Department: Science
Subject: Physics
Programme of Study: Key Stage 3 to Key Stage 5

Key Concepts

Energy	Electricity	Particle model of matter	Atomic structure	Forces	Waves	Magnetism and electromagnetism	Space physics
The concept of energy emerged in the 19th century. The idea was used to explain the work output of steam engines and then generalised to understand other heat engines. It also became a key tool for understanding chemical reactions and biological systems. Limits to the use of fossil fuels and global warming are critical problems for this century.	Electric charge is a fundamental property of matter everywhere. Understanding the difference in the microstructure of conductors, semiconductors and insulators makes it possible to design components and build electric circuits. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind.	The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft.	Ionising radiation is hazardous but can be very useful. Radioactivity was discovered over a century ago, but it took several decades to understand the structure of atoms, nuclear forces and stability. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation.	Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible.	Wave behaviour appears in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves.	Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this	In the past century, astronomers and astrophysicists have made remarkable progress in understanding the scale and structure of the universe, its evolution and ours. New questions have emerged recently. ‘Dark matter’, which bends light and holds galaxies together but does not emit electromagnetic radiation, is everywhere – what is it? And what is causing the universe to expand ever faster?

Key Themes

Models	Cause and Effect	Non-contact forces	Difference	Proportionality	Mathematical models (equations)
The use of models, as in the particle model of matter or the wave models of light and of sound	The concept of cause and effect in explaining such links as those between force and acceleration, or between changes in atomic nuclei and radioactive emissions	The phenomena of 'action at a distance' and the related concept of the field as the key to analysing electrical, magnetic and gravitational effects	That differences, for example between pressures or temperatures or electrical potentials, are the drivers of change	That proportionality, for example between weight and mass of an object or between force and extension in a spring, is an important aspect of many models in science	That physical laws and models are expressed in mathematical form.

Key Stage 3

YEAR: 7

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25 26 27	28 29 30 31 32	33 34 35 36 37 38 39
Big Question: What are we made of? (Chemistry + Biology)	Big Question: What makes things move ? (Physics) How do organisms manage to live and survive together? (Biology)	Big Question: Where does the electricity in our homes come from? What is it? (Physics)	Big Question: Where do babies come from? (Biology)	Big Question: How do we fit into our Universe? (Physics)	Big Question: Is the phrase “you are what you eat” really true? (Biology) How do rocks change? (Chemistry)
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
Assessment Method: EXAM Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac EXAM

YEAR: 8

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25 26 27	28 29 30 31 32	33 34 35 36 37 38 39
Big Question: What makes me, me? Where did we all come from? (Biology) How do we see? (Physics)	Big Question: What is the Periodic Table? (Chemistry) Do we really live on a ball of rock? (Chemistry)	Big Question: Can space travel help me lose weight? (Physics) Why do magnets ‘stick’? (Physics)	Big Question: Are all acids dangerous? What is a chemical reaction? (Chemistry)	Big Question: Why don’t all my house lights go out when a bulb blows? What is ‘green energy’? (Physics)	Big Question: Do plants eat sunshine? Where do we get our energy from? (Biology) If a tree falls in the woods but no one sees, does it still make a sound? (Physics)
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
Assessment Method: EXAM Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac EXAM

Key Stage 4

YEAR: 9

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25	26 27 28 29 30 31 32	33 34 35 36 37 38 39
Particle Model of Matter Big Question: How does the particle model explain everyday phenomena and behaviour in the states of matter?	Atomic Structure Big Question: How has the model of the atom structure evolved over time in order to provide us with a clear and accurate picture today?	Energy Big Question: How do we use energy to power the world we live in?	Electric Circuits Big Question: How do current, voltage and resistance link to explain how electricity flows in a circuit?	Electricity & The National Grid Big Question: How does The National Grid supply our homes with electricity?	Forces Big Question: How are forces applied in everyday life?
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
Assessment Method: EXAM	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment: Educake + ERA/Prac	Assessment Method: EXAM	Assessment Method: Educake + ERA/Prac

YEAR: 10

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25	26 27 28 29 30 31 32	33 34 35 36 37 38 39
Electricity Big Question: How does electricity flow in a circuit with varying levels of resistance?	Atomic Structure Big Question: How can the atom impact the way we live?	Energy & Magnetism Big Question: How do magnetic and electric fields interact to produce different phenomena and effects?	Forces Big Question: How do we investigate the relationship between forces, using mathematical concepts?	Magnetism & Electromagnetism Big Question: How are magnetic fields, current and electromagnets linked?	Waves Big Question: How do waves travel in order for us to see and hear?
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
Assessment Method: EXAM	Assessment Method: Educake + ERA/Prac	Assessment Method: Educake + ERA/Prac	Assessment: Educake + ERA/Prac	Assessment Method: EXAM	Assessment Method: Educake + ERA/Prac

YEAR: 11

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25 26 27 28 29 30 31 32	33 34 35 36 37 38 39
<u>Forces & Space</u> Big Question: How did the world come to look like it does today?	<u>Waves</u> Big Question: How are waves applied to a variety of scenarios to enable us to carry out everyday tasks?	<u>Forces & Magnetism</u> Big Question: How do we investigate magnetism using mathematical concepts?	<u>Revision</u> Big Question: Revision	Revision + EXAMS
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
Assessment Method: EXAM	Assessment Method: Educake + ERA/Prac	Assessment Method: PPE Exams Educake + ERA/Prac	Assessment: Educake + ERA/Prac	Assessment Method: EXAMs

Key Stage 5

YEAR: 12 (ARU)

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25	26 27 28 29 30 31 32	33 34 35 36 37 38 39
Measurements & Errors (Including GCSE to A-Level Transition) Big Question: How does Science Work?	Mechanics Big Question: How can we use mathematical concepts to explain motion and forces?	Mechanics Big Question: How can we use mathematical concepts to explain motion and forces?	Mechanics & Materials Big Question: How can we use mathematical concepts to explain the behaviour of materials?	Revision Big Question: Revision	Revision Big Question: Revision
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
Assessment Method: End of topic test	Assessment Method: End of topic test	Assessment Method: End of topic test	Assessment: End of topic test	Assessment Method: EXAM	Assessment Method: End of topic test

YEAR: 12 (RWK)

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25	26 27 28 29 30 31 32	33 34 35 36 37 38 39
Particles & Radiation (Including GCSE to A-Level Transition) Big Question: What are the fundamental particles, and the forces that form atoms and lead to observable phenomena?	Particles & Radiation Big Question: What are the fundamental particles, and the forces that form atoms and lead to observable phenomena?	Waves Big Question: How does the behaviour of waves help create the world which we experience?	Waves & Electricity Big Questions: How does the behaviour of waves help create the world which we experience? How is current flow affected by resistivity, potential difference dividers and the electromotive force?	Electricity How is current flow affected by resistivity, potential difference dividers and the electromotive force?	Revision Big Question: Revision
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
Assessment Method: End of topic test	Assessment Method: End of topic test	Assessment Method: End of topic test	Assessment: End of topic test	Assessment Method: EXAM	Assessment Method: End of topic test

YEAR: 13

Teacher A – TLU

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25	26 27 28 29 30 31 32	33 34 35 36 37 38 39
Further mechanics The earlier study of mechanics is further advanced through a consideration of circular motion and simple harmonic motion (the harmonic oscillator).		Thermal Physics Thermal properties of materials, the properties and nature of ideal gases, and the molecular kinetic theory	Option Topic Flexible; dependent on mutual teacher and student agreement	Revision	
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	
Assessment Method: End of topic test	Assessment Method: End of topic test	Assessment Method: PPE EXAMs	Assessment: End of topic test	Assessment Method: EXAMs	

Teacher B – RWK

1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21	22 23 24 25	26 27 28 29 30 31 32	33 34 35 36 37 38 39
Gravitational and Electric Fields The concept of field is one of the great unifying ideas in physics. How does this impact modern society?		Capacitors and Magnetic fields Practical applications of capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction.	Nuclear Physics What is the physics that underpins nuclear energy production and what is the potential impact on society?	Revision	
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	
Assessment Method: End of topic test	Assessment Method: End of topic test	Assessment Method: PPE EXAMs	Assessment: End of topic test	Assessment Method: EXAMs	