



Wallington
County Grammar School

The Physics Curriculum

Whole School Curriculum Intent:	<p>Wallington County Grammar School is a highly academic but pastorally minded school which delivers a curriculum that enables all students to embody our motto - <i>Per Ardua ad Summa</i>, Through Difficulties to the Heights. Each Subject Leader has autonomy over their own curriculum and its intent, i.e. its subject content, skills content, sequencing and assessment schedule. This is vital to ensure the academic curriculum is designed by highly qualified subject experts. The intentions behind whole school approach to curriculum design taken by senior leaders are to provide:</p> <ul style="list-style-type: none">● Breadth - We intend to provide a broad, academic and liberal curriculum that equips students with the body of human knowledge and different ways of thinking necessary to succeed in and enjoy their education, careers and wider lives.● Depth - We do not want our students to simply study the national curriculum and examination specifications with grades being our sole focus. We aim for our students to become true scholars of the disciplines that they are learning so that they achieve a deep and sophisticated level of knowledge and understanding.● Values - We aim for our students to develop our four core values: commitment, courage, compassion and creativity.● Democracy - We aim for all our students to have the necessary knowledge and confidence, not just to participate in the democracy of the United Kingdom, but to lead it.
Subject Curriculum Intent:	<p>The intent of our Physics curriculum is to provide a high level of academic challenge while nurturing curiosity, critical thinking, and independence. At Wallington County Grammar School, where a significant proportion of students go on to study STEM subjects, with many choosing engineering, we ensure that the curriculum equips students with the knowledge, skills, and confidence needed to succeed at the highest levels.</p> <p>We deliver a well-sequenced and knowledge-rich curriculum that enables students to:</p> <ul style="list-style-type: none">● Build a deep and connected understanding of key principles such as forces and motion, energy stores and transfers, waves, fields, and electricity● Develop precision in practical skills, analytical methods, and data evaluation, preparing students for both examinations and the demands of university-level science;● Engage with real-world contexts, including physics applications in health, industry, and the environment, to foster scientific literacy and ethical awareness;● Think and communicate like scientists, with increasing fluency in scientific language, logic, and mathematical reasoning.

Subject Curriculum Aims:	<p>Our Physics curriculum aims to build a strong understanding of physics concepts, exploring how scientific ideas, theories, and models develop and relate to each other, thereby strengthening students' understanding of the material world.</p> <p>A core aim is to develop competence in scientific methods and practical skills. Students will learn to ask scientific questions, form hypotheses, and plan, carry out, and evaluate investigations. This includes making observations, collecting, processing, and interpreting data, and identifying potential errors. Students will also apply mathematical and problem-solving skills essential for physics, using calculations, interpreting graphs, and expressing physical laws algebraically.</p> <p>Beyond the scientific and practical, our curriculum helps students understand the wider uses and implications of physics, including its real-world applications, societal impact, and ethical considerations. We seek to inspire curiosity and enthusiasm for physics, preparing them for further study and careers in science and engineering</p>
GCSE Examination Specifications:	Pearson
A Level Examination Specifications:	AQA

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Y7	Forces & Motion	Forces & Motion	Energy	Energy	Space	Space & Practical Skills
	Assessment 1 Format:	50 minutes exam made up of short and long answer, and calculation questions		Assessment 2 Format:	50 minutes exam made up of short and long answer, and calculation questions	
Y8	Electricity	Electricity & Waves	Waves	Moments & Pressure	Moments & Pressure & Magnetism	Magnetism
	Assessment 1 Format:	50 minutes exam made up of short and long answer, and calculation questions		Assessment 2 Format:	50 minutes exam made up of short and long answer, and calculation questions	
Y9	Forces & Motion	Energy, Forces & Their effects	Waves	Forces, Matter & Density	Particles	Particles
	Assessment 1 Format:	50 minutes exam made up of short and long answer, and calculation questions		Assessment 2 Format:	60 minutes exam made up of short and long answer, and calculation questions	
Y10	Astronomy	Static Electricity	Electricity	Electricity, Light & EM	Light & EM, Radioactivity	Radioactivity
	Assessment 1 Format:	50 minutes exam made up of short and long answer, and calculation questions		Assessment 2 Format:	90minutes exam made up of short and long answer, and calculation questions	
Y11	Momentum, Impulse, Car Safety	Magnetism	EM Induction	Revision	Revision	Revision
	Mock Format:	90minutes exam made up of short and long answer, and calculation questions		Assessment 2 Format:	Previous year GCSE papers	
L6th	Electricity	Electricity + Materials	Mechanics	Mechanics	Circular Motion & SHM	Circular Motion & SHM
	Waves	Waves + Quantum & Particles	Quantum & Particles	Thermal	Thermal	Thermal + Capacitors
	Assessment 1 Format:	120 minute exam made up of short and long answer, and calculation questions 50 minute exam made up of multiple choice questions		Assessment 2 Format:	2 x 90 minute exams made up of short and long answer, calculation, and multiple choice questions	
U6th	G- Fields + E-fields	E-fields + Capacitors	B-fields	Induction	Revision	
	Nuclear + Radioactivity	Radioactivity + Turning points	Turning points	Turning points + Practical Physics	Practical Physics + Revision	

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Mock Format:	2 x 90 minute exams made up of short and long answer, calculation, and multiple choice questions				

Key Vocabulary

KS3

1. Forces

- **Force:** A push or pull acting on an object, measured in newtons (N).
- **Newton (N):** The SI unit of force, equal to the force needed to accelerate 1 kg by 1 m/s².
- **Contact force:** A force resulting from physical contact (e.g., friction, tension).
- **Non-contact force:** A force acting at a distance without physical contact (e.g., gravity, magnetism).
- **Gravity:** The force that attracts objects toward a massive body like Earth.
- **Weight:** The gravitational force on an object, measured in newtons (N); weight = mass × gravitational field strength.
- **Mass:** The amount of matter in an object, measured in kilograms (kg).
- **Friction:** A force opposing motion between surfaces in contact.
- **Air resistance:** A type of friction acting on objects moving through air.
- **Water resistance (drag):** A force opposing motion through water.
- **Upthrust (buoyancy):** The upward force a fluid exerts on a submerged or floating object.
- **Balanced forces:** Equal forces acting opposite on an object, resulting in no net change in motion.
- **Unbalanced forces:** Forces of unequal size or opposite direction causing acceleration.
- **Resultant force:** The single force resulting from combining all acting forces.
- **Hooke's Law:** The extension of a spring is directly proportional to the force applied, up to its elastic limit.
- **Elastic limit:** The maximum extension/shrinkage at which a material returns to original shape.
- **Extension:** Increase in length when a force stretches an object (like a spring).

Key Vocabulary

- **Compression:** Reduction in length when force is applied to squeeze an object.
 - **Pressure:** Force per unit area, measured in pascals (Pa).
 - **Surface area:** The total area over which a force is applied.
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2. Motion & Speed

- **Speed:** How fast an object moves; distance travelled per unit time (m/s).
 - **Velocity:** Speed with direction.
 - **Distance:** How far an object travels (m).
 - **Time:** Duration of an event (s).
 - **Acceleration:** Rate of change of velocity (m/s^2).
 - **Deceleration:** Negative acceleration, or slowing down.
 - **Average speed:** Total distance / total time.
 - **Gradient (on distance–time graph):** Represents speed.
 - **Uniform motion:** Constant speed in a straight line.
 - **Relative motion:** Movement compared to another object.
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3. Energy

- **Energy:** The ability to do work or cause change, measured in joules (J).
- **Joule (J):** Unit of energy.

Key Vocabulary

- **Kinetic energy:** Energy of motion.
- **Gravitational potential energy:** Stored energy due to an object's position in a gravitational field.
- **Thermal energy:** Energy due to temperature.
- **Chemical energy:** Energy stored in chemical bonds.
- **Light energy, Sound energy, Electrical energy:** Different forms energy can be transferred or transformed into.
- **Energy transfer:** Movement of energy from one place or form to another.
- **Energy transformation:** Changing energy from one type to another.
- **Conduction:** Heat transfer through direct contact.
- **Convection:** Heat transfer via fluid movement.
- **Radiation:** Heat transfer through electromagnetic waves.
- **Insulation:** Material that reduces heat transfer.
- **Efficiency:** Useful energy output / total energy input $\times 100\%$.
- **Power:** Rate of doing work or transferring energy (watts, W).
- **Work done:** Force \times distance (joules, J).

4. Electricity & Magnetism

- **Charge:** Property causing electric forces and interactions.
- **Current (I):** Rate of flow of electric charge (amperes, A).
- **Ampere (A):** Unit of electric current.
- **Voltage (potential difference, V):** Energy transferred per unit charge.

Key Vocabulary

- **Volt (V):** Unit of voltage.
- **Resistance (Ω):** Opposition to electric current.
- **Ohm (Ω):** Unit of electrical resistance.
- **Series circuit:** Components connected end-to-end; single path for current.
- **Parallel circuit:** Components connected on separate branches.
- **Conductor:** Material allowing electric current to flow easily.
- **Insulator:** Material resisting electric current.
- **Switch:** Device to open or close an electric circuit.
- **Cell:** Single source of voltage; for example a battery cell.
- **Battery:** One or more cells providing voltage.
- **Circuit diagram:** Symbolic representation of an electric circuit.
- **Magnet:** Material object that produces a magnetic field.
- **Magnetic field:** Region around a magnet where magnetic forces act.
- **Electromagnet:** Magnet created by an electric current through a coil.
- **Compass:** Device to detect magnetic field direction.
- **Induced magnetism:** When a material becomes magnetic in the presence of another magnet.
- **Permanent magnet:** Material that retains magnetic properties without a current.

5. Waves (Sound & Light)

- **Wave:** A disturbance that transfers energy without transferring matter.

Key Vocabulary

- **Longitudinal wave:** Particle oscillations parallel to wave direction (e.g. sound).
 - **Transverse wave:** Particle oscillations perpendicular to wave direction (e.g. light).
 - **Frequency:** Number of waves passing a point per second (Hz).
 - **Hertz (Hz):** Unit of frequency.
 - **Wavelength:** Distance between successive wave peaks.
 - **Amplitude:** Maximum displacement of a wave from rest.
 - **Reflection:** Bouncing of waves off a surface.
 - **Refraction:** Changing direction of waves entering a different medium.
 - **Absorption:** When material takes in wave energy.
 - **Transmission:** Waves passing through a material.
 - **Medium:** Substance through which a wave travels.
 - **Transparent:** Material that lets light pass through clearly.
 - **Translucent:** Lets light through but not clear images.
 - **Opaque:** Does not let light through.
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6. Space Physics

- **Planet :** Large celestial body that orbits a star
- **Star:** massive, luminous ball of hot gas (mostly hydrogen and helium) that produces its own light and heat through nuclear fusion.
- **Orbit:** Path of one body around another.
- **Satellite:** Natural or man-made object orbiting another.

Key Vocabulary

- **Eclipse:** When one celestial body moves into the shadow of another.
- **Galaxy:** Huge systems of stars and cosmic matter.
- **Umbra:** The innermost, darkest part of a shadow where light is completely blocked.
- **Penumbra:** The lighter, outer part of a shadow where light is partially blocked.

KS4

1. **Acceleration** — The rate of change of velocity, measured in m/s^2 .
2. **Amplitude** — The maximum displacement from the equilibrium position in a wave.
3. **Atomic Number** — The number of protons in the nucleus of an atom.
4. **Conduction** — Transfer of heat or electricity through a material without movement of the material itself.
5. **Convection** — Transfer of heat through a fluid (liquid or gas) caused by molecular motion.
6. **Current (Electric)** — The flow of electric charge, measured in amperes (A).
7. **Density** — Mass per unit volume of a substance, measured in kg/m^3 .
8. **Diffraction** — The spreading out of waves when they pass through a gap or around an obstacle.
9. **Elastic Potential Energy** — Stored energy in a stretched or compressed elastic object.
10. **Efficiency** — The ratio of useful energy output to total energy input, often expressed as a percentage.
11. **Electromagnetic Spectrum** — The range of all types of electromagnetic radiation, from radio waves to gamma rays.
12. **Force** — A push or pull on an object, measured in newtons (N).
13. **Frequency** — The number of complete waves passing a point per second, measured in hertz (Hz).
14. **Gravitational Field Strength** — The force per kilogram acting on a mass in a gravitational field, measured in N/kg .

Key Vocabulary

15. **Half-life** — The time taken for half the radioactive nuclei in a sample to decay.
16. **Insulator (Thermal/Electrical)** — A material that does not allow heat or electricity to flow easily.
17. **Ionisation** — The process of gaining or losing electrons to form ions.
18. **Kinetic Energy** — The energy possessed by a moving object, calculated using $\frac{1}{2}mv^2$.
19. **Longitudinal Wave** — A wave where the oscillations are parallel to the direction of energy transfer.
20. **Mass Number** — The total number of protons and neutrons in an atomic nucleus.
21. **Momentum** — The product of mass and velocity of an object.
22. **Newton's Laws of Motion** — Three fundamental laws describing the relationship between the motion of an object and the forces acting on it.
23. **Ohm's Law** — States that the current through a conductor is directly proportional to the voltage across it, provided temperature remains constant.
24. **Potential Difference (Voltage)** — The work done per unit charge as it moves between two points in a circuit.
25. **Power** — The rate at which work is done or energy is transferred, measured in watts (W).
26. **Pressure** — Force applied per unit area, measured in pascals (Pa).
27. **Reflection** — The bouncing back of waves when they hit a barrier.
28. **Refraction** — The changing direction of waves as they pass from one medium to another.
29. **Resistance** — The opposition to the flow of electric current, measured in ohms (Ω).
30. **Resultant Force** — The overall force acting on an object when all individual forces are combined.
31. **Scalar Quantity** — A quantity with only magnitude, not direction (e.g., speed, mass).
32. **Specific Heat Capacity** — The amount of energy needed to raise the temperature of 1 kg of a substance by 1°C without changing state
33. **Speed** — The distance traveled per unit time, a scalar quantity.
34. **Transverse Wave** — A wave where oscillations are perpendicular to the direction of energy transfer.

Key Vocabulary

- 35. Velocity** — Speed in a given direction, a vector quantity.
- 36. Vector Quantity** — A quantity with both magnitude and direction (e.g., velocity, force).
- 37. Wavefront** — A surface over which a wave has a constant phase.
- 38. Wavelength** — The distance between two corresponding points on adjacent waves.
- 39. Work Done** — The energy transferred when a force moves an object, measured in joules (J).

Suggested Reading List

KS3/KS4

Stannard, Russel: "The Time and Space of Uncle Albert"
Sobel, Dava: "Longitude"
Adams, Douglas: "Hitchiker's Guide to the Galaxy"
Keay, John: "The Great Arc"
Bryson, Bill: "A brief history of nearly everything"
Johnson, Keith: "Physics for you by Keith Johnson"

KS5

Al-Khalili, Jim: "Quantum: A Guide for the Perplexed", 2004
Al-Khalili, Jim: "Paradox: The Nine Greatest Enigmas in History", 2012
Bryson, Bill: "A Short History of Nearly Everything", 2004
Carroll, Sean: "The Particle at the End of the Universe", 2012
Cox, Brian and Forshaw, Jeff: "Why Does $E = mc^2$? (And why should we care?)", 2010
Chown, Marcus: "Quantum Theory Cannot Hurt You: A Guide to the Universe", 2009
Greene, Brian: "The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory", 1999
Feynman, Richard: "QED: The Strange Theory of Light and Matter", 1985
Feynman, Richard: "Six Easy Pieces", 1964
Gribbin, John: "In Search of Schrodinger's Cat: Quantum Physics and Reality", 1984
Hawking, Stephen: "A Brief History of Time", 1988
Hawking, Stephen: "The Grand Design", 2012
Kaku, Michio: "Physics of the Impossible", 2009
Abbott, Edwin: "Flatland: A Romance of Many Dimensions", first published 1884.