# PHYSICS CURRICULUM MAP: [OCR A H556]

JMF6 ABINGDON

Specific careers that utilise skills from **PHYSICS**: Physics is a very well-respected A level course which will help you develop the skills, understanding and knowledge that many employers across a range of industries are looking for. It is an excellent grounding for careers in Engineering, Physical Sciences, Forensic Sciences, Environmental Sciences, Education and many more.

**Opportunities for further study:**
Physics can lead to a further study in a range of fields both undergraduate and apprenticeship opportunities. Some courses include physics, engineering (mechanical, electronic, aerospace), astrophysics, medical physics, radiotherapist, architecture, forensic science, environmental science and many more.

Students will be assessed on the content for Modelling physics. This includes contents from Terms 3 to 6 in Year 12 and Terms 1 and 2 in Year 13.

Mock exams

## Terms 1 and 2: Astrophysics and cosmology, simple harmonic motion and gravitational fields

**Teacher 1:** Students will learn about the life cycle and characteristics of stars and study how electromagnetic radiation can be used to determine surface temperature and elements within the stars. They will then study cosmology, looking at distance in the universe and evidence for the Big Bang theory and the future of the universe.
**Teacher 2:** Students will learn about simple harmonic oscillations, forced oscillations and resonance. They will then study gravitational fields, looking at Newton's law of gravitation, planetary motion and gravitational potential and energy.

## Terms 3 and 4:Particles and medical physics

**Teacher 1:** Students will study nuclear and particle physics, looking at the atom, nucleus, fundamental particles, radioactivity and fission and fusion. Students will then complete a topic on medical imaging looking at x-rays, CAT scan, PET scans and ultrasound scans

**Teacher 2:** Students will study the properties of capacitors and how they are used in electrical circuits. They will then study electric fields, looking at Coulomb's law and electric potential and energy. Students will then study electromagnetism, looking at the motion of charged particles in a magnetic field, Lenz's law and Faraday's law and generators and transformers.

## Term 5: Revision

With both teachers, students will revise and refine exam technique. They will continue with reactive and general revision with a focus on exam questions.
They will also focus on the skills necessary for the unified physics paper

**Further study and career pathways**

Over the summer, students will review their knowledge from year one of the course and ensuring this is embedded ahead of year 13.

Mock exams

Students will be assessed on electrons, waves and photons and the forces and motion topics.

**Year 13**

## Terms 5 and 6: Forces and motion continued, thermal physics and circular motion

**Teacher 1:** Students will learn about material properties, looking at springs and the mechanical properties of matter, including the Young modulus. Students will then begin a thermal physics topic, looking at the behaviour of gases and using kinetic theory, Students will then complete a short topic on circular motion.

**Teacher 2:** Students will learn about Newton's laws of motion and momentum. They will also look at work, energy and power and the conservation of energy. Students will then begin a thermal physics topic, looking at the solids, liquids and gases and the thermal properties of materials as they change temperature or state,

### Forces and motion

In this unit, students will study:
- Kinematics and linear motion
- Projectile motion
- Forces in action
- Work, energy and power
- Momentum
- Materials

## Terms 3 and 4: Quantum physics, foundations of physics, forces and motion

**Teacher 1:** Students will learn about the photon model of light, the photoelectric effect and wave-particle duality.
Students will then begin to study linear motion, looking at equations of motion and projectile motion, as well as factors affecting acceleration and terminal velocity of objects.

**Teacher 2**: Students will learn about physical quantities, SI units, uncertainties and scalars and vectors. They will then move on to study statics, looking at moments and couples, objects on inclined planes. They will also study density and pressure and calculate the upthrust on an object in a fluid.

KS5 trips and visits where possible:
- Particle physics masterclass
- Local scientific companies/researchers
- Visiting guest lectures and speakers

**Year 12**

### Electrons, waves and photons

In this unit, students will study:
- Current and charge
- Energy, power and resistance
- Electrical circuits
- Waves
- Quantum physics

## Terms 1 and 2: Waves and Electrical circuits

**Teacher 1**: Students will learn about the properties and characteristics of waves and investigate wave phenomena like refraction, internal reflection, superposition and interference, stationary waves and polarisation. There is lots of opportunity for practical work in this topic and students will investigate all the above wave phenomena.

**Teacher 2:** Students will learn about electrons, electric current and electrical circuits. They will investigate and calculate the current, potential difference, resistance and power in circuits. There is lots of opportunity for practical work in this topic and students will investigate electrical circuits, internal resistance, resistivity of materials and potential divider circuits.

### Non-Examined Assessment

Throughout the two-year course students will complete a minimum of twelve required practicals. These work to investigate the theory but also develop students' practical skills and techniques in science.

KS5 extra-curricular opportunities:
- Mentoring of lower years
- Clubs like A level Grade Booster

# Year 13

Year 13 Terms 1 and 2: **Astrophysics and cosmology, Simple harmonic motion and Gravitational fields**

Why this?

These topics complete the module on Newtonian world and astrophysics and complete the content necessary for the Modelling physics paper.
Topics are taught in parallel to allow for reinforcing of key ideas and consolidation.

Why now?

The astrophysics topic requires knowledge of interference from the waves topic.
The simple harmonic motion topic requires students already have the knowledge of linear motion and confidence in using trigonometric equations that were learnt in year 12.

Year 13 Terms 1 and 2: **Particles and Medical physics**

Why this?

This final module builds upon ideas encountered in the previous module, and students will now study both electric and magnetic fields.
The topic of radioactivity is an important one and highlights to students the many incredible uses of radioactive substances as well as ethical and environmental issues.

Why now?

The electric and magnetic fields topics rely on key knowledge on fields encountered in the previous module and often involves key ideas from the forces and motion topic from Year 12 as well as the circular motion topic.
The topics of magnetic fields and particles and radiation also provide the foundation for the final topic of medical imaging.

Year 13 Terms 5 : **Revision**

Why this?

Having encountered the full course, students practice exam technique and revision for the final few weeks before exams. They will also practice the skills required to be successful in the Unified physics paper which draws from across the entire specification.

Why now?

All units have been covered: this part of the course will interleave knowledge and exam skills responsively to student need.

# Year 12

Year 12 Terms 1 and 2: **Waves and Electrical circuits**

Why this?

These two topics will introduce students to fundamental topics in Physics which will be integral for the future topics covered.

Why now?

It bridges the gap between year 11 and year 12, taking content they are familiar with but extended to an A level standard.
The knowledge learnt will be required to allow understanding of future topics.
Students will begin to develop their practical skills as they are introduced to the practical assessment of the course.

Year 12 Terms 3 and 4: **Quantum physics, foundations of physics, forces and motion.**

Why this?

The quantum physics topic concludes brings together aspects of the waves and the electricity topic and introduces an area of physics not covered at GCSE. Foundations of physics focusses on measurements and uncertainty to complement the investigative work. Forces and motion is another fundamental topic in Physics and will be crucial for future topics.

Why now?

The quantum physics topic requires knowledge of wave properties and electrical charges learnt in the previous topic. Some aspects of the forces and motion topic require greater mathematical confidence and competence. These skills will have been practiced and developed during previous topics.

Year 12 Term 5 and 6: **Forces and motion.Thermal physics and circular motion**

Why this?

Building upon the foundations of physics topic and the introductory forces and motion. The topic now moves to look at collisions, projectile motion and the properties of materials.
Once the end of year assessments have been completed and reviewed, we make a useful start to Year 13 physics and cover the contained topics of thermal physics and circular motion.

Why now?

This large topic of forces and motion relies on the understanding from the previous term. Students need a sound understanding of motion and vector resolution and more mathematical confidence to greater understand the complexities of projectile motion and collisions in two dimensions.
Covering thermal physics and circular motion is a good introduction to Year 13 physics and allows more time for consolidation and practice later.