University of Birmingham School Curriculum Outline: PHYSICS

Term ➔ Year ↓	Term 1a	Term 1b	Term 2a	Term 2b	Term 3a	Term 3b
7	**Energy stores** You will learn… - How we can observe the effects of energy in the world around us. - How scientists use the transfer of energy to describe phenomena such as: • How a moving car accelerates. • How a stretched elastic band starts moving when let go. • Why a rollercoaster at the top of a ride starts accelerating downwards. - How to carry out an investigation into the relationship between the gravitational potential energy and kinetic energy of a toy car moving down a slope. What skills will you develop? ♦ Identifying quantities and units. ♦ Identifying independent, dependent and control variables. ♦ Setting up simple experiments and recording results using a results table.	**Electricity** You will learn… - Some examples of how we use electricity in our everyday lives. - How to explain how circuits work using key vocabulary such as charge, current and energy. - To explain the differences between series and parallel circuits and give examples of these circuits. - Set up a selection of electricity experiments to test the ideas introduced in lessons. What skills will you develop? ♦ Representing scientific ideas (such as electrical circuits) as models. ♦ How to carry out practical work safely in the lab. ♦ How to conclude investigations and suggest improvements.	**Energy resources** You will learn… - How the electricity in our homes is generated from different energy resources. - The difference between renewable and non-renewable energy resources and examples of these. - About the advantages and disadvantages of different energy resources such as fossil fuels and renewable sources. - About the transfer of energy stores when energy resources are used. What skills will you develop? ♦ Evaluating the ethics and practicalities of different energy resources in different contexts. ♦♦ How to comprehend and evaluate numerical information provided to evaluate your own opinions.	**Thermal Physics** You will learn… - The different properties of solids, liquids and gases and how we use the particle model to explain them. - Why materials expand as they are heated and shrink as they cool (this explains how the liquid in a thermometer expands as it heats!) - How convection currents in fluids work and how energy moves through a material by conduction. - How the sun can transfer energy to the earth through radiation. - How insulating materials can be used to keep hot drinks hot and cold drinks cold. What skills will you develop? ♦ Using the particle model to represent solids, liquids and gases. ♦ Plotting graphs and using these to support conclusions you arrive at. ♦ How to pick suitable apparatus for experiments you conduct.	**Forces** You will learn… - The names of the different forces which act around us. - The ways in which scientists can measure the magnitude of forces. - How to represent the forces acting on moving objects like cars, planes and bicycles. - How to maximise or minimise air resistance as appropriate for applications such as parachutes or driving. - How scientists calculate the energy transferred by forces. - How to use the force on an object to calculate the energy transferred when moving through a distance. What skills will you develop? ♦ The ability to identify quantities given and use these in equations. ♦♦ How to measure quantities then undergo numerical analysis to support your conclusions.	**Space** You will learn… - The names of the planets and other objects in our solar system. - The scale of the size of our solar system. - The history behind key discoveries in the solar system. - Why the moon looks different from the earth at different times of the month. What skills will you develop? ♦ How the scale of the solar system can be modelled using familiar objects. ♦ How our understanding of the solar system and the universe has developed over time. ♦ How to use graphical data to determine the relationship between the distance of a planet from the sun and the time to orbit the sun.
8	**Sound** You will learn… - Examples of waves in physics and the properties of waves. - How sound waves travel from one place to another. - How an echo forms in a large room. - The differences in the way sounds travel through solids, liquids and gases. - How the structure of the ear helps us hear the sounds around us. - Why we see lighting before we hear thunder. What skills will you develop? ♦ Evaluating flaws in the practical methods to measure the speed of sound and considering potential improvements to these. ♦ The ability to identify quantities given and use these in equations. ♦♦ How to measure quantities then undergo numerical analysis to support your conclusions.	**Forces** You will learn… - New applications of the forces we learnt about in year 7. - How to conduct an experiment to measure how the extension of a spring changes as the mass hung from it is changed. - How to plan a simple investigation to measure whether an object sinks or floats. What skills will you develop? ♦ Identifying dependent, independent and control variables. ♦ Setting up experiments while considering hazards and precautions to mitigate these and recording results using a results table. ♦ Plotting graphs and using these to support conclusions you arrive at. ♦ How to plan an investigation using apparatus provided.	**Static electricity** You will learn… - The structure of the atom generally accepted by scientists. - The charges and masses of protons, neutrons and electrons. - How to apply the ideas we learnt in the year 7 electricity topic to explain a range of common scenarios, such as: • How a lightning strike occurs. • How a Van Der Graff generator works. • Why rubbing a balloon on your head makes your hair stand on end. What skills will you develop? ♦ Using the model of electricity to explain common phenomena in static electricity.	**Light** You will learn… - The differences between sound waves and light waves. - Why we can see our reflection in a mirror. - Why a straw in a glass of water appears to bend. - A selection of practical techniques scientists use when investigating the reflection and refraction of light. - The differences between the waves of difference colours and intensities of light. What skills will you develop? ♦ Applying a selection of ideas from the topic to explain phenomena observed. ♦ How to use apparatus to investigate the refraction and reflection of light.	**Magnetism** You will learn… - The effects of magnetic fields including the earth's magnetic field. - How the poles of magnets interact with one another. - How a current carrying wire produces a magnetic field and the applications of this. What skills will you develop? ♦ To evaluate a selection of applications of magnetism and electromagnetism in our everyday lives, such as how a compass is used for navigation. ♦ Forming a hypothesis based on ideas you have learnt on a topic. ♦ Setting up and carrying out a simple investigation into the relationship between the number of coils on a wire and the strength of its magnetic field. ♦ Using the data from this investigation to form conclusions about this relationship.	**Space** You will learn… - What an exoplanet is and how scientists discover these. - The big bang theory and the evidence for these ideas. - Potential theories about what will happen to the universe in the future. What skills will you develop? ♦♦ How to use evidence and data provided by scientists to arrive at a conclusion. ♦ How scientists discover exoplanets and the potential implications of this for society in the future.

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<tr><td>9</td><td colspan="2">Forces
You will learn…
- Further ways scientists can measure the size of the forces introduced in years 7 and 8.
- The mathematical skills needed for success in GCSE physics and beyond.
- A selection of equations to describe the forces which act around us and applications of these.
- How to manipulate these equations as appropriate.
- The difference between scalars and vectors and what is meant by the terms distance, displacement, speed, velocity and acceleration.
- How scientists use distance-time graphs to describe the motion of objects and how to calculate the gradient of graphs.

What skills will you develop?
♦ An improved understanding of units and quantities.
♦ How to use and manipulate equations to determine the magnitudes of a range of quantities.
♦ How to describe the information provided by graphs and how to use these to find a gradient, including how to draw a tangent.
♦ How to use a scale to represent forces on diagrams in a more accurate way.</td><td colspan="2">Electricity
You will learn…
- About new quantities related to electricity such as potential difference and power and examples of how these are used for electricity in our homes.
- How to use ammeters and voltmeters to measure the current through and potential difference across a range of electrical components.
- How to determine the resistance of a component.
- About a range of new electrical components such as light dependent resistors, thermistors and diodes, including the ways in which these are used.

What skills will you develop?
♦ How use a selection of new apparatus such as voltmeters and multimeters to take accurate measurements in electrical circuits.
♦ How to plot a graph including both positive and negative values.
♦ How to analyse results from experiments to measure different quantities, for example using current and potential difference recorded to measure the resistance of a component.</td><td colspan="2">Energy stores
You will learn…
- How to calculate the magnitude of a number of energy stores including kinetic energy and gravitational potential energy.
- How we can use the conservation of energy to calculate the sizes of different quantities as energy is transferred such as speed, height and mass.
- How to describe the rate of transfer of energy as power and the ways in which energy is transferred and dissipated.

What skills will you develop?
♦ How to carry out more complicated manipulations of equations including quantities which are squared and equations with more than three terms.
♦ To evaluate models of energy transfers, including identifying their strengths and weaknesses.
♦♦ To plan and carry out an experiment to measure the relationship between the initial gravitational potential energy and the final kinetic energy of a trolley, including setting up light gates and the analysis of your results.</td></tr>
<tr><td>10</td><td>Energy
In this half term:
• Energy stores and transfers
• Power and efficiency
• Reducing unwanted energy transfers
• Conduction and convection
• Energy resources</td><td>Particle model of matter
In this half term:
• Density and states of matter
• Internal energy
• Specific heat capacity
• Specific latent heat
• Particle motion in gases
• Pressure (separate science only)</td><td>Electricity
In this half term:
• Circuits, current and potential difference
• LDRs and thermistors
• Resistance and I-V characteristics
• Series and parallel circuits</td><td>Electricity (cont.)
In this half term:
• Investigating resistance
• Power and energy transfer
• Electricity in the home
• The national grid
• Static electricity (separate science only)</td><td>Atomic structure
In this half term:
• The history and structure of the atom
• Radioactivity, activity and half-life
• Irradiation and contamination
• Risks and uses of radiation
• Fission and fusion (separate science only)
• Nuclear reactors (separate science only)</td><td>Forces
In this half term:
• Distance, displacement, speed, velocity and acceleration
• Motion graphs
• Contact and non-contact forces
• Resultant forces
• Newton’s laws</td></tr>
<tr><td>11</td><td>Forces
In this half term:
• Forces and elasticity
• Moments (separate science only)
• Braking and stopping distances
• Momentum
• Changes in momentum and impact forces (separate science only)</td><td>W aves
In this half term:
• Features of waves
• Wave speed
• Refraction of waves
• Reflection of waves (separate science only)
• Electromagnetic waves and their uses
• Lenses (separate science only)
• Sound waves and seismic waves (separate science only)</td><td>Electromagnetism
In this half term:
• Magnetic fields
• Electromagnetism
• The motor effect
• Motors
• The generator effect (separate science only)
• Transformers (separate science only)</td><td>Revision</td><td colspan="2"></td></tr>
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<tr><td rowspan="2">12</td><td>Particles
In this topic you discover the sub-atomic particles which make up atoms and the ways in which physicists categorise these.</td><td>Mechanics (motion)
You will learn about motion and the ways we can describe this, including devising a method to measure the strength of gravity by freefall.</td><td>Mechanics (forces)
Apply the ideas of forces to explain how to motion and shapes of objects change, how objects balance and other fundamentals of mechanics.</td><td>Mechanics (materials)
In this topic you will learn about the key properties of the materials we rely on in our day to day lives.</td><td>Revision</td><td>Simple harmonic motion
Study how objects oscillate such as a swinging pendulum or a mass on a spring.</td></tr>
<tr><td colspan="2">Electricity
Revisit the key concepts of electricity and apply this to more interesting and complex circuits. You will learn of many applications of electrical circuits which are important to society.</td><td>Waves
Learn about waves, how they interact with each other and the different types of waves we rely on in everyday life.</td><td>Quantum mechanics
We will study the various quantum phenomena and use the ideas from the particles topic and waves topic to explain these.</td><td>Revision</td><td>Circular motion
Explain the principles of the centripetal force and examples of where this occurs.</td></tr>
<tr><td rowspan="2">13</td><td>Electric and gravitational fields
The concept of fields is one of the great unifying ideas in physics. You will be introduced to electric and gravitational fields and their effects.</td><td>Capacitors
Use the ideas from electrical fields to explain the function of this important electrical component.</td><td colspan="2">Magnetic fields
Learn about magnets and electromagnetism, along with some of the applications in our day to day lives. By the end of the topic you will be able to describe a range of interesting electromagnetic phenomena.</td><td colspan="2"></td></tr>
<tr><td>Thermal physics
Learn about the thermal properties of materials and the nature of ideal gases including kinetic theory.</td><td>Nuclear physics
Link the properties of the nucleus to the production of nuclear power through the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass.</td><td colspan="2">Option topic</td><td colspan="2"></td></tr>
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