Order	Title and content	Additional Info	Literacy/Numeracy/FBV/SMSC links	Spec link	Alleynes skills for life
1	Conduction and convection	To explain energy transfer through conduction, convection and radiation Use examples of radiators, cavity walls, loft insulation, carpet, double glazing	Literacy - description and comparison of methods of energy transfer	4.2.1.1	Teamwork
2	Thermal insulators	Explain thermal conductivity Describe how the rate of cooling of a building is affected by the thickness and thermal conductivity (required practical - thickness of material and type of material)	SMSC - making a house more energy efficient	4.2.1.1	Creativity
3	Infrared and temperature	Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface. (coloured test tubes - required practical)	Numeracy - using data to compare absorption and emission	4.6.2.2	Teamwork
4	Peer Assessment				
5	EM waves - uses and dangers	Explain that radio waves can be produced by oscillations in electrical circuits Explain that when radio waves are absorbed they may create an alternating current with the same frequency as the radio wave itself so radio waves can themselves induce oscillations in an electrical circuit. Describe how hanges in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed over a wide frequency range. Gamma rays originate from changes in the nucleus of an atom. Know that Ultraviolet waves, X-rays and gamma rays can have hazardous effects on human body tissue. Explain how the effects depend on the type of radiation and the size of the dose. Know that radiation dose (in sieverts) is a measure of the risk of harm resulting from an exposure of the body to the radiation. draw conclusions from given data about the risks and consequences of exposure to radiation	SMSC - everyday uses of waves	4.6.2.3	Literacy
6	P and S waves	Explain in qualitative terms, how the differences in velocity, absorption and reflection between different types of wave in solids and liquids can be used both for detection and exploration of structures which are hidden from direct observation. Waves include echo sounding, seismic waves and ultasound	SMSC - everyday uses of waves	4.6.1.5	Communication
7	Literacy				
8	The ear	Describe, with examples, processes which convert wave disturbances between sound waves and vibrations in solids. Examples may include the effect of sound waves on the ear drum Explain why such processes only work over a limited frequency range and the relevance of this to human hearing. Know the range of normal hearing	Literacy - description of the ear and how it works	4.6.1.4	Empathy
9	Ultrasound	Describe how ultrasound waves have a frequency higher than the upper limit of hearing for humans. Explain how any why ultrasound waves are partially reflected when they meet a boundary between two different media. Know the time taken for the reflections to reach a detector can be used to determine how far away such a boundary is Explain how ultrasound waves can be used for both medical and industrial imaging.	SMSC/Literacy - description of ultrasound it's application to everyday life	4.6.1.5	Creativity
10	Reflection	Construct ray diagrams to illustrate the reflection of a wave at a surface. Compare the two types of reflection: specular and diffuse Describe the effects of reflection, transmission and absorption of waves at material interfaces	Literacy - description interaction of light on different surfaces	4.6.1.3	Numeracy
11	Revision				
12	EOT				
13	Feedback				
14	Moments	To describe examples in which forces cause rotation. Describe a moment Use the equation: moment = force × distance To calculate the size of a force, or its distance from a pivot, acting on an object that is balanced.	SMSC- How moments are used to our benefit		

15	Levers and gears	A simple lever and a simple gear system can both be used to transmit the rotational effects of forces. To explain how levers and gears transmit the rotational effects of forces.	SMSC- How gears are used to our benefit
16	Momentum	Complete calculations involving an event, such as the collision of two objects and explosions Use equation F = m x v / t To explain safety features To apply equations relating force, mass, velocity and acceleration to explain how the changes involved are inter-related.	Numeracy- Calculating change in momentum
17	Peer Assessment		
18	Fluid pressure	To know a fluid can be either a liquid or a gas. To describe that pressure in fluids causes a force normal (at right angles) to any surface. The pressure at the surface of a fluid can be calculated using the equation: pressure = force normal to a surface / area of that surface The pressure due to a column of liquid can be calculated using the equation: pressure = height × density × gfs To explain why, in a liquid, pressure at a point increases with the height of the column of liquid and with the density of the liquid. To calculate the differences in pressure at different depths in a liquid. Define upthrust and describe factors affecting floating and sinking	Numeracy- Calculating pressure in liquids
19	Atmospheric pressure	Describe a simple model of the Earth's atmosphere and of atmospheric pressure Explain why atmospheric pressure varies with height above a surface.	SMSC- Atmosphere on other planets
20	Gas pressure (PV = constant)	Effect of pressure changes on gas To use the particle model to explain how increasing the volume can affect pressure For a fixed mass of gas held at a constant temperature: pressure × volume = constant To calculate the change in the pressure of a gas or the volume of a gas	SMSC- Gas canister safety
21	Revision		
22	EOT		
23	Feedback		
24	Background radiation, contamination and irradiation	Background radiation is around us all of the time. Sources of background radiation The level of background radiation and radiation dose may be affected by occupation and/or location.	SMSC - Managing impact on health of exposure to radiation
25	Uses and risks	Explain why the hazards associated with radioactive material differ according to the half-life involved. Describe and evaluate the uses of nuclear radiations for exploration of internal organs, and for control or destruction of unwanted tissue Evaluate the perceived risks of using nuclear radiations in relation to given data and consequences.	SMSC - Evaluation of perceived risks from radiation
26	Fission and fusion	Nuclear fission Energy is released by the fission reaction. All of the fission products have kinetic energy. Chain reaction and explosion caused by a nuclear weapon is caused by an uncontrolled chain reaction. To draw/interpret diagrams representing nuclear fission and how a chain reaction may occur. In this process some of the mass may be converted into the energy of radiation.	SMSC - Impact of nuclear waste and potential explosions
27	Revision		
28	EOT		
29	Feedback		
30	Research project	Research project	

A1 Literature review	A1 Literature review • Criteria for the review, to include: o how many sources o dates of resources o academic level of resources. • Nature of practical study, to include: o field work o laboratory-based work o sports facility o workshop. • Sources of information: o identification and location of relevant and reliable sources of information, to include: – journal articles – textbooks – reliable websites. o obtains information from different sources, to include: – libraries – resource centres – organisations – government organisations – charities. o protocols for referencing information sources, to include: – Harvard and Vancouver referencing systems.
A2 Investigative project proposal	A2 Investigative project proposal • Developing a project proposal: o area of study – suitable for interest and based on literature review o background o hypothesis o suitable aims and objectives. • Potential limitations of the project, to include: o availability of resources o participant availability o time constraints.
A3 Methods of data collection and analysis	A3 Methods of data collection and analysis •Review different methods of data collection •Analyse different data analysis, to include: ○ Graph types ○ Statistical testing ○ Validity ○ Accuracy and precision ○ Reproducibility

B1 Project scheduling	B1 Project scheduling Timeline for the project, to include: • Start date • Completion date • Scheduling.
B2 Project planning	B2 Project planning • Relevant methods for processes/procedures. • Use of resources, participants, equipment and instrumentation, materials. • Contingency planning and remedial actions (resources, revision of plan). • Control groups, representative and random sampling. • Realistic and viable, will test the hypothesis.
B3 Health and safety and ethical considerations	Identification of hazards, to include: o personal protective equipment (PPE) o controlling of substances hazardous to health (COSHH) regulations o health and safety legislation o environmental protection. • Risk assessments, to include: o type of hazard o level of risk o prevention and minimising of hazards. • Ethical considerations, to include: o project method o informed consent o maintaining confidentiality
C1 Experimental procedures and techniques	C1 Experimental procedures and techniques • Assembly of relevant equipment and materials. • Adhering to risk analysis, relevant legislation and local rules during practical investigation. • Skills of transferring, handling and using equipment and materials. • Use of equipment, instruments, sensors and techniques for taking measurements; calibration, repeating readings and measurements. • Observation and measurement skills.

C2 Collect, collate and analyse data	C2 Collect, collate and analyse data • Capturing and recording results with, accuracy, integrity, precision. • Maintenance of laboratory logbook and record keeping. • Organisation of data in class intervals, tallying. • Methods and uses of data processing and analysis, mean, mode, median, standard deviation, standard error, significance tests (t-test, chi-square test, confidence levels of 95% and 99%). • Inclusion and use of correct units for quantities. • Use of correct number of decimal places and significant figures. • Assessment of experimental accuracy, reliability and precision.
C3 Data presentation	C3 Data presentation • Appropriate methods used for data presentation. • Choice of data presentation explained; representation of variability of data.
D1 Scientific report for the investigative project	D1 Scientific report for the investigative project • Correct scientific principles: o structure and format o use of correct scientific terminology, past tense, passive voice and in third person o correct and consistent use of the Harvard or Vancouver referencing system.
D2 Scientific evaluation of findings	D2 Scientific evaluation of findings • Validation of method and results: o fitness for purpose of methods used o repeatability o sources and magnitudes of errors in readings taken • Evaluation of statistical results. • Reasoned conclusions drawn from primary and secondary data using scientific principles; use of critical thinking skills. • Limitations of investigative project and areas for improvement. • Assessment of information sources used and relevance to investigation experimental and literature investigations. • Evaluation of proof, or otherwise, of hypothesis. • Recommendations for further research.

D3 Skill development within project work	D3 Skill development within project work • Time management and organisation. • Adhering to and following appropriate standards and protocols. • Taking responsibility for completing tasks/procedures. • Making judgements within defined parameters. • Application of safe and legal working practice. • Give and receive constructive feedback. • Identify, organise and use resources effectively to complete tasks. • Utilising channels of communication. • Resourceful and using initiative.