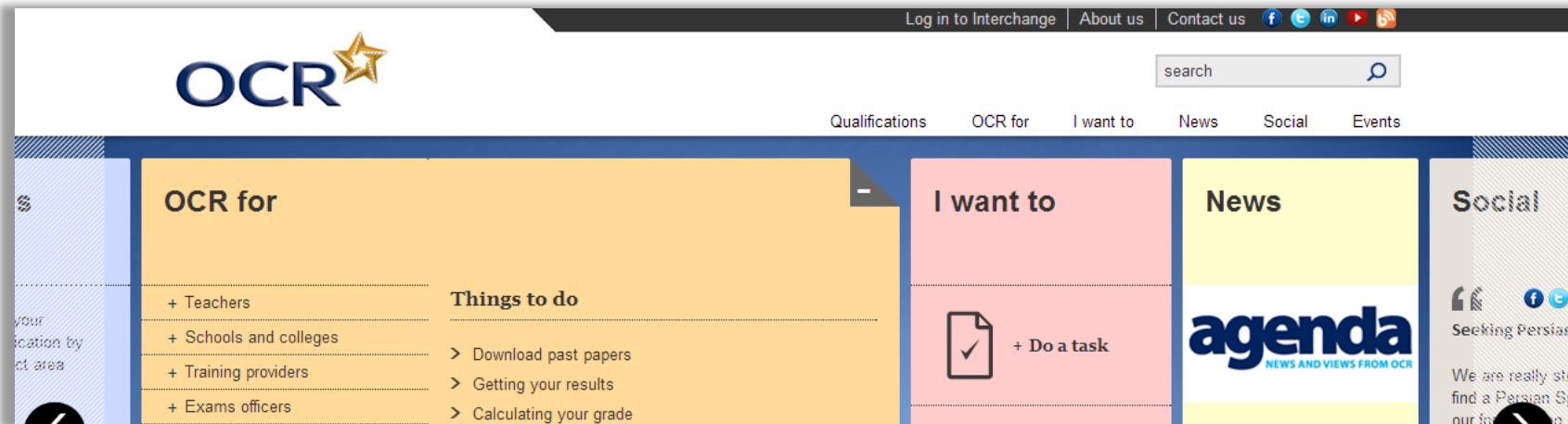
This weighty document outlines the entire course content, assessment information and technical information for teachers and technicians. Chapter 3 is essential reading in preparation for the exams.

## Practical Skills Handbook (Version 1.2)

20% of the course is assessed with practical work carried out in class. For the best chance of success in modules G483 and G486 Chapter 10 of the Practical Skills Handbook must be studied.



**Past Papers and Mark Schemes** are an essential tool for revision and preparation for this course. This area of the OCR site is regularly updated with the most recent papers and reports.





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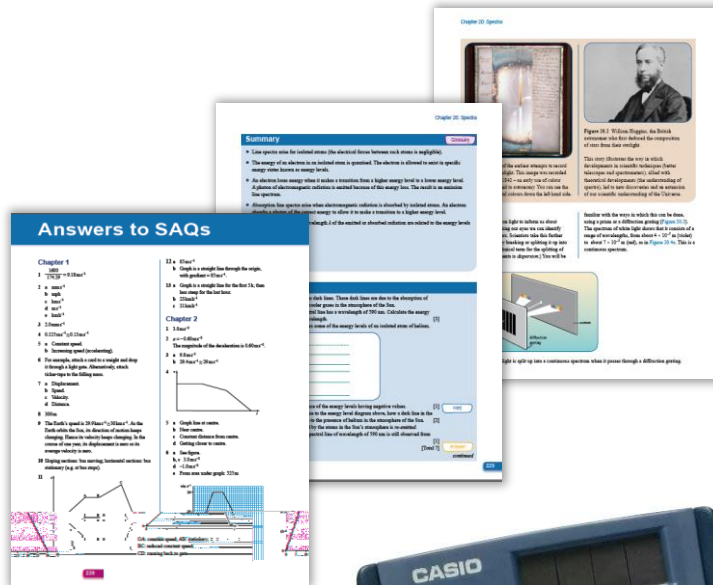
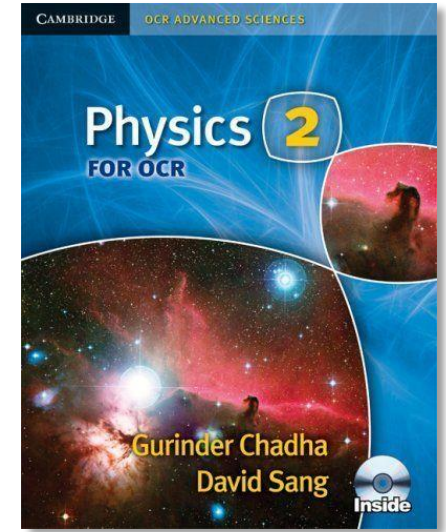
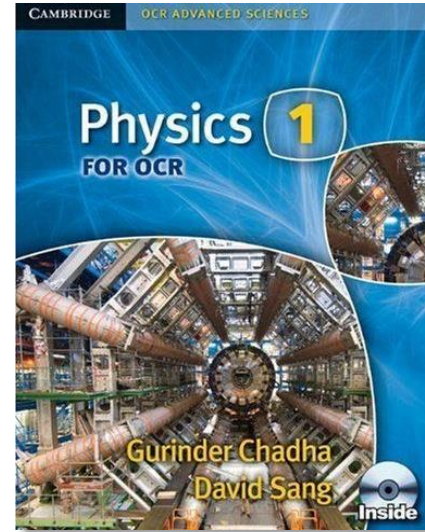
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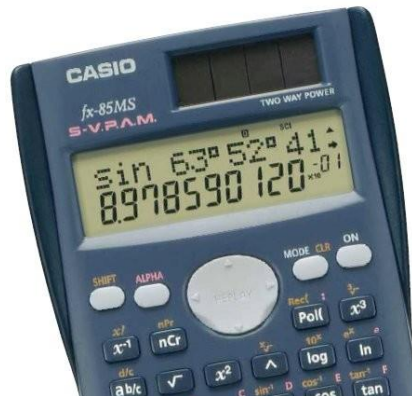
The core textbook that every student must purchase for the AS course is 'Physics 1 for OCR' from Cambridge University Press, this must be brought to every lesson. These can often be found for a reasonable price on Amazon or can be bought direct from the publishers. The subsequent book 'Physics 2 for OCR' is used for A2 work.

They both include an interactive CD-ROM that has extra help and hints linked to the chapter and past exam questions.



Every year students fail to prepare for their A Levels, turning up without essential equipment for their exams. In addition to pens, pencils and an A4 ring binder for your course notes you must ensure you acquire:

- 30cm clear ruler
- Protractor
- Scientific calculator  
(try and avoid Casio calculators with 'natural' in the title)



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The course is taught with four lessons per week split between two teachers. The majority of the content is taught before Easter with Term 5 used for revision and exam preparation. Term 6, after the

the summer examinations, allows a chance to start the A2 work and complete a summer project. Students are reminded that they must attend these lessons until their A2 choices are finalised.

L6B – OJA L6C – LJM L6E – LJM L6F – OJA	Group Splits	L6B – LJM L6C – AJS L6E – AJS L6F – PFW
<b>G481 and G483</b>	<b>School Week</b>	<b>G482</b>
Overview of key mathematical skills, graphs, trigonometry and vectors	Week 1	Overview of key mathematical skills, rearranging equations, sig figs and decimal places
	Week 2	
	Week 3	
1.1.1 Physical Quantities	Week 4	2.1.1 Electric Current
1.1.2 Scalars and Vectors	Week 5	2.2.1 Circuit Symbols
1.1.3 Kinematics	Week 6	2.2.2 E.m.f and p.d
1.1.4 Linear Motion	Week 7	2.2.3 Resistance
<b>End of Topic Assessment</b>	Week 8	<b>End of Topic Assessment</b>
<b>Half Term</b>		
1.2.1 Force	Week 9	2.2.4 Resistivity
1.2.2 Nonlinear Motion	Week 10	2.2.5 Power
1.2.3 Equilibrium	Week 11	
1.2.4 Car Safety	Week 12	2.3.1 Series and Parallel Circuits
<b>End of Topic Assessment</b>	Week 13	2.3.2 Practical Circuits
<b>G483 Qualitative Task</b>	Week 14	<b>End of Topic Assessment</b>
	Week 15	
<b>Christmas Holiday</b>		
<b>JANUARY MOCK EXAM</b>	Week 16	<b>JANUARY MOCK EXAM</b>
	Week 17	
<b>G483 Quantitative Task</b>	Week 18	2.4.1 Wave motion
	Week 19	2.4.2 Electromagnetic waves
<b>G483 Evaluative Task</b>	Week 20	2.4.3 Interference...
	Week 21	
<b>Half Term</b>		

L6B – OJA L6C – LJM L6E – LJM L6F – OJA	Group Splits	L6B – LJM L6C – AJS L6E – AJS L6F – PFW
<b>G481</b>	<b>School Week</b>	<b>G482</b>
1.3.1 Work and Energy	Week 22	2.4.3 Interference (cont)
1.3.2 Kinetic and Potential Energies	Week 23	2.4.4 Stationary waves
1.3.3 Power	Week 24	<b>End of Topic Assessment</b>
1.3.4 Behaviour of Materials	Week 25	2.5.2 The Photoelectric effect
<b>End of Topic Assessment</b>	Week 26	2.5.3 Wave - Particle Duality
	Week 27	2.5.4 Energy Levels in atoms
		<b>End of Topic Assessment</b>
<b>Easter Holidays</b>		
Revision	Week 28	Revision
	Week 29	
	Week 30	
Study Leave	Week 31	Study Leave
	Week 32	
<b>Half Term</b>		
Study Leave	Week 33	Study Leave
	Week 34	
	Week 35	
	Week 36	
Summer Project and WEX	Week 37	Summer Project and WEX
	Week 38	
	Week 39	
<b>Summer Holiday</b>		

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Please note the sequence of modules taught will not change, however, there may be slight alterations to the dates and end of unit assessments.

U6A – LJM U6D – LJM U6E – AJS U6F – AJS	Group Splits	U6A – PFW U6D – PFW U6E – OJA U6F – OJA
<b>G484 and G486</b>	<b>School Week</b>	<b>G485</b>
4.1.1 Newton's laws of motion 4.1.2 Collisions <b>End of Unit Assessment</b>	Week 1 Week 2 Week 3 Week 4 Week 5 Week 6 Week 7 Week 8	5.1.1 Electric fields 5.1.2 Magnetic fields 5.1.3 Electromagnetism <b>End of Unit Assessment</b>
<b>Half Term</b>		
<b>G486 Qualitative Task</b>	Week 9 Week 10	5.2.1 Capacitors <b>End of Unit Assessment</b>
<b>G486 Quantitative Task</b>	Week 11 Week 12 Week 13	5.3.1 The nuclear atom 5.3.2 Fundamental particles
<b>G486 Evaluative Task</b>	Week 14 Week 15	
<b>Christmas Holiday</b>		
<b>JANUARY MOCK EXAM G486 Resits</b>	Week 16 Week 17 Week 18 Week 19 Week 20 Week 21	<b>JANUARY MOCK EXAM</b> 5.3.3 Radioactivity 5.3.4 Nuclear fission and fusion <b>End of Unit Assessment</b> 5.4.1 X-Rays
<b>Half Term</b>		

U6A – LJM U6D – LJM U6E – AJS U6F – AJS	Group Splits	U6A – PFW U6D – PFW U6E – OJA U6F – OJA
<b>G484 and G486</b>	<b>School Week</b>	<b>G485</b>
4.3.1 Solid, liquid and gas 4.3.2 Temperature 4.3.3 Thermal properties 4.3.4 Ideal Gases <b>End of Unit Assessment</b>	Week 22 Week 23 Week 24 Week 25 Week 26 Week 27	5.4.2 Diagnostic methods 5.4.3 Ultra Sound <b>End of Unit Assessment</b> 5.5.1 Structure of the Universe 5.5.2 The evolution of the Universe <b>End of Unit Assessment</b>
<b>Easter Holidays</b>		
Revision	Week 28 Week 29 Week 30 Week 31 Week 32	Revision
<b>Half Term</b>		
Study Leave	Week 33 Week 34 Week 35	Study Leave
<b>The rest of your life</b>		



# Examinations

The course is assessed through a combination of external exams and internally marked assessments.

All exams take place in June, there are no longer January exams. There is the opportunity to re-sit each module with the highest mark for each module carried forward. Dates for the external exams will be published nearer the time, although can often be found on the OCR website.

G483 and G486 are internally assessed practical units. Focusing on Qualitative, Quantitative and Evaluative skills these are carried out during lesson periods. There are a total of three papers for each area with the highest mark carried forward to the final result.

Once the exams have been marked the papers are moderated to ensure that marking is consistent by all markers.

The raw mark is converted to a Uniform Mark Score, UMS, that allows for the weighting of each module with the highest possible score totaling 300 for AS and 600 for the full A Level. For example, G485 is worth 25% of the overall total so the module has a mark out of 150. The papers are graded so grades awarded each year are equivalent.

*“ An A grade at GCSE does not necessarily mean an A at A Level ”*



Grade	Percentage	AS Level Mark /300	A Level Mark /600
A*		See note below	
A	80	240	480
B	70	210	420
C	60	180	360
D	50	150	300
E	40	120	240
U	<40	<120	<240

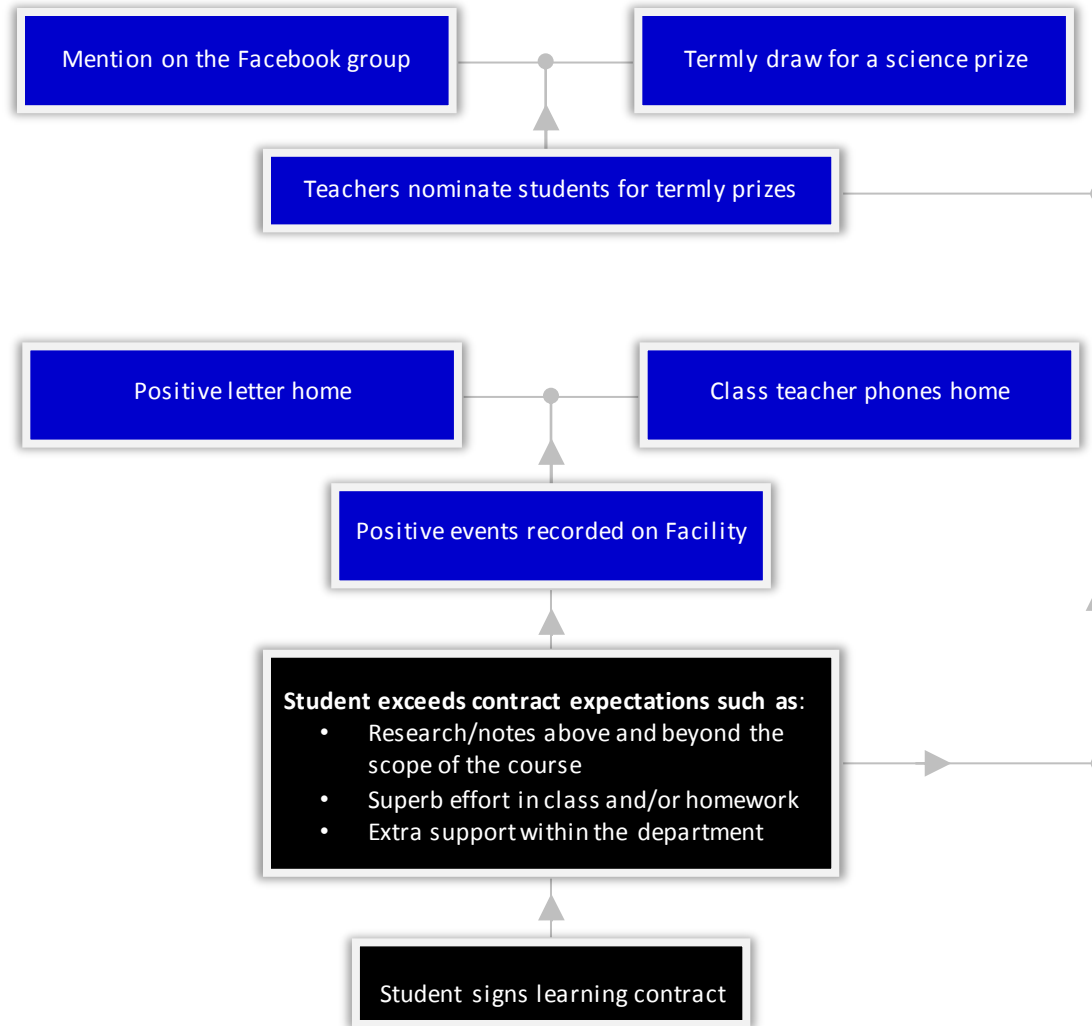
To distinguish between the highest achievers the A\* was recently introduced for those taking the full A Level. Candidates achieving at least 480 uniform marks in their Advanced GCE, i.e. grade A, and who also gain at least 270 uniform marks in their three A2 units will receive an A\* grade.



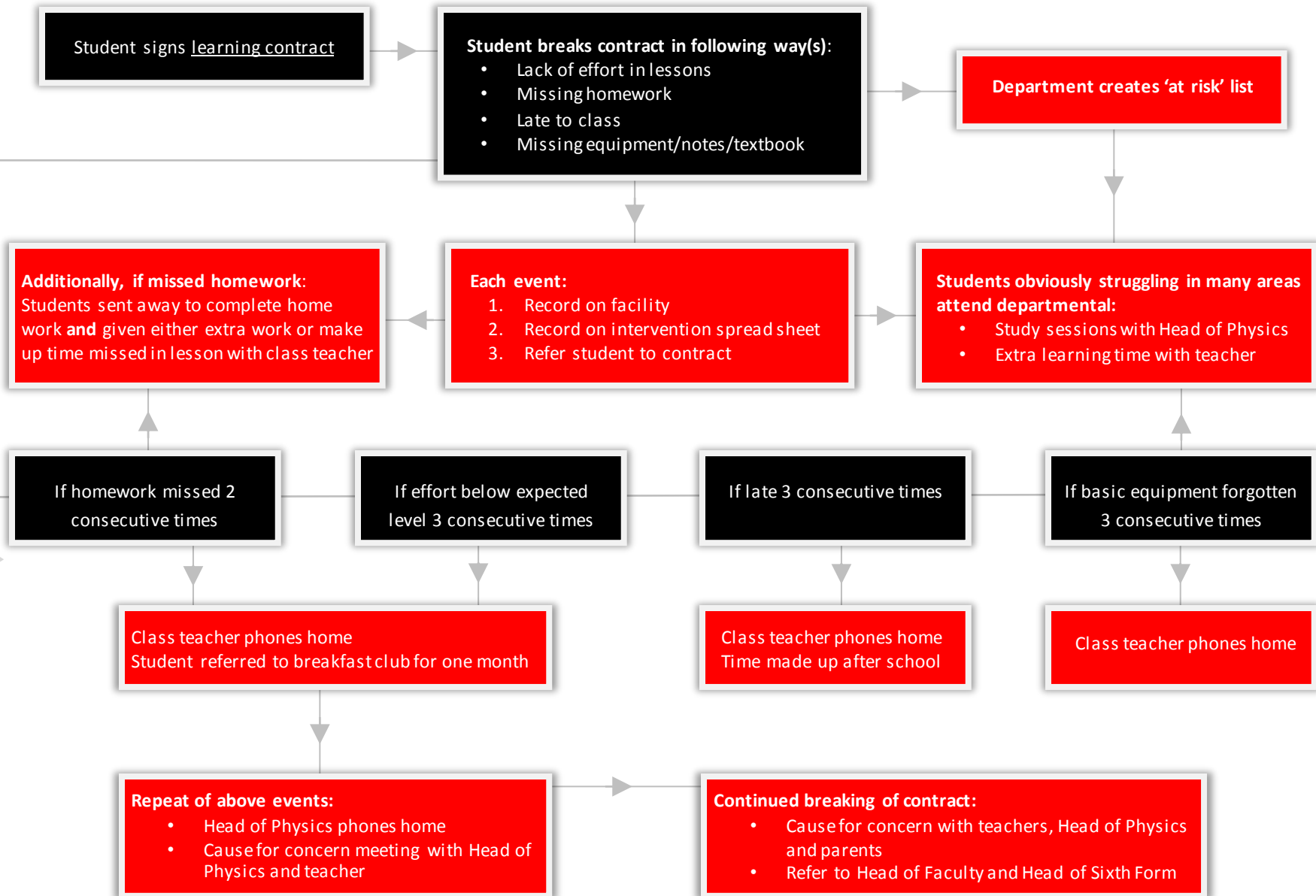
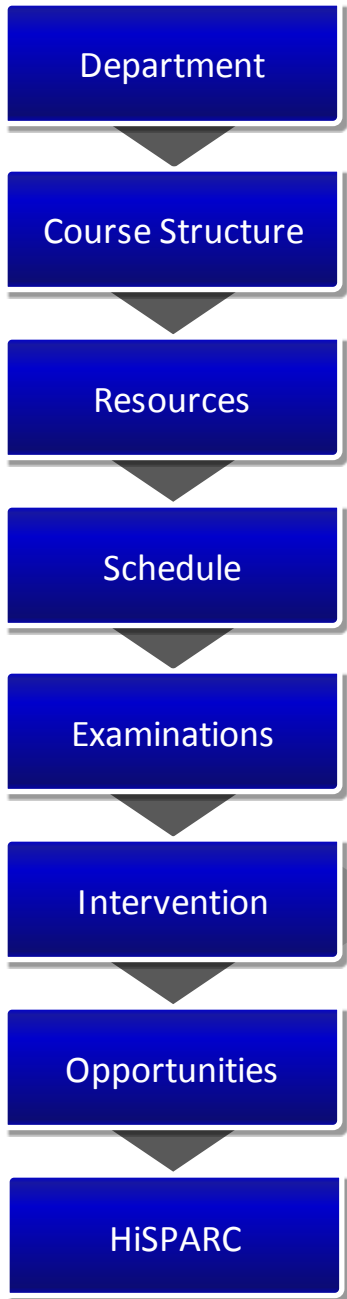


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A range of strategies have been developed within the department to reward pupils who have shown great commitment to the course, and help those who are struggling to achieve their full potential.



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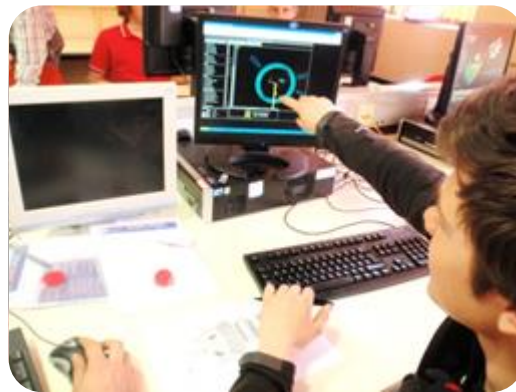
# Opportunities

The Physics Department staff are keen to offer students many opportunities to extend their physics knowledge and see the wider applications of this subject – especially in a setting other than the classroom.

In recent years students have been on trips to:

- University of Cardiff Astrophysics Department for talks on astronomy and applications of physics post degree level.
- University of Bristol Physics Department for a particle physics master class with lectures on the Higgs and fundamental particles.
- Herschel House Museum, Bath. The townhouse where William Herschel lived just two miles away from Beechen Cliff. He discovered the planet Uranus and also infrared Radiation.

Students have also had the chance to complete holiday placements with the Headstart scheme and complete their extended essay on Physics topics with support from teaching staff.



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# HiSPARC

HiSPARC is an international Particle Physics project that detects Cosmic Radiation from Space. Two particle detectors have been installed on the roof of the main building, with a computer (in the main dining hall) that sends our data to a central database.

The University of Bristol (one of the top three universities for science in the UK) have signed a contract with Beechen Cliff School offering support: lectures, visits, and technical help.

Other schools involved in this project include:

- Royal High School Bath
- Bristol Grammar School
- Red Maids, Bristol

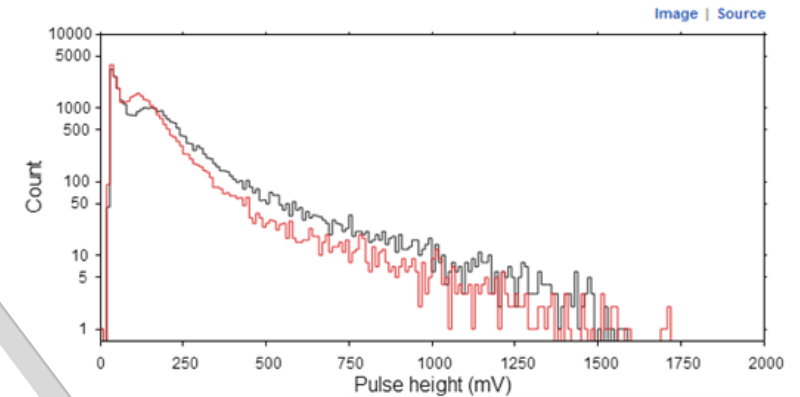
Successes last year with the project included:

- Detector system constructed and installed on the roof
- Over 30 students from years 11-13 involved
- Data is now being collected and the analysis has begun

We are very grateful to the following who have donated funds towards our project:

- Medlock Charitable Trust
- Institute of Physics
- Beechen Cliff Great Walk Fund

Pulseheight histogram



[View the live data here](#)

