KING EDWARD VI
CAMP HILL
SCHOOL FOR BOYS

King Edward VI Camp Hill School for Boys

Physics

Department Handbook

2021-22

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Department intent, implementation and impact:

Curriculum Intent:

- Introduce students to scientific investigations through experimentation and evaluation
- Provide opportunities for pupils to critically assess the real world based on fact-driven views
- Cultivate the use of academic terminology in the process of learning new knowledge in order to develop pupils' scientific literacy
- Develop the ability to comprehend science through real-life observations, scientific principles and logic
- Build up channels for pupils to access wider scientific world through the familiarisation of basic scientific principles
- Apply and develop numeracy skills alongside scientific investigations and establish the key roles played by mathematics in building physical models
- Develop independence and resilience when encountering complex concepts and solving challenging problems
- Nurture and entrench scientific and critical thinking skills into the day-to-day learning routines

Curriculum Implementation:

- The department delivers a large number of well-designed class practical from Year 7 to Y11
- The curriculum provides a wide breath in KS3 as well as opens discussions for further investigations in KS4
- The scheme of work is designed to suit our pupils' intellectual ability at different stages but also offers an opportunity to challenge the brightest
- The understanding of complex physical concepts is built in sequence from basic experimental observations to in-depth mathematical calculations
- The learning progress is monitored by standardised termly assessment in all year groups within the department

Curriculum Impact:

- The percentage of 8/9 Grade and A*/A Grade at GCSE has been kept around 90% for nearly a decade.
- The percentage of A*-B Grade at A Level has been kept around 85% from 2015 to 2019.
- We have always had a large number of students who choose to study Physics at A Level in the sixth form and many of them continue to study Physics or Engineering at Oxbridge and Russell group universities.

Department admin and resources

Staffing:

Staff	Roles	email
Miss Ruoshan Li	Head of Physics, Radioactive Protection Supervisor	r.li@camphillboys.bham.sch.uk
Mr Daniel Redshaw	Teacher of Physics	d.redshaw@camphillboys.bham.sch.uk
Mr James Oggelsby	Teacher of Physics, Assistant Head of Sixth Form	j.oggelsby@camphillboys.bham.sch.uk
Mr Joe White (part time)	Teacher of Physics	j.white@camphillboys.bham.sch.uk
Mrs Jagminder Hundal (part time)	Teacher of Chemistry, Teacher of Physics, Teacher of PHSE	j.hundal@camphillboys.bham.sch.uk
Mrs Wioletta Bartoszak	Head Technician	w.bartoszak@camphillboys.bham.sch.uk
Mr Robert McQueen	Technician	r.mcqueen@camphillboys.bham.sch.uk

Resources:

Laboratories and experimental resources:

Over the years the Physics department has built a large stock of equipment for all key stages practical work. We are very proud that the department is able to offer our students a wide range of experiment in comparison to most state schools. In addition to the large number of experiment we offer, students generally can work by themselves or in pairs rather than sharing the apparatus between too many students.

The Physics department has three main labs, P1, P2 and P3 which are regularly used for practical lessons. Since we deliver a large quantity of practical lessons to our Key Stage 3 students, P1 and P2 are equipped with frequently used class-set apparatus for motion practicals, thermal practicals and electricity practicals. This arrangement enables teachers to be able to get most of the key apparatus directly from the labs.

For KS4 and KS5 practical lessons, teachers and students may use Room3 and Room 4 with all equipment delivered to the room by our technicians.

Health and Safety

There is usually very low risk in physics experiment across KS3 to KS5. We still expect all students to follow general lab rules which are clearly published and stuck on the wall in all labs. For all Year 7 practical work, precautions and risk assessment is written in the student workbook in each practical so that pupils get used to the idea of risk assessment. Once pupils are trained to use different equipment appropriately, it is easy to maintain a safe practical environment and atmosphere.

All radioactive material is securely stored and logs of the use of radioactive material are complete and up-to-date. Both technicians and RPS attend regular trainings to follow and implement the latest guidance at school.

Textbooks:

The department provides our own KS3 and KS4 student workbooks to deliver the curriculum the way we feel most suitable for our students and the workbook are regularly updated in every few years. Please see the attached pages of some chapters from the student workbooks.

In KS4 we also offer students *CGP Grade 9-1 Revision Guide* for further assistance.

In KS5 we offer *A-Level Year 1 and Year 2 Physics – The Complete Course for AQA* and *CGP AQA Revision Guide*.

Teaching Resources:

In the departmental hard drive and shared departmental google drive, we create and share very rich teaching resources which always evolve when each member of the department contributes new resources or update the existing ones.

The department makes a great effort to create our own assessment materials, similar to the student workbooks, we feel some of the worksheets widely available on the internet do not always suit the ability of our students. The assessment material we write is often more targeted to focus on our own curriculum intent, and most importantly, this offers an opportunity to make some challenging questions for our brightest students.

CPD:

Members of the department are always encouraged to attend external CPDs in need of delivering certain topics or experiment. In departmental meetings, feedback from external CPDs is shared within the department. However, CPDs are not only limited to focus on Physics, members of the department have also attended CPDs to support UCAS applications or supervising EPQs.

Department meetings:

The Physics department has regular meetings in addition to the day-to-day communications.

In the department meetings we usually:

- Decide the topics to be delivered in the coming weeks
- Assessment arrangement across all year groups
- Share of new teaching and learning pedagogy
- Internal CPDs focusing on specific experiment or assessment
- Share of books between different classes

New Staff Information

The department seeks to implement the whole school policy for the induction of new members of staff.

The department will provide support and assistance through:

- information about the departmental resources, SoW, KS4 and KS5 specifications
- training on delivering experiment that the new members of the staff are not familiar with
- regular meetings with teachers who teach the same year group
- CPDs within the department as well as external ones
- opportunities to take responsibility for activities within the department
- support to take wider roles within the school community

Curriculum maps: KS3, 4 and 5

	Theory Development	Curriculum Rationale
Year 7	• basic application of mass/volume/density equation • basic application of distance/time/speed equation • basic understanding of weight and mass	We aim to provide a wide range of practical work for our Year 7 students so that our young pupils have the opportunity to enjoy a variety of different types of scientific investigations. We feel it is more important for the Year 7 students to focus on developing their investigational skills than too much emphasis on the in-depth theory learning at this stage. Although we do not reveal all the theoretical detail behind each experiment, it is very important for students to understand how we conduct each investigation and how to draw a valid conclusion based on the experimental results. Since our students are exposed to various practical work, most of our students become quite competent in using basic equipment in labs. A lot of the experiment are revisited in Y9, Y10 and Y11, with more focus on the theory side.

	Theory Development	Curriculum Rationale
Year 8	• law of reflection • plane mirror image formation through light ray diagrams • refraction of light through glass blocks • basic wave properties of light • basics of coloured light • basic structure of circuits • basics series circuits • curved mirrors and lenses through light ray diagrams • focal lengths and powers of converging lenses • basic eye structure and eye sight correction • basic magnetic field around bar magnets • basic magnetic field around direct current • basic static electricity	Our Year 8 curriculum is still heavily focused on experiment and students usually have one experiment per week. We start to gradually build some understanding on the concepts in parallel with the practical work. • We use basic reflection and refraction of light to open the world of waves but the more in-depth theory is revealed in Y10. Students learn to draw a lot of light ray diagrams which are not too abstract but also provide a great opportunity to transfer their Maths skills into Physics. The curriculum also offers some challenges for our most able students, such as calculating refractive index from critical angles. •The electricity topic also offers a wide range of experiment and students get to learn how to use equipment such as ammeters, voltmetres, rehostats, and thermistors appropriately. Energy and energy transfers are also built into the electricity topic. We introduce the basic electricity and circuit calculations in Y8 and move to the much complicated series and parallel circuits in Y10. •The electromagnetic topic mainly focuses on the observations of magnetic field using plotting compasses. Students learn to draw magnetic field lines of simple bar magnets and direct current. The theory behind and t he more complicated motor and generator effect are discussed in detail in Y11.

	Theory Development	Curriculum Rationale
Year 9	• distance-time and speed-time graphs • vector and scalar • motion equations • Newton's 1st, 2nd and 3rd laws • balanced and unbalanced forces • terminal velocity • friction and resistive forces • weight and mass • different types of forces • free body force diagrams • adding and resolving forces • momentum and conservation of momentum • collisions and car safeties • work done and energy transfers • Hooke's law and elastic difformations • GPE and KE • energy, power and efficiency • moments and centre of mass • liquid pressure and hydraulic system • solar system and space physics (research and project)	The Y9 curriculum is designed to bridge the transition between KS3 and KS4. The topics focuses on forces, motions and energy. In KS4 and KS5 Physics, forces motions and energy are the absolute fundamental building block for studying other topics. •The distance-time experiment in Y7 is revisited in Y9 with much in-depth explanation and discussions. This is the starting point where pupils start to build their more extensive understanding of graphs. The learning process also offers many opportunities to practise their maths skills. •The relationships between forces, motions and energy transfers serve as the foundation and core of physics studies throughout all key stages. We build this foundation from the most basic free body force diagrams and link the motion states to the forces exerted. In the exploration of different types of motion scenarios, pupils gradually develop their logical thinking and analytical skills. We also address the importance of using appropriate academic terms and highlight the common misconceptions such as the constant missuse of weight and mass, speed and velocity. •The study of liquid pressure, Hooke's Law, moments and momentum are all built on a good understanding of forces but these topics also explore wider side of physical studies and offers more explanations to a lot of real life experiences. •Energy and work done are embedded throughout the Y9 curriculum and the concept of energy conservation is designed to be well developed through the discussions of all physical scenarios such as car collisions and sky diving. •The solar system and space study provides a great opportunity for students to apply their knowledge of light and shadow and forces and motion into the topic. In addition, projects are set up for pupils to carry some of their own independent researches.

	Theory Development	Curriculum Rationale
Year 10 and Year 11	• basic wave features and properties • EM wave uses and hazards • how EM waves are produced • image formation of converging and diverging lenses • medical imaging using EM waves and ultra sound • atomic structure and isotopes • alpha beta gamma radiations and half lives • uses and hazard of radioactive isotopes • nuclear fission and fusion and nuclear power station • simple series and parallel circuits • alternating current, domestic electricity and national grid • I-V characteristics of ohmic conductors, filament lamp and diodes • electricity and energy calculations • static electricity • particle theory of matters • specific heat capacity and specific latent heat • gas pressure • magnetic field of bar magnets and direct current • motor effect and generator effect • Fleming's left hand role • how DC motor works • how AC generator works • how transformer works • satellite and circular motion • Doppler effect, red shift and blue shift • expansion of universe and origin of universe	The KS4 curriculum is vertically integrated with the KS3 curriculum but with new topics explored such as radioactivity. •In Y8 pupils have chances to physically observe light reflection, refraction and colour spectrum but there is little focus on the theory side. In Y10 the wave topic explores all different types of waves: from the entire electromagnetic spectrum, sound and ultra sound waves to Earthquakes. •The electricity curriculum in KS4 is also built on the Y8 study. Pupils have chances to do more circuit building practical work as well as develop deeper understandings of more complex series and parallel circuits. Domestic electricity and alternating current are also explored in this topic which offers many opportunities and challenges for pupils who consider to take Physics at A Level. •The atomic structure and radioactivity topic opens up the world of subatomic particles which are explored with a lot more detail in A Level. •The particle and matter topic brings some of the Y7 experiment back with more explanations. The study of gas pressure is another example to show how forces and motions are integrated in almost every topic. •The space physics is another extension of what pupils have explored in Y9. •The study of motor and generator is placed at the very last because the understanding of electromagnetic induction is built on top of basic magnetism, DC electricity, AC electricity and forces and moments. This topic truly challenges pupils' understanding of physics in all perspectives.

Year 12 Physics:

- Particle physics and quantum phenomena
    - Classification of particles
    - Spectra of light
    - Wave particle duality
    - Matter and antimatter
    - Photoelectric effect
- DC electricity
    - Mixed circuit calculations
    - EMF and internal resistance
    - Resistivity and super conductivity
    - I-V characteristics
    - Energy and power
- Mechanics
    - Uniform accelerations
    - Newton's laws
    - Energy and work done
    - Moments
    - Momentum and conservation of momentum
    - Circular motion
    - SHM and damping
- Waves
    - Progressive and standing waves
    - Diffraction and interferences

Year 13 physics:

- Fields and its interactions
    - Gravitational field
    - Electric field and capacitance
    - Magnetic field and particle accelerators
    - EM inductions
    - Transformers and AC circuits
- Nuclear physics
    - Alpha beta and gamma radiations
    - Nuclear decay and half life
    - Stable and unstable nucleus
    - Binding energy
    - Nuclear powers
- Thermal physics
    - SHC and SLH
    - Ideal gas laws
- Options:
    - Astrophysics or Engineering Physics

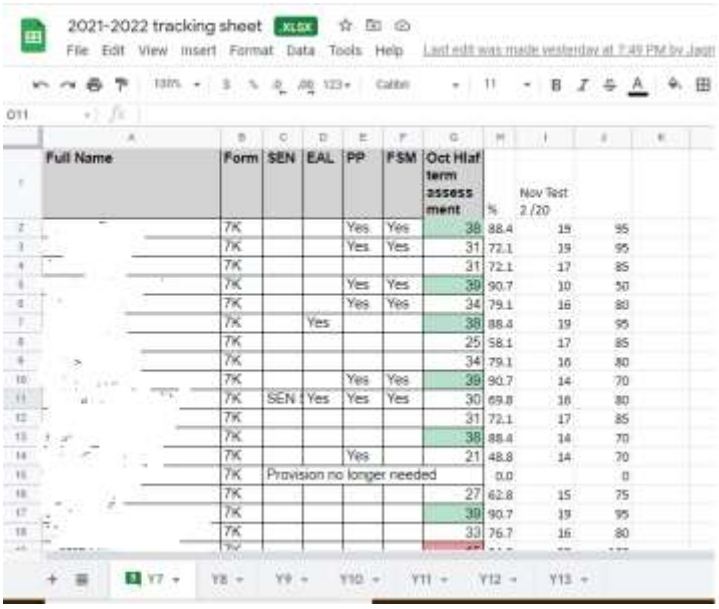
Assessment and marking

Homework:

Each individual members of the department creates their own mark books to monitor pupil progress. The marking policy is in line with the whole school assessment policy which is available at Y:\STAFF INFORMATION\STAFF HANDBOOK\Staff Handbook 21-22\D POLICIES\Assessment Policy.

The department aims to provide pupils with regular feedback through a combination of formative and summative assessment.

The Physics department has also created a whole school tracking sheet to monitor all pupils' progress every half term. In each year group, pupils take the same assessments and the assessment results are used to identify students who may need immediate intervention as well as the very gifted and talented students who would benefit further challenges. The half-termly assessment is also aim to reduce teachers' marking load yet provide more reliable information on pupil's progress.



Full Name	Form	SEN	EAL	PP	FSM	Oct Hlaf term assessment	%	Nov Test 2 /20		
	7K			Yes	Yes	38	88.4		19	95
	7K			Yes	Yes	31	72.1		19	95
	7K					31	72.1		17	85
	7K			Yes	Yes	39	90.7		10	50
	7K			Yes	Yes	34	79.1		16	80
	7K		Yes			38	88.4		19	95
	7K					25	58.1		17	85
	7K					34	79.1		16	80
	7K			Yes	Yes	39	90.7		14	70
	7K	SEN	Yes	Yes	Yes	30	69.8		16	80
	7K					31	72.1		17	85
	7K					38	88.4		14	70
	7K			Yes		21	48.8		14	70
	7K	Provision no longer needed					0.0			0
	7K					27	62.8		15	75
	7K					39	90.7		19	95
	7K					33	76.7		16	80

Closing the gap and SEND pupils

All pupil premium and SEND pupils are highlighted in teachers' mark book as well as the seating plans. All lesson plans are adapted to suit the SEND pupils' need. The Physics department uses regular homework and classwork assessments and the half-termly assessment to identify pupils who need short term or medium term interventions.

Interventions:

- Teachers may take pupils back at lunchtime or breaktime for incomplete work or poor quality work.
- Teachers may email parents for repeated late, missing homework, or poor quality homework and classwork.
- If students show little improvement on the quality of work after being taken back at lunch for multiple occasions, Head of Department will intervene and provide extra support.
- Lower school pupils who perform poorly in half-termly assessments can get help from our older students who excel in physics.
- Lunchtime and after school revision sessions are offered for exam group students who struggle to achieve their targeted grades.

British Values and SMSC education

British values are defined as including:

"democracy, the rule of law, individual liberty and mutual respect and tolerance for those with different faiths and beliefs"

Tolerance and respect characterise effective learning as set out in the Equality Act and where those with protected characteristics receive fair treatment so that all are treated equally. Individual colleges and providers will capture these expectations in their Mission and Values statements and also in codes of conduct for students. In implementing these standards teachers, tutors and lecturers will be exemplifying and promoting British Values.

Many learning opportunities in Physics will be framed by complying with Health and Safety legislation. This will include the role of risk assessments in defining and addressing risks. Opportunities will arise to discuss British law in this context.

There are a diverse range of topical scientific issues at GCSE level that with allow students to explore the nature of scientific evidence and the interplay between scientific communities, the media, politicians and policy makers. Students will find it necessary to distinguish between opinion based on

valid, repeatable and reproducible evidence and opinion based on non-scientific ideas (for example prejudices, or hearsay).