Science Year 11 Long Term Map

Subject Intent/Aims

Expose all students to a broad range of learning opportunities to deepen their knowledge and understanding of themselves and the world around them and to build a solid foundation of Science knowledge and skills.We believe in developing curiosity and understand that science is an active process with many questions to be answered and still to be asked. We provide an understanding of how knowledge was derived, discovered and came to be accepted by the scientific community. By focusing on thinking, interpreting and evaluating rather than simply memorising scientific fact we intend to enable our students to use the skills that they need to answer their own scientific questions.

Our focus on the scientific process as a way of thinking and working will allow our students to develop their own ideas, attitudes and interpretations.

Topic: Forces	Topic: Magnetism and Electromagnetism	Topic: Space (Physics only)
National Curriculum • forces and fields: electrostatic, magnetic, gravity • forces as vectors • calculating work done as force x distance; elastic and inelastic stretching • pressure in fluids acts in all directions: variation in Earth's atmosphere with height, with depth for liquids, up-thrust force (qualitative). • speed of sound, estimating speeds and accelerations in everyday contexts • interpreting quantitatively graphs of distance, time, and speed • acceleration caused by forces; Newton's First Law • weight and gravitational field strength • decelerations and braking distances involved on roads, safety.	**National Curriculum** • exploring the magnetic fields of permanent and induced magnets, and the Earth's magnetic field, using a compass • magnetic effects of currents, how solenoids enhance the effect • how transformers are used in the national grid and the reasons for their use.	**National Curriculum** • the main features of the solar system.
Composition	**Composition**	**Composition**
Understand what forces are and how they interact with objects.	Understand magnetism, the link between magnetism and electricity and some of the applications.	Understand the solar system.
Components	**Components**	**Components**
Component 1: Recall example of scalar and vector quantities and define both. **Component 2:** Identify contact and noncontact forces. **Component 3:** Know Newton's three laws of motion. **Component 4:** Know examples of the forces acting on an isolated object or system. **Component 5:** Know the difference between elastic deformation and inelastic deformation caused by stretching forces **Component 6:** Know the formula for speed. **Component 7:** Know what the gradients on distance-time graphs represent. **Component 8:** Know the gradient of a distance-time graph represents speed. **Component 9:** Know what the lines on a velocity-time graph represent.	**Component 1:** Know the poles of the magnets are the strongest and are called north and south. **Component 2:** Know unlike poles attract and like poles repel for permanent magnets. **Component 3:** Know the difference between permanent and induced magnets and name the magnetic metals. **Component 4:** Know a magnetic compass contains a small bar magnet. The Earth has a magnetic field and the compass needle points in the direction of the Earth's magnetic field. **Component 5:** Know when a current flows through a conducting wire a magnetic field is produced around the wire. **Component 6:** Know how the strength of the magnetic field depends on the current through the wire and the distance from the wire.	**Component 1:** Know what the parts of the solar system is and where they are located. **Component 2:** Know the lifecycle of a star. **Component 3:** Know a stars fuel is hydrogen and how fusion leads to new elements being formed in stars. **Component 4:** Know the similarities and distinctions between the planets, their moons, and artificial satellites and the role of motion and gravity in orbiting objects. **Component 5:** Know what the big bang theory is and what evidence supports or refutes it. **Component 6:** Know what red-shift is and how red-shift provides evidence for the Big Bang model.

Component 10: Know that the gradient of a velocity time graph represents acceleration. **Component 11:** Know the area under velocity time graph is distance. **Component 12:** Know what stopping is distance in made up of and what factors affect it **Component 13:** Know the factors which affect the distance required for road transport vehicles to come to rest in emergencies, and the implications for safety. **Component 14**: Know the dangers caused by large decelerations and estimate the forces involved in the deceleration of road vehicles in typical situations on a public road.	**Component 7: HT** Know what causes the motor effect, how to apply flemings left-hand rule and recall factors that affect the size of the force on the wire. **Component 8: HT** Know that the force on a conductor in a magnetic field causes the rotation of the coil in an electric motor.	
Composite	**Composite**	**Composite**
Composite 1: Calculate work done and power and how they are useful in different ways. **Composite 2:** Describe the interaction between pairs of objects. **Composite 3:** Use free body diagrams to describe qualitatively examples where several forces lead to a resultant force on an object, including balanced forces when the resultant force is zero **Composite 4**: Convert between newton metres and joules and apply the equation linking work done, force and distance. **Composite 5:** Calculate the work done in stretching a spring. **Composite 6:** Investigate the relationship between force and extension for a spring. **Composite 7:** Interpret distance time graphs. **Composite 8:** Interpret velocity time graphs. **Composite 9:** Calculate stopping distances and evaluate the effect of various factors on thinking distance based on given data. **Composite 10:** Calculate momentum and describe and explain examples of momentum in an event, such as a collision.	**Composite 1:** Know how to use iron filings and plotting compasses to investigate magnetic field patterns. **Composite 2:** Draw magnetic field patterns for different magnets. **Composite 3:** Investigate the strength of electromagnets. **Composite 4: HT** apply the force = magnetic flux density × current × length **Composite 5: PO** Draw/interpret graphs of potential difference generated in the coil against time. **Composite 5: (PO)** Apply the transformer formula.	**Composite 1:** Interpret representations of red-shift data. **Composite 2:** Explain why new data from experiments or observations led to changes in models or theories. **Composite 3:** Decide whether or not given data supports a particular theory. **Composite 4:** Use a model of the solar system. **Composite 5:** Use a model of the universe.
Higher Order Knowledge	**Higher Order Knowledge**	**Higher Order Knowledge**
Composite 11: Complete calculations involving an event, such as the collision of two objects. **Composite 12**: Explain safety features such as: air bags, seat belts, gymnasium crash mats, cycle helmets and cushioned surfaces for playgrounds with reference to the concept of rate of change of momentum. **Composite 13:** Apply equations relating force, mass, velocity and acceleration to explain how the changes involved are inter-related.	**Component 1: (Physics only)** Students should be able to interpret diagrams of electromagnetic devices in order to explain how they work. **Component 2: (PO)** explain how a moving-coil loudspeaker and headphones work. **Component 3: (PO)** To explain the principles of the generator effect in a given context. **Component 4: (PO)** Explain how the generator effect is used in an alternator to generate ac and in a dynamo to generate dc **Component 5: (PO)** Explain how a moving-coil microphone works. **Component 6: (PO)** Explain how a transformer works and link this to power transmission in the national grid.	**Component 1: (HT)** Explain how for circular orbits, the force of gravity can lead to changing velocity but unchanged speed. **Component 2:** Explain how scientists are able to use observations to arrive at theories such as the Big Bang theory.

Key terms	**Key terms**	**Key terms**
Acceleration, air resistance, average speed, braking distance, centre of mass, conservation of momentum, contact force, deceleration, displacement, distance, force, free body diagram, friction, gravity, inelastic deformation, inertia, limit of proportionality, magnitude, momentum, newton, non-contact force, resultant force, scalar quantity, speed, tension, terminal velocity, thinking distance, uniform motion, vector quantity, velocity, weight	Alternator, attraction, commutator, compass, dynamo, electric field, electromagnet, Fleming's left-hand rule, generator effect, induced current, induced magnet, induced potential difference, loudspeaker, magnet, magnetic field lines, magnetic lux density, microphone, motor effect, permanent magnet, pole, primary coil, secondary coil, repulsion, secondary coil, soft iron core, step-down transformer, step-up transformer,	Big Bang theory, black body, black dwarf, dark energy, dark matter, main sequence star, nebula, neutron star, orbit, planet, protostar, red giant, red-shift, satellite, solar system, star, supernova, white dwarf
Final Composition/Deliberate Practice	**Final Composition/Deliberate Practice**	**Final Composition/Deliberate Practice**
Force and extension required practical. Acceleration required practical.	Practical investigating factors that affect the strength of an electromagnet.	Exam question on the life cycle of a star.
Summative/Formative assessment	**Summative/Formative assessment**	**Summative/Formative assessment**
RRR Exam questions on forces. Exam Style question on distance-time, velocity time graphs. Learner checks. Final assessments covering forces in motion, Newtons laws and forces and stopping.	RRR Exam questions on magnets and electromagnets. Learner checks. Final assessment covering magnets and their interactions and applications.	RRR Exam questions on the solar system and life cycle of a star. Final assessment on the solar system, evidence for the big bang and life cycle of a star.

Numeracy	**Literacy**	**Numeracy**	**Literacy**	**Numeracy**	**Literacy**
Interpreting graphs, calculating gradients of lines, application and rearrangement of formula, calculating the area under a graph. Interpreting information from infographics, the square law and its impact on stopping distance.	English – literacy skills – focusing onkeywords, tier 3 vocabulary, connectives, SPAG, synonyms, Science specific definition of the weight and mass, and the use of weight in everyday language.	Ratios. Application and rearrangement of formula.	English – literacy skills – focusing onkeywords, tier 3 vocabulary, connectives, SPAG, synonyms,	Inverse square law, resultant vectors and the red-shift.	English – literacy skills – focusing onkeywords, tier 3 vocabulary, connectives, SPAG, synonyms,
Cross curricular links		**Cross curricular links**		**Cross curricular links**	
Maths- application for calculating the gradient. Calculating area of a rectangle/square. P.E.- Sports data used for speed and graphing. Biology- effects of drugs and alcohol.		Engineering-use of magnets in circuits.		R.E.- Big Bang theory and religion. Maths – resultant vectors in orbits. Inverse square law for gravitational force and distance. History – Technology advances and the history of the model of the solar system and the Universe.	

SMSC	British Value	RSHE
There will be multiple opportunities for students develop spiritually; being creative in their learning and a range of activities. *Pupils to develop a better understand of electrical safety, and how transformers are used in the national grid.* *Pupils will learn about stopping distance, factors that affect it including drugs and alcohol.* *Pupils will develop and understanding of the peer review process and why it is important to verify evidence before publishing.* *The high expectations placed on the student from the school and department mean that pupils will regularly be made aware of the right and wrong morally.* *Pupils are expected to share the views morally on the different topics but also show respect and appreciate others in the classroom.* *The students have the opportunity to develop their social skills by working in groups to complete the force, extension and acceleration.*	*Democracy: Students work together practically in groups which encourages them to share views and opinions and take instructions from others. Group practicals include, force and extension, acceleration and motion, electromagnets.* *The rule of law: Students follow laboratory rules for the safety of all. Opportunities to discuss laws relating to road safety.* *Individual liberty;* *There are opportunities for students to work independently and make choices in a safe environment when carrying out investigations.* *Mutual respect and tolerance: Students work together practically in groups which encourages teamwork and respect for others. Students will have the opportunity to explore different safety features on cars.* *Students are taught how to contribute to life in modern Britain by learning about the history of scientific discovery.*	*They will be taught about the need for tolerance of other people's viewpoints.* *Safe us of the internet when carrying out research.*

Adapted Curriculum Content:	**Adapted Curriculum Content:**	**Adapted Curriculum Content:**
Higher tier: Vector diagrams and resolving forces. Drawing a tangent and measuring the gradient of the distance–time graph at that time. Distance is area under the graph. Inertia. Momentum Separate science only: Changes in momentum, Moments, levers and gears. Pressure and pressure differences in fluids, HT only atmospheric pressure.	Magnetism Higher tier only Fleming's lefthand rule, Electric motors Separate science higher tier only Loudspeakers, Induced potential, transformers and the National Grid, Induced potential, Uses of the generator effect, Microphones, Transformers.	Space is a separate science only topic.
Adaptive Implementation Practices:	**Adaptive Implementation Practices:**	**Adaptive Implementation Practices:**
Coloured paper/pens Differentiated worksheets Differentiated tasks Seating plans to maximise concentration allowing for visual/hearing impairments etc Appropriate use of IWB Dual coding Spare equipment Modelling experimental detail Pre drawn tables/graphs/diagrams to be labelled	Coloured paper/pens Differentiated worksheets Differentiated tasks Seating plans to maximise concentration allowing for visual/hearing impairments etc Appropriate use of IWB Dual coding Spare equipment Modelling experimental detail Pre drawn tables/graphs/diagrams to be labelled	Coloured paper/pens Differentiated worksheets Differentiated tasks Seating plans to maximise concentration allowing for visual/hearing impairments etc Appropriate use of IWB Dual coding Spare equipment Modelling experimental detail Pre drawn tables/graphs/diagrams to be labelled