MANCHESTER 1824
The University of Manchester

Science & Engineering Education Research and Innovation Hub

fascinate

Progression in **LIGHT & SOUND Year 1-9 Key for use** Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time

Year group	English National Curriculum statement	Child led enquiry opportunities (write as questions)	Maths opportunities	Story opportunities	Resources links	Enquiry type (highlight)	Working scientifically links (highlight)
Year 1 Year 2							
Year 3	**Light** 1. Recognise that they need light in order to see things and that dark is the absence of light notice that light is reflected from surfaces 2. Recognise that light from the sun can be dangerous and that there are ways to protect their eyes 3. Recognise that shadows are formed when the light from a light source is blocked by a solid object 4. Find patterns in the way that the size of shadows change.	Which is the best material for a mirror? Which material is best for sunglasses? Do cats' eyes light up in the dark? - lead on to luminous and non luminous objects? Why can we see fireworks better in the dark? How do the size of a shadow change over a day?	Data handling Data measuring Use of a protractor, telling time.	Snow white Barnaby bear Cat story The Firework-maker's daughter	Variety of materials Data recorders, book, sunglasses frame Marbles as models for cats eyes. Protractor, pencil, paper plate, compass	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	● asking relevant questions & using different types of scientific enquiries to answer them ● setting up simple practical enquiries, comparative & fair tests ● making systematic and careful observations &, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers & data loggers ● gathering, recording, classifying and presenting data in a variety of ways to help in answering questions ● recording findings using

Year 4	1. Identify how sounds are made, associating some of them with something vibrating 2. Recognise that vibrations from sounds travel through a medium to the ear 3. Find patterns between the pitch of a sound and features of the object that produced it 4. Find patterns between the volume of a sound and the strength of the vibrations that produced it 5. Recognise that sounds get fainter as the distance from the sound source increases.	1. Cup & string - pupils to ask their own enquiry question. 2. Can you make a guitar that plays 4 different pitch sounds? 3. What is the effect of distance from source on the volume/amplitude of a sound?	Length of string (ruler use) Length of elastic band related to pitch. Decibels on data collector	Made up story about being stuck on a desert island and need to contact another island. Horrid Henry rocks story	cups, string, scissors, rulers Junk, elastic bands Air horn, decibel meter	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	simple scientific language, drawings, labelled diagrams, keys, bar charts, & tables ● reporting on findings from enquiries, including oral & written explanations, displays or presentations of results & conclusions ● using results to draw simple conclusions, make predictions for new values, suggest improvements & raise further questions ● identifying differences, similarities or changes related to simple scientific ideas and processes ● using straightforward scientific evidence to answer questions or to support their findings.

Year 5							• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations • identifying scientific evidence that has been used to support or refute ideas or arguments.
Year 6	1. Recognise that light appears to travel in straight lines 2. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye 3. Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes 4. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	1. How can a submarine see where it is going? 2. Why do we see the moon? 3. What is the best position for a car rear-view mirror? 4. How can I use shadows to identify aeroplanes? 4. How does the position of a light source affect the size of a shadow?	Angles - use of a protractor Converting units of measure	Submarine story WW2 story	Mirrors, light beams. Mirrors, periscope templates, cereal boxes. Mirrors, Lollipop sticks, ruler, protractor. Card, plane templates. Lamp, object, measuring stick.	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	

Key Stage 3	***Waves*** **Sound waves** 1. frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound 2. sound needs a medium to travel, the speed of sound in air, in water, in solids 3. sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal **4.** auditory range of humans and animals. **Light waves** 5. the similarities and differences between light waves and waves in matter 6. light waves travelling through a vacuum; speed of light 7. the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface 8. use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye 9. light transferring energy	How can I use echoes to work out the speed of sound? What materials make the best ear defenders? What is the range of human hearing? Does the angle of incidence affect the angle of reflection? Does the angle of incidence affect the angle of refraction? How can you make a rainbow?	Using speed = distance/time calculations Measuring materials Data collection, drawing graphs Data collection, measuring angles	Alien & star wars - sound travelling in a vacuum? Story of placing mirrors - Medusa pencil in a cup of water, kingfisher. Loads!	Stop watches, wood, calculators cups, card, assortment of materials signal generator (online) Plane mirrors, ray boxes, power packs, protractors. prisms, ray boxes, power pack prisms, ray boxes,	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	**Scientific attitudes** ● pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility ● understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review ● evaluate risks. **Experimental skills and investigations** ● ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience ● make predictions using scientific knowledge and understanding ● select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate ● use appropriate techniques, apparatus,

	from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras **10.** colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection				power pack		and materials during fieldwork and laboratory work, paying attention to health and safety ● make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements ● apply sampling techniques. **Analysis and evaluation** ● apply mathematical concepts and calculate results ● present observations and data using appropriate methods, including tables and graphs ● interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions ● present reasoned explanations, including explaining data in relation to predictions and hypotheses ● evaluate data, showing awareness of potential sources of random and systematic error ● identify further questions

							arising from their results. **Measurement** ● understand and use SI units and IUPAC chemical nomenclature ● use and derive simple equations and carry out appropriate calculations ● undertake basic data analysis including simple statistical techniques.