Physics Year 7

Subject Vision

Physics is the study of how bodies, small and large, interact with each other. Over the 2 key stages we look at motion both on a human scale and a planetary scale, the conservation of energy and the forms it can be found in, the dangers of electricity and how to harness it to control and enrich our lives. Nuclear fusion, fission and decay are all studied with their individual benefits and risks investigated. These areas are all under pinned by calculations, practical demonstrations and investigations. Students are encouraged to be creative and 'think outside the box' by linking abstract phenomena on the micro and macroscale to their experiences of the world around them.

End Points

EP1. Demonstrate a deep understanding of Physics and how this relates to the real world
EP2. Conduct practical Physics safely and accurately
EP3. Visualise Physics related concepts and processes
EP4. Form reasoned and logical conclusions backed up with evidence
EP5. Manipulate mathematical equations

Subject Domains of Knowledge

D1. Energy & Energy Transfers
D2. Particle Model
D3. Force & their effects
D4. Waves
D5. Accurately Measuring and Reporting data

Subject Key Concepts

C1. Circuits & electrical charge
C2. Energy transformation & rate of charge
C3. Heating & Cooling
C4. Energy Resources & generating electricity

C5. Particle arrangement
C6. Density
C7. Pressure
C3. Atomic Structure
C4. Radioactive decay
C5. Hazards & uses of radioactivity

C6. Types of Force

	C7. Newtons Laws C8. Force & Motion C9. Magnetic field & the motor effect C10. Types of Wave C11. Wave equation C12. Wave behaviour C13. Formula rearrangement & application C14.Numeracy C15. Si Units C16. Standard Form C17. Graph Interpretation

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Medium Term Curriculum Plan

Year 7: Physics

Unit	Unit 1: Energy	
Unit Sections	**1.1 Energy Costs**	**1.2 Energy Transfers**
Unit overview	In this unit, students will compare the amounts of energy transferred by different foods and activities, compare the energy usage and cost of running different home devices and explain the advantages and disadvantages of different energy resources.	In this unit, students will investigate energy transfers and be able to describe and explain the Law of Conservation of Energy.
Lesson Sequence	1. **What is energy?** - In this lesson students will learn that energy can be transferred in a variety of ways 2. **Stores of energy** - in this lesson students will investigate energy transfers 3. **Energy in food** - In this lesson students will learn how to calculate the amount of chemical energy stored in different foods 4. **Conservation of energy** - In this lesson students will learn about energy transfers in terms of conservation and dissipation of energy 5. **Sankey Diagrams** - In this lesson students will learn how to construct Sankey diagrams to show energy transfers	1. **Fossil fuels** - In this lesson students will learn at fossil fuels as a finite energy resource 2. **Renewable and non-renewable energy sources** - In this lesson students will learn how electricity is generated using a variety of different entry resources 3. **Light bulb investigation** - In this lesson students will investigate the efficiency of different types of lightbulb 4. **Power** - In this lesson students will learn about the power of different appliances and the units that it is measured in 5. **Electrical Power** - In this lesson students will learn about different energy transfers involving electrical energy **Energy bills** - In this lesson students will learn how to calculate the cost of running electrical appliances
Key Domains and Concepts taught in this Unit / Term	D1. Energy & Energy Transfers C4. Energy Resources & generating electricity C2. Energy transformation & rate of charge C13. Formula rearrangement & application C14.Numeracy	D1. Energy & Energy Transfers D5. Accurately Measuring and Reporting data C2. Energy transformation & rate of charge C4. Energy Resources & generating electricity C14.Numeracy C15. Si Units

		C17. Graph Interpretation (in terms of Sankey Diagrams)
KS4 End Points	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world** **EP2. Conduct practical Physics safely and accurately** **EP4. Form reasoned and logical conclusions backed up with evidence** **EP5. Manipulate mathematical equations**	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world** **EP2. Conduct practical Physics safely and accurately** **EP3. Visualise Physics related concepts and processes** **EP4. Form reasoned and logical conclusions backed up with evidence** **EP5. Manipulate mathematical equations**
Declarative Knowledge (Students should know)	We pay for our domestic electricity usage based on the amount of energy transferred. Electricity is generated by a combination of resources which each have advantages and disadvantages. Food labels list the energy content of food in kilojoules (kJ). How solar, wind, waves, geothermal and biomass coal, crude oil and natural gas are used as energy sources The formula: cost = power (kW) x time (hours) x price (per kWh).	We can describe how jobs get done using an energy model where energy is transferred from one store at the start to another at the end. When energy is transferred, the total is conserved, but some energy is dissipated, reducing the useful energy.

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Procedural Knowledge (Students should be able to)	Represent the energy transfers from a renewable or non-renewable resource to an electrical device in the home. Calculate the cost of home energy usage, using the formula: cost = power (kW) x time (hours) x price (per kWh). Compare the amounts of energy transferred by different foods and activities. Compare the energy usage and cost of running different home devices. Explain the advantages and disadvantages of different energy resources. solar, wind, waves, geothermal and biomass coal, crude oil and natural gas. Extend - Evaluate the social, economic and environmental consequences of using a resource to generate electricity, from data Extend - Suggest actions a government or communities could take in response to rising energy demand. Extend - Suggest ways to reduce costs, by examining data on a home energy bill. HOW SCIENCE WORKS - Compare the running costs of fluorescent and filament light bulbs enabling students to: Analyse patterns, Discuss limitations, Draw conclusions, Communicate ideas, Construct explanations, Critique,	Describe how the energy of an object depends on its speed, temperature, height or whether it is stretched or compressed. Show how energy is transferred between energy stores in a range of real-life examples. Calculate the useful energy and the amount dissipated, given values of input and output energy. Explain how energy is dissipated in a range of situations. Extend - Compare the percentages of energy wasted by renewable energy sources. Extend - Explain why processes such as swinging pendulums or bouncing balls cannot go on forever, in terms of energy Extend - Evaluate analogies and explanations for the transfer of energy HOW SCIENCE WORKS - Investigate the link between gravitational potential and elastic potential energy when a ball bounces, allowing students to: Analyse patterns, Discuss limitations, Draw conclusions, Communicate ideas, Construct explanations, Critique a method and suggest improvements

	Justify opinions, Examine consequences and Interrogate sources.	
Developing T3 Literacy and Numeracy	**Power:** How quickly energy is transferred by a device (watts). Energy resource: Something with stored energy that can be released in a useful way. **Non-renewable:** An energy resource that cannot be replaced and will be used up. **Renewable:** An energy resource that can be replaced and will not run out. Examples are solar, wind, waves, geothermal and biomass. **Fossil fuels:** Non-renewable energy resources formed from the remains of ancient plants or animals. Examples are coal, crude oil and natural gas.	**Thermal energy store**: Filled when an object is warmed up. **Chemical energy store**: Emptied during chemical reactions when energy is transferred to the surroundings. **Kinetic energy store:** Filled when an object speeds up. **Gravitational potential energy store**: Filled when an object is raised. **Elastic energy store**: Filled when a material is stretched or compressed. **Dissipated**: Become spread out wastefully.
Assessment Summative and Formative	Formative – questioning in class, live marking and MS Forms online homework Summative – End of unit test	Formative – questioning in class, live marking and MS Forms online homework Summative – End of unit test
Links to prior learning	Energy is a new concept in Key Stage 3	Energy is a new concept in Key Stage 3
Next steps in learning	Students will go on to study energy in the combined science or physics course in Key Stage 4	Students will go on to study energy in the combined science or physics course in Key Stage 4

Common barriers to learning in this unit	Numeracy skills	Abstract concept to model and visualise

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Units / Term	Unit 2: Forces	
Unit Sections	**2.1 Contact Forces**	**2.2 Gravity**
Unit overview	In this unit, students will explore the effects of balanced and unbalanced force pairs on objects and be able to describe and explain the observations they make in terms of resultant forces.	In this unit students explore the relationship between mass and gravity, how the force of gravity is affected by different factors and the role of gravity in keeping the planets in orbit around the Sun.
Key Domains and Concepts taught in this Unit / Term	D3. Force & their effects D5. Accurately Measuring and Reporting data C6. Types of Force C7. Newtons Laws C8. Force & Motion C14.Numeracy C15. Si Units	D3. Force & their effects D5. Accurately Measuring and Reporting data C6. Types of Force C8. Force & Motion C13. Formula rearrangement & application C14.Numeracy C15. Si Units C17. Graph Interpretation
Lesson Sequence	1. **Types of forces** - In this lesson students will learn about the different types of force 2. **Pairs of forces** - In this lesson students will learn how to identify pairs of forces and their effects on objects' movement 3. **Resultant force** - In this lesson students will learn about the effect of balanced and unbalanced forces on an object 4. **Friction** - In this lesson students will investigate the effect of the force of friction and how to increase and decrease it 5. **Springs (Hooke's Law)** - In this lesson students will investigate the effect of mass on the extension or compression of an elastic material	1. **Parachutes** - In this lesson students will learn about the different forces acting on a parachute 2. **Gravity on other planets** - In this lesson students will learn how the force of gravity can vary on other planets 3. **Space Journey** - in this lesson students will describe the forces acting during a space journey 4. **Orbits of planets** - In this lesson students will learn about the effect of gravity on the orbiter planets 5. **Different liquids** – In this lesson students will learn about the effect of buoyancy on the weight of an object 6. **Force comparison** – In this lesson students will compare gravity to other non-contact and contact forces
KS4 End Points	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world**	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world**

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	EP2. Conduct practical Physics safely and accurately EP3. Visualise Physics related concepts and processes EP4. Form reasoned and logical conclusions backed up with evidence	EP2. Conduct practical Physics safely and accurately EP3. Visualise Physics related concepts and processes EP4. Form reasoned and logical conclusions backed up with evidence EP5. Manipulate mathematical equations
Declarative Knowledge (Students should know)	When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied.	Mass and weight are different but related. Mass is a property of the object; weight depends upon mass but also on gravitational field strength. Every object exerts a gravitational force on every other object. The force increases with mass and decreases with distance. Gravity holds planets and moons in orbit around larger bodies. Force of gravity on Earth = 10 N/kg. On the moon it is 1.6 N/kg.
Procedural Knowledge (Students should be able to)	Explain whether an object in an unfamiliar situation is in equilibrium. Describe factors which affect the size of frictional and drag forces. Describe how materials behave as they are stretched or squashed. Describe what happens to the length of a spring when the force on it changes. Sketch the forces acting on an object, and label their size and direction. Extend - Evaluate how well sports or vehicle technology reduces frictional or drag forces. Extend - Describe the effects of drag and other forces on falling or accelerating objects as they move.	Explain unfamiliar observations where weight changes. Draw a force diagram for a problem involving gravity. Deduce how gravity varies for different masses and distances. Compare your weight on Earth with your weight on different planets using the formula. Use the formula: weight (N) = mass (kg) x gravitational field strength (N/kg). Extend - Compare and contrast gravity with other forces.

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	Extend - Using force and extension data, compare the behaviour of different materials in deformation using the idea of proportionality. Extend - Explain how turning forces are used in levers. HOW SCIENCE WORKS - Investigate the effect of friction forces on objects, allowing students to: Analyse patterns, Discuss limitations, Draw conclusions, Communicate ideas, Construct explanations, Critique a method and suggest improvements	Extend - Draw conclusions from data about orbits, based on how gravity varies with mass and distance. Extend - Suggest implications of how gravity varies for a space mission. HOW SCIENCE WORKS - Investigate theeffect of upthrust from different liquids on a floating object, allowing students to: Analyse patterns, Discuss limitations, Draw conclusions, Communicate ideas, Construct explanations, Critique a method and suggest improvements
Developing T3 Literacy and Numeracy	**Equilibrium**: State of an object when opposing forces are balanced. **Deformation**: Changing shape due to a force. **Linear relationship**: When two variables are graphed and show a straight line which goes through the origin, and they can be called directly proportional. **Newton**: Unit for measuring forces (N). **Resultant force**: Single force which can replace all the forces acting on an object and have the same effect. **Friction**: Force opposing motion which is caused by the interaction of surfaces moving over one another. It is called 'drag' if one is a fluid. **Tension**: Force extending or pulling apart. **Compression**: Force squashing or pushing together. **Contact force**: One that acts by direct contact.	**Weight**: The force of gravity on an object (N). **Non-contact force**: One that acts without direct contact. **Mass**: The amount of stuff in an object (kg). **Gravitational field strength**, g: The force from gravity on 1 kg (N/kg). **Field**: The area where other objects feel a gravitational force.
Assessment Summative and Formative	Formative – questioning in class, live marking and MS Forms online homework Summative – End of unit test	Formative – questioning in class, live marking and MS Forms online homework Summative – End of unit test

Links to prior learning	In Key Stage 2: • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect	• explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect
Next steps in learning	Students study the effect of forces in some detail in GCSE P5 unit	Students will go on to study two further units in year 8, Pressure and Speed.
Common barriers to learning in this unit	Abstract concept to model and visualise	Abstract concept to model and visualise