| Topic Name | Term | Skills Developed | Link to NC Subject Content | Next link in curriculum  | Prior learning and other notes |
| --- | --- | --- | --- | --- | --- |
| **9.1 Energy** | Autumn | MS 1a, ca expressions in decimal form c Use ratios, fractions and percentages MS 3b, cb Change the subject of an equation c Substitute numerical values into algebraic equations using appropriate units for physical quantitiesWS 1.2 – use a variety of models to develop scientific explanations. | **KS3:*** Comparing energy values of different foods (from labels) (kJ)
* Comparing power ratings of appliances in watts (W, kW)
* Simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged
* Changes in systems energy as a quantity that can be quantified and calculated;
* Comparing amounts of energy transferred (J, kJ, kW hour)
* Other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels.
* Energy changes and transfers: product of force and displacement unchanged.

 **Extension:*** *Energy Stores and systems*
* *Conservation and dissipation of energy*
* *Energy changes and transfers: product of force and displacement unchanged*
* *Work done equation, W=Fs*
* *Power, P=E/t=W/t*
* *Efficiency*
 | **KS4 GCSE Physics**4.1 Energy4.5.2 Work done and energy transfer | **Energy** is not studied specifically at KS2, but the students were introduced to the effects of energy in other topics, eg**Plants and animals**:describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food**Light and sound:** recognise that light from the sun can be dangerous and that there are ways to protect their eyes. Recognise that sounds get fainter as the distance from the sound source increases.**states of matter:** observe that some materials change state when they are heated or cooled. |
| Topic Name | Term | Skills Developed | Link to NC Subject Content | Next link in curriculum  | Other Notes |
| **9.2 Matter** | Autumn | MS 3b, cb Change the subject of an equation c Substitute numerical values into algebraic equations using appropriate units for physical quantitiesWS 1.2 – use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts. | **KS3:*** conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving
* similarities and differences, including density differences, between solids, liquids and gases
* Brownian motion in gases
* the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition
* atoms and molecules as particles
* changes with temperature in motion and spacing of particles
* internal energy stored in materials
* Pressure in fluids
* atmospheric pressure, decreases with increase of height as weight of air above decreases with height
* pressure in liquids, increasing with depth; upthrust effects, floating and sinking
* pressure measured by ratio of force over area – acting normal to any surface

 **Extension:*** *Particle model of matter*
* *Changes of state and the particle model*
* *Internal energy and energy transfer (Not the equations for SHC and latent heat).*
* *Particle model and pressure (Only qualitatively)*
* *Density = m/V*
* *Pressure, P=F/A*
 | **KS4 GCSE Physics**4.3 Particle model of matter | **KS1 Everyday materials** (properties and uses), rocks**KS2** **States of matter** (solids, liquids and gases- their properties and changes of state). |
| Topic Name | Term | Skills Developed | Link to NC Subject Content | Next link in curriculum  | Other Notes |
| **9.3 Forces and Motion** | Spring | MS 1a, ca Recognise and use expressions in decimal form c Use ratios, fractions and percentages MS 3b, cb Change the subject of an equation c Substitute numerical values into algebraic equations using appropriate units for physical quantitiesWS 1.2 – use a variety of models to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts. | **KS3:*** (speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time)
* the representation of a journey on a distance-time graph)
* relative motion: trains and cars passing one another.
* forces measured in newtons,
* forces: associated with deforming objects; stretching and squashing – springs; Hooke’s Law as a special case
* work done and energy changes on deformation
* measurements of stretch or compression as force is changed
* force-extension linear relation; Hooke’s Law as a special case
* moment as the turning effect of a force
* simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged
* forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)
* change depending on direction of force and its size

 **Extension:*** *Speed and speed-time graphs*
* *Forces and their interactions (1D vectors)*
* *Work done and energy transfer*
* *Forces and Elasticity (Not elastic potential energy)*
* *Distance = speed x time, s=vt*
* *Weight,W=mg*
* *Hooke’s Law F= ke*
* *Work done, W= Fs*

 | **KS4 GCSE Physics**4.5 Forces | **KS1 Forces and magnets**compare how things move on different surfaces (friction), contact and non-contact forces**KS2** **Forces**the force of gravity acting between the Earth and the falling object, 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 |
| Topic Name | Term | Skills Developed | Link to NC Subject Content | Next link in curriculum  | Other Notes |
| **9.4 Electricity and magnetism** | Spring | MS 1a, b, c,a Recognise and use expressions in decimal form b Recognise and use expressions in standard form c Use ratios, fractions and percentages MS 3b, cb Change the subject of an equation c Substitute numerical values into algebraic equations using appropriate units for physical quantitiesWS 1.2 – use a variety of modelsto solve problems, make predictions and to develop scientific explanations and understanding. | **KS3:*** potential difference, measured in volts
* battery and bulb ratings
* resistance, measured in ohms, as the ratio of potential difference (p.d.) to current
* differences in resistance between conducting and insulating components (quantitative).
* electric current, measured in amperes, in circuits
* series and parallel circuits, currents add where branches meet and current as flow of charge.
* magnetic poles, attraction and repulsion
* magnetic fields by plotting with compass, representation by field lines
* Earth’s magnetism, compass and navigation
* The magnetic effect of a current, electromagnets, D.C. motors (principles only).

  **Extension:*** *Current, potential difference and resistance (but not IV characteristics)*
* *Series and parallel circuits*
* *Charge, current, time, Q=It*
* *Potential difference and energy, E=QV*
* *Resistance, R=V/I*
* *Permanent and induced magnetism, magnetic forces and fields*
* *Electromagnetism*
* *Electric motors (qualitatively)*
 | **KS4 GCSE Physics**4.2 Electricity4.7 Magnetism and electro-magnetism | **KS1 Forces and magnets**observe how magnets attract or repel each other describe magnets as having 2 polespredict whether 2 magnets will attract or repel each other, depending on which poles are facing**KS2 Electricity**Series circuits, insulators and conductors, safety, circuit symbols |
| Topic Name | Term | Skills Developed | Link to NC Subject Content | Next link in curriculum  | Other Notes |
| **9.5 Waves** | Summer | MS 1a, ca Recognise and use expressions in decimal form c Use ratios, fractions and percentages MS 3b, cb Change the subject of an equation c Substitute numerical values into algebraic equations using appropriate units for physical quantitiesWS 1.2 – use a variety of models to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts. | **KS3:*** waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition.
* The similarities and differences between light waves and waves in matter
* light waves travelling through a vacuum; speed of light
* Time period and frequency, f=1/T

  **Extension:** * *Transverse and longitudinal waves*
* *Properties of waves*
* *Types of electromagnetic waves*
* *Uses and applications of electromagnetic waves*
* *Time period and frequency, f=1/T*
* *Wave equation, v=fl*
 | **KS4 GCSE Physics**4.6 Waves | **KS1 Light**Light and shadows **KS2 Light and sound** including reflection and the transfer of energy by light. Producing sounds by vibrations, how sound travels and is detected by the ear, understanding the link between pitch and frequency and amplitude and volume. |