West Kirby Grammar School

Curriculum Map – Year 10 Separates – Physics (2026-27)

Topic name	Term	Skills developed	Link to NC subject content and beyond	Prior learning	Next link in curriculum
4.1 Energy	*Autumn*	Apply the principle of conservation of energy to different systems. Analyse energy transfers using Sankey diagrams and energy stores pathways. Calculate efficiency and evaluate methods of reducing unwanted energy transfers. Interpret data from heating, insulation and energy resource investigations. Use equations involving energy, power and work done, including rearranging formulae and selecting appropriate units. Evaluate evidence about renewable and non-renewable energy resources considering environmental, social and economic factors. Across all eight topics, pupils progressively develop the ability to: • Apply mathematical equations confidently, including rearranging formulae and using standard units. • Interpret and construct graphs, identifying patterns, trends and relationships. • Analyse experimental data and draw evidence-based conclusions. • Plan, carry out and evaluate practical investigations, including identifying variables, risks and sources of error.	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. Physicist and engineers are working hard to identify ways to reduce our energy usage. **This unit covers -** **4.1.1 Energy changes in a system and the way energy is stored before and after such changes** 4.1.1.1 - Energy stores and systems 4.1.1.2 - Changes in energy 4.1.1.3 - Energy changes in systems 4.1.1.4 - Power **4.1.2 Conservation and dissipation of energy** 4.1.2.1 - Energy transfers in a system 4.1.2.2 - Efficiency	***Links from prior topics:*** This unit builds on the work covered in the year 7 unit of energy and the year 8 unit of heating and cooling. Pupils should understand energy as a quantity that can be stored and transferred between stores. They should know common energy stores and pathways, describe energy changes in everyday contexts, understand conservation of energy qualitatively. Pupils should also recognise renewable and non-renewable energy resources and their environmental impacts.	***Links to future topics:*** GCSE energy concepts underpin **Module 3: Forces and Motion**, particularly work, energy and power. Pupils extend their understanding of energy stores into quantitative studies of kinetic and gravitational potential energy, conservation of energy, efficiency, power, materials and elastic strain energy. The GCSE treatment of thermal energy also provides the foundation for **Module 5: Thermal Physics**, where students develop the kinetic theory of gases, internal energy and the first law of thermodynamics.

		• Use scientific models to explain observations and predict outcomes. • Evaluate evidence and make justified scientific judgements. • Communicate scientific ideas using accurate terminology and appropriate diagrams. • Solve unfamiliar problems by applying physics principles to new contexts. • Develop quantitative reasoning through proportionality, algebra, graph interpretation and data analysis,			
4.2 Electricity	*Autumn / Spring*	Construct and interpret circuit diagrams using standard symbols. Explain current, potential difference and resistance using particle models. Calculate electrical quantities using multiple equations including power and energy. Analyse current-potential difference graphs for different components. Carry out investigations into resistance and electrical characteristics. Interpret patterns in experimental data and identify sources of uncertainty.	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 electrical circuits. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. Electrical power fills the modern world with artificial sound and light, information and entertainment, remote sensing and control. He fundamental of electromagnetism were worked out by scientists of the 19th century. However, power stations, like all machines, have a limited lifetime. If we continue to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future? **This unit covers -** **4.2.1 Current, potential difference and resistance** 4.2.1.1 - Standard circuit diagram symbols 4.2.1.2 - Electrical charge and current 4.2.1.3 - Current, resistance and potential difference	This unit builds on the work covered in the year 7 unit of circuits and the year 9 unit of resistance. Pupils should understand complete circuits, current in series circuits, cells, batteries, switches and components. They should know the difference between conductors and insulators, understand current as a flow of charge at a simple level, recognise that resistance affects current, and explain the safe use of electricity in everyday situations.	GCSE electricity provides the basis for **Module 4: Electrons, Waves and Photons**. Students extend simple circuit analysis to include resistivity, electromotive force (emf), internal resistance, Kirchhoff's laws and more complex circuit calculations. These ideas are then developed further in **Module 6**, where students study capacitors, electric fields and the behaviour of charged particles in electric fields.

			4.2.1.4 - Resistors **4.2.2 Series and parallel circuits** **4.2.3 Domestic uses and safety** 4.2.3.1 - Direct and alternating potential difference 4.2.3.2 - Mains electricity **4.2.4 Energy transfers** 4.2.4.1 - power 4.2.4.2 - energy transfers in everyday appliances 4.2.4.3 - The national grid **4.2.5 Static electricity** 4.2.5.1 - Static charge 4.2.5.2 - Electric fields		
4.3 Particle model of matter	*Spring*	Apply the particle model to explain changes of state and gas behaviour. Interpret heating and cooling graphs including specific heat capacity and latent heat. Use mathematical relationships involving density, pressure and gas laws. Explain observations using kinetic theory. Analyse practical data from heating and density investigations. Link microscopic particle behaviour to observable macroscopic properties.	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 pressure and temperatures, such as submarines and aircraft. It also explains why it is difficult to make a good cup of tea high up a mountain! **This unit covers -** **4.3.1 Changes of state and the particle model** 4.3.1.1 - Density of materials 4.3.1.2 - Changes of state **4.3.2 Internal energy and energy transfers** 4.3.2.1 Internal energy	This unit builds on the work covered in the year 8 unit of heating and cooling and is supported by chemistry units on particle behaviour and materials. Pupils should know the particle model of solids, liquids and gases, describe changes of state, explain diffusion using particle movement, relate particle arrangement to density, and recognise that heating changes particle energy and movement. They should	The GCSE particle model forms the conceptual basis of **Module 5: Thermal Physics**. Students move from qualitative particle explanations to quantitative kinetic theory, ideal gas behaviour, pressure-volume relationships, internal energy and Boltzmann's interpretation of temperature. Mathematical modelling becomes significantly more sophisticated than at GCSE.

			4.3.2.2 Temperature changes in a system and specific heat capacity 4.3.2.3 Changes of state and specific latent heat **4.3.3 Particle model and pressure** 4.3.3.1 - Particle motion in gases 4.3.3.2 - Pressure in gases	have experience of measuring mass, volume and density through practical work.	
4.4 Atomic Structure	*Summer*	Interpret scientific models of atomic structure and understand how they have developed through evidence. Describe radioactive decay and nuclear radiation using appropriate scientific terminology. Analyse graphical data involving half-life and radioactive decay. Evaluate risks and benefits of ionising radiation in medical and industrial contexts. Apply exponential ideas qualitatively to radioactive decay. Understand how evidence changes scientific theories over time.	Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. Early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently improved. Today radioactive materials are widely used in industry, agriculture and electrical power generation. **This unit covers -** **4.4.1 Atom and isotopes** 4.4.1.1 - The structure of an atom 4.4.1.2 - Mass number, atomic number and isotopes 4.4.1.3 - The development of the model of the atom **4.4.2 Atoms and nuclear radiation** 4.4.2.1 - Radioactive decay and nuclear radiation 4.4.2.2 - Nuclear equations 4.4.2.3 - half lives and the random nature of radioactive decay 4.4.2.4 - Radioactive contamination **4.4.3 Hazards and uses of radioactive emissions and of background radiation**	This unit builds on the ks3 work covered in the ks3 chemistry units of particles, elements, atoms and compounds and the periodic table. Pupils should understand that all matter is composed of atoms, know the basic structure of the atom (nucleus and electrons), distinguish elements, compounds and mixtures, recognise the periodic table as an organisation of elements, and appreciate that scientific models develop as new evidence becomes available.	GCSE atomic structure and radioactivity develop directly into **Module 6: Nuclear and Particle Physics**. Students build on their understanding of nuclear decay to study quarks, leptons, hadrons, antiparticles, fundamental interactions, nuclear binding energy, mass-energy equivalence and particle exchange models. Quantum ideas introduced through atomic models also support learning in **Module 4: Quantum Physics**.

			4.4.3.1 - Background radiation 4.4.3.2 - Different half-lives of radiative materials 4.4.3.3 - Uses of nuclear radiation **4.4.4 Nuclear fission and fusion** 4.4.4.1 - Nuclear fission 4.4.4.2 - Nuclear Fusion		