	Lesson title	Lesson objectives
		Chapter 1: Energy
1.1	Potential energy	• Consider what happens when a spring is stretched. • Describe what is meant by gravitational potential energy. • Calculate the energy stored by an object raised above ground level.
1.2	Investigating kinetic energy	• Describe how the kinetic energy store of an object changes as its speed changes. • Calculate kinetic energy. • Consider how energy is transferred.
1.3	Work done and energy transfer	• Understand what is meant by work done. • Explain the relationship between work done and force applied. • Identify the transfers between energy stores when work is done against friction.
1.4	Understanding power	• Define power. • Compare the rate of energy transfer by various machines and electrical appliances. • Calculate power.
1.5	Specific heat capacity	• Understand how things heat up. • Find out about heating water. • Find out about specific heat capacity.
1.6	Required practical: Investigating specific heat capacity	• Use theories to develop a hypothesis. • Evaluate a method and suggest improvements. • Perform calculations to support conclusions.
1.7	Dissipation of energy	• Explain ways of reducing unwanted energy transfer. • Describe what affects the rate of cooling of a building. • Understand that energy is dissipated.
1.8	Energy efficiency	• Explain what is meant by energy efficiency. • Calculate the efficiency of energy transfers. • Find out about conservation of energy.
1.9	Required practical: Investigating ways of reducing the unwanted energy transfers in a system	• Use scientific ideas to make predictions • Analyse data to identify trends. • Evaluate an experimental procedure.
1.10	Using energy resources	• Describe the main energy resources available for use on Earth. • Distinguish between renewable and non-renewable resources. • Explain the ways in which the energy resources are used.
1.11	Global energy supplies	• Analyse global trends in energy use. • Understand what the issues are when using energy resources.
1.12	Key concept: Energy transfer	• To be able to recognize objects with energy. • To be able to recognize the different types of energy. • To be able to describe energy transfers. • To be able to use and describe the law of conservation of energy.
1.13	Maths skills: Calculations using significant figures	• Substitute numerical values into equations and use appropriate units. • Change the subject of an equation. • Give an answer using an appropriate number of significant figures.
1.14	Maths skills: Handling data	• Recognise the difference between mean, mode and median. • Explain the use of tables and frequency tables. • Explain when to use scatter diagrams, bar charts and histograms.

	Lesson title	Lesson objectives
		Chapter 2: Electricity
2.1	Static electricity	• Describe how insulating materials can become charged. • Know that there are two kinds of electric charge. • Explain these observations in terms of electron transfer.
2.2	Electric fields	• Explain what an electric field is. • Draw an electric field pattern for a charged sphere. • Use the idea of an electric field to explain electrostatic attraction and sparking.
2.3	Electric current	• Know circuit symbols. • Recall that current is a rate of flow of electric charge. • Recall that current (I) depends on resistance (R) and potential difference (V) • Explain how an electric current passes round a circuit.
2.4	Series and parallel circuits	• Recognise series and parallel circuits. • Describe the changes in the current in series and parallel circuits. • Describe the changes in the potential difference in series and parallel circuits.
2.5	Investigating circuits	• Classify materials as either conducting or insulating. • Use series circuits to test components and make measurements. • Carry out calculations on series circuits.
2.6	Circuit components	• Set up a circuit to investigate resistance. • Investigate the changing resistance of a filament lamp. • Compare the properties of a resistor and a filament lamp.
2.7	Required practical: Investigatethe I–V characteristics of components	• Understand how an experiment can be designed to test an idea. • Evaluate how an experimental procedure can yield more accurate data. • Interpret and explain graphs using scientific ideas.
2.8	Required practical: Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance	• Use a circuit to determine resistance. • Gather valid data for use in calculations. • Apply the circuit to determine the resistance of combinations of components.
2.9	Control circuits	• Use a thermistor and a light-dependent resistor (LDR). • Investigate the properties of thermistors, LDRs and diodes.
2.10	Electricity in the home	• Recall that the domestic supply in the UK is 230 V ac and 50 Hz. • Describe the main features of live, neutral and earth wires.
2.11	Transmitting electricity	• Describe how electricity is transmitted using the National Grid. • Explain why electrical power is transmitted at high potential differences. • Understand the role of transformers.
2.12	Power and energy transfers	• Describe the energy transfers in different domestic appliances. • Describe power as a rate of energy transfer. • Calculate the energy transferred.
2.13	Calculating power	• Calculate power. • Use power equations to solve problems. • Consider power ratings and changes in stored energy.
2.14	Key concept: What's the difference between potential difference and current?	• Understand the concepts of current and potential difference. • Apply the concepts of current and potential difference. • Use these concepts to explain various situations.
2.15	Maths skills: Using formulae and understanding graphs	• Recognise how algebraic equations define the relationships between variables. • Solve simple algebraic equations by substituting numerical values. • Describe relationships expressed in graphical form.

	Lesson title	Lesson objectives
	Chapter 3: Particle Model of Matter	
3.1	Density	• Use the particle model to explain the different states of matter. • Describe differences in density for different states of matter. • Calculate density for the different states of matter.
3.2	Required practical: To investigate the densities of regular and irregular solid objects and liquids	• Interpret observations and data. • Use spatial models to solve problems. • Plan experiments and devise procedures. • Use an appropriate number of significant figures in measurements and calculations.
3.3	Changes of state	• Describe how, when substances change state, mass is conserved. • Describe energy transfer in changes of state. • Explain changes of state in terms of particles.
3.4	Internal energy	• Describe the particle model of matter. • Understand what is meant by the internal energy of a system. • Describe the effect of heating on the energy stored within a system.
3.5	Specific heat capacity	• Describe the effect of increasing the temperature of a system in terms of particles. • State the factors that are affected by an increase in temperature of a substance. • Explain specific heat capacity.
3.6	Latent heat	• Explain what is meant by latent heat. • Describe that when a change of state occurs it changes the energy stored but not the temperature. • Perform calculations involving specific latent heat.
3.7	Particle motion in gases	• Relate the temperature of a gas to the average kinetic energy of the particle. • Explain how gas has a pressure. • Explain that changing the temperature of a gas held at constant volume changes its pressure.
3.8	Increasing the pressure of a gas	• Describe the relationship between the pressure and volume of a gas at constant temperature. • Calculate the change in the pressure or volume of a gas held at constant temperature when either the pressure or volume is increased or decreased. • Explain how doing work on a gas can increase its temperature.
3.9	Key concept: Particle model and changes of state	• Use the particle model to explain states of matter. • Use ideas about energy and bonds to explain changes of state. • Explain the relationship between temperature and energy.
3.10	Maths skills: Drawing and interpreting graphs	• Plot a graph of temperature against time, choosing a suitable scale. • Draw a line of best fit (which may be a curve). • Interpret a graph of temperature against time.

	Lesson title	Lesson objectives
	Chapter 4: Atomic Structure	
4.1	Atomic structure	• Describe the structure of the atom. • Use symbols to represent particles. • Describe ionisation.
4.2	Radioactive decay	• Describe radioactive decay. • Describe the types of nuclear radiation. • Understand the processes of alpha decay and beta decay.
4.3	Background radiation	• Recall sources of background radiation. • Describe how different types of radiation have differing ionising power. • Justify the selection of sources for particular applications.
4.4	Nuclear equations	• Understand nuclear equations. • Write balanced nuclear equations for alpha decay. • Write balanced nuclear equations for beta decay.
4.5	Radioactive half-life	• Explain what is meant by radioactive half-life. • Calculate half-life. • Choose the best radioisotope for a task.
4.6	Hazards and uses of radiation	• Describe radioactive contamination. • Give examples of how radioactive tracers can be used. • Explain how contaminated waste is disposed of.
4.7	Irradiation	• Explain what is meant by irradiation. • Understand the distinction between contamination and irradiation. • Appreciate the importance of communication between scientists.
4.8	Uses of radiation in medicine	• Compare gamma rays and X-rays. • Describe some uses of radiation for medical diagnosis and therapy.
4.9	Using nuclear radiation	• Explore the risks and benefits of using nuclear radiation. • Describe how internal organs can be explored. • Understand how nuclear radiation can control or destroy unwanted tissue.
4.10	Nuclear fission	• Describe nuclear fission. • Explain how a chain reaction occurs. • Explain how fission is used.
4.11	Nuclear fusion	• Explain nuclear fusion. • Describe the conditions needed for fusion. • Describe how nuclear fusion might be an attractive energy source.
4.12	Key concept: Developing ideas for the structure of the atom	• Understand how ideas about the structure of the atom have changed. • How evidence is used to test and improve models.
4.13	Maths skills: Using ratios and proportional reasoning	• Calculate radioactive half-life from a curve of best fit. • Calculate the net decline in radioactivity.