| **This 3-Year Scheme of Work offers a flexible approach for KS4. The suggested timings are based on three science lessons per fortnight (assuming a two week timetable of two lessons one week and one in the other) but can be tailored to suit the needs of a particular class or group of students. Lessons are assumed to be sessions of 40-60 minutes. The teaching scheme is scheduled to finish at end of Year 10 to allow time for revision and GCSE examinations.****Please note that there is sometimes allowance for more than one session for a lesson where this may be helpful so on occasion there are fewer than three lessons in a fortnight. The maths skills spreads are numbered as the last spread in a chapter but can be used at any appropriate point according to the needs of your students.** |
| --- |
| **Year** | **Term** | **Week** | **Student Book spread number** | **Lesson title** | **Learning objectives** | **OCR specification reference** | **Lesson resources (on CD ROM)** | **Collins Connect resources** |
| **Chapter 1: Matter (12 lessons)** |
| 9 | 1 | 1/2 | 1.1 | 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.
 | P1.1a, b, c | Worksheets 1.1.1, 1.1.2, 1.1.3 and 1.1.4  | Quick starter Homework worksheetHomework quizSlideshow |
| 9 | 1 | 1/2 | 1.2 | Density | * Use the particle model to explain the different states of matter and differences in density.
* Calculate density.
 | P1.1d, f  | Worksheet 1.2; Practical sheet 1.2; Technician’s notes 1.2 | Quick starter Homework worksheetHomework quizSlideshow |
| 9 | 1 | 1/2 | 1.3 | 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.
 | P1.1e  | Worksheet 1.3; Practical sheet 1.3; Technician’s notes 1.3 | Quick starter Homework worksheetHomework quizVideo |
| 9 | 1 | 3/4 | 1.4 | 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.
 | Prac P1, M1a, b, c, M5c | Worksheet 1.4; Practical sheet 1.4; Technician’s notes 1.4 | Quick starter Homework worksheetHomework quizVideo |
| 9 | 1 | 3/4 | 1.5 | 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.
 | P1.2a, b  | Worksheet 1.5; Practical sheet 1.5; Technician’s notes 1.5 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 5/6 | 1.6 | 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.
 | P1.2c  | Worksheet 1.6; Practical sheets 1.6.1, 1.6.2, 1.6.3, 1.6.4, 1.6.5 and 1.6.6; Technician’s notes 1.6 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 5/6 | 1.7 | 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.
 | P1.2d (part), e  | Worksheet 1.7; Practical sheet 1.7; Technician’s notes 1.7 | Quick starter Homework worksheetHomework quizSlideshowVideo |
| 9 | 1 | 5/6 | 1.8 | Specific 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.
 | P1.2d (part), f  | Worksheet 1.8; Practical sheet 1.8; Technician’s notes 1.8 | Quick starter Homework worksheetHomework quizSlideshow |
| 9 | 1 | 7/8 | 1.9 | 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.
* Comment on the specific heat capacity and specific latent heat of a substance.
 | PM1.2 I, ii, M2g, M4a, c | Worksheet 1.9, Practical sheet 1.9, Technician’s notes 1.9 | Quick starter Homework worksheetHomework quizVideo |
| 9 | 1 | 7/8 | 1.10 | Practical: Investigating specific heat capacity | * Use theories to develop a hypothesis.
* Evaluate a method and suggest improvements.
* Perform calculations to support conclusions.
 | Prac P5, M1c, M3b, c, d | Worksheet 1.10; Practical sheet 1.10; Technician’s notes 1.10 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 9/10 | 1.11 | Particle motion in gases | * Relate the temperature of a gas to the average kinetic energy of the particles.
* Explain how a gas has a pressure.
* Explain that changing the temperature of a gas held at constant volume changes its pressure.
 | P1.2g, h | Worksheet 1.11; Practical sheet 1.11; Technician’s notes 1.11 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 9/10 | 1.12 | 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.
 | M2b, c, f | Worksheets 1.12.1, 1.12.2 and 1.16.3; Practical sheet 1.12; Technician’s notes 1.12 | Quick starter Homework worksheetHomework quizVideo |
| 9 | 1 | 9/10 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins Connect |
| **Chapter 2: Forces (20 lessons)** |
| 9 | 1 | 11/12 | 2.1 | Scalars and vectors | * Define distance, displacement, speed, velocity and acceleration.
* Recognise the difference between scalar and vector quantities.
* State examples of scalar and vector quantities.
 | P2.1d | Worksheets 2.1.1, 2.1.2 and 2.1.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 11/12 | 2.2 | Speed | * Calculate speed using distance travelled divided by time taken.
* Calculate speed from a distance–time graph.
* Recall that distance = speed × time
* Measure the gradient of a distance–time graph at any point.
 | P2.1a, b, c, e (part), g, M1c, M4a, d, e | Worksheets 2.2.1, 2.2.2 and 2.2.3; Practical sheet 2.2; Technician’s notes 2.2 | Quick starter Homework worksheetHomework quizSlideshowVideo |
| 9 | 1 | 11/12 | 2.3 | Acceleration | * Describe acceleration.
* Calculate acceleration.
 | P2.1h (part) | Worksheets 2.3.1, 2.3.2 and 2.3.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 1/2 | 2.4 | Calculations of motion | * Describe motion with uniform acceleration.
* Use an equation for motion with uniform acceleration.
* Apply this equation to vertical motion.
 | P2.1h (part) | Worksheet 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.4.5 and 2.4.6 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 1/2 | 2.5 | Velocity–time graphs **(HT)** | * Draw velocity–time graphs.
* Calculate acceleration using a velocity–time graph.
* Calculate displacement using a velocity–time graph. **(HT)**
 | P2.1e (part), f, M4a, c, d, f | Worksheets 2.5.1, 2.5.2 and 2.5.3; Practical sheet 2.5; Technician’s notes 2.5 | Quick starter Homework worksheetHomework quizSlideshow |
| 9 | 2 | 1/2 | 2.6 | Maths skills: Making estimates of calculations | * Estimate the results of simple calculations.
* Round numbers to make an estimate.
* Calculate order of magnitude.
 | PM2.1i to iv, M1c, d, h, M3a, c, d | Worksheets 2.6.1, 2.6.2 and 2.6.3 | Quick starter Homework worksheetHomework quizVideo |
| 9 | 2 | 3/4 | 2.7 | Forces explain how objects interact **(HT)** | * Describe a force.
* Recognise the difference between contact and non-contact forces.
* State examples of scalar and vector quantities.
 | P2.2a, b, c, f | Worksheets 2.7.1, 2.7.2 and 2.7.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 3/4 | 2.8 | Forces and motion **(HT)**  | * Understand what a force does.
* Explain what happens to an object if all the forces acting on it cancel each other out.
* Analyse how this applies to everyday situations.
 | P2.2d, e (part), h (part), q | Worksheets 2.8.1, 2.8.2 and 2.8.3; Practical sheet 2.8; Technician’s notes 2.8 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 3/4 | 2.9 | Resultant forces **(HT)** | * Calculate the resultant of a number of forces.
* Draw free-body diagrams to find resultant forces.
* Understand that a force can be resolved into two components acting at right angles to each other. **(HT)**
 | P2.2e (part), g, h (part), M5a, b | Worksheets 2.9.1, 2.9.2 and 2.9.3  | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 5/6 | 2.10 | Forces and acceleration **(HT)** | * Explain what happens to the motion of an object when the resultant force is not zero.
* Analyse situations in which a non-zero resultant force is acting.
* Explain what inertia is. **(HT)**
 | P2.2i, j | Practical sheets 2.10.1, 2.10.2 and 2.10.3; Technician’s notes 2.10 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 5/6 | 2.11 | Momentum **(HT only)** | * Explain what is meant by momentum.
* Apply ideas about rate of change of momentum to safety features in cars.
* Use momentum calculations to predict what happens in a collision.
 | P2.2k | Worksheets 2.11.1, 2.11.2 and 2.11.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 5/6 | 2.12 | Practical: Investigating the acceleration of an object | * Plan an investigation to explore an idea.
* Analysing results to identify patterns and draw conclusions.
* Compare results with scientific theory.
 | P2.2i, Prac P3, M1c, M2g, M4a, c, d | Practical sheet 2.12; Technician’s notes 2.12 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 7/8 | 2.13 | Newton’s third law | * Identify force pairs.
* Understand and be able to apply Newton’s third law.
 | P2.2o | Worksheets 2.13.1, 2.13.2 and 2.13.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 7/8 | 2.14 | 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.
 | P2.2l, m | Worksheets 2.14.1, 2.14.2, 2.14.3; Practical sheets 2.14.1 and 2.14.2; Technician’s notes 2.14 | Quick starter Homework worksheetHomework quizSlideshow |
| 9 | 2 | 7/8 | 2.15 | Understanding power | * Define power.
* Compare the rate of energy transfer by various machines and electrical appliances.
* Calculate power.
 | P2.2n | Worksheet 2.15; Practical sheets 2.15.1 and 2.15.2; Technician’s notes 2.15.1 and 2.15.2 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 9/10 | 2.16 | Key concept: Forces and acceleration | * Recognise examples of balanced and unbalanced forces.
* Apply ideas about speed and acceleration to explain sensations of movement.
* Apply ideas about inertia and circular motion to explain braking and cornering.
 | Key concept | Worksheets 2.16.1, 2.16.2 and 2.16.3; Practical sheet 2.16; Technician’s notes 2.16 | Quick starter Homework worksheetHomework quizVideoSlideshow |
| 9 | 2 | 9/10 | 2.17 | Forces and energy in springs | * Explain why you need two forces to stretch a spring.
* Describe the difference between elastic and inelastic deformation.
* Calculate extension, compression and elastic potential energy.
 | P2.3a, b | Worksheets 2.17.1 and 2.17.2; Practical sheet 2.17; Technician’s notes 2.17  | Quick starter Homework worksheetHomework quizSlideshow |
| 9 | 2 | 9/10 | 2.18 | Practical: Investigate the relationship between force and the extension of a spring | * Interpret readings to show patterns and trends.
* Interpret graphs to form conclusions.
* Apply the equation for a straight line to the graph.
 | P2.3c, d, e, Prac P2, M2b, f, M4a, b, c, d | Practical sheet 2.18, Required practical 2.18, Technician’s notes 2.18 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 11/12 | 2.19 | 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.
 | P2.3f | Worksheets 2.19.1, 2.19.2 and 2.19.3; Practical sheet 2.19; Technician’s notes 2.19 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 11/12 | 2.20 | Heavy or massive?  | * Identify the correct units for mass and weight.
* Explain the difference between mass and weight.
* Understand how weight is an effect of gravitational fields.
 | P2.3g, h, i | Worksheets 2.20.1, 2.20.2 and 2.20.3; Practical sheet 2.20; Technician’s notes 2.20 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 11/12 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins ConnectEnd of teaching block test Collins Connect |
| **Chapter 3: Electricity and Magnetism (21 lessons)** |
| 9 | 3 | 1/2 | 3.1 | 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.
 | P3.1a, b, c | Worksheet 3.1 | Quick starter Homework worksheetHomework quizVideo |
| 9 | 3 | 1/2 | 3.2 | Electric charge and currents | * Recall that an electric current is a rate of flow of electric charge.
* Recall that current has the same value at any point in a single closed loop.
* Recall and use the relationship between quantity of charge, current and time.
 | P3.1d, e, f | Worksheets 3.2.1, 3.2.2 and 3.2.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 1/2 | 3.3 | Electric circuits and potential difference | * Know circuit symbols.
* Recall that current (*I*) depends on resistance (*R*) and potential difference (*V*)
* Explain how an electric current passes round a circuit.
 | P3.2 b, c, d | Worksheets 3.3.1, 3.3.2, 3.3.3 and 3.3.4 | Quick starter Homework worksheetHomework quizVideo |
| 9 | 3 | 3/4 | 3.4 | Series and parallel circuits | * Recognise series and parallel circuits.
* Describe the changes in the current and potential difference in series and parallel circuits.
 | P3.2a, i and j (part) | Worksheets 3.4.1, 3.4.2 and 3.4.3 | Quick starter Homework worksheetHomework quizSlideshow |
| 9 | 3 | 3/4 | 3.5 | Resistance | * Set up a circuit to investigate resistance.
* Investigate the changing resistance of a filament lamp.
* Compare the properties of a resistor and filament lamp.
 | P3.2 e, f, g, M1c, M4a, b, d | Practical sheet 3.5; Technician’s notes 3.5 | Quick starter Homework worksheetHomework quizSlideshow |
| 9 | 3 | 3/4 | 3.6 | Practical: Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting resistance | * Use a circuit to determine resistance.
* Gather valid data to use in calculations.
* Apply the circuit to determine the resistance of different components.
 | P3.2h, k (part), Prac P6, M1c, M4a, b | Practical sheet 3.6 Technician’s notes 3.6 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 5/6 | 3.7 | Investigating circuits | * Use series circuits to test components and make measurements.
* Carry out calculations on series circuits.
 | P3.2j (part) | Worksheets 3.7.1, 3.7.2 and 3.7.3; Practical sheet 3.7; Technician’s notes 3.7 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 5/6 | 3.8 | Control circuits | * Use a thermistor and light-dependent resistor (LDR).
* Investigate the properties of thermistors, LDRs and diodes.
 | P3.2k (part) | Worksheet 3.8; Practical sheet 3.8; Technician’s notes 3.8 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 5/6 | 3.9 | Power and energy transfers | * Describe the energy transfers in different domestic appliances.
* Describe power as a rate of energy transfer.
* Calculate the energy transferred.
 | P3.2l (part) | Worksheets 3.9.1, 3.9.2 and 3.9.3; Practical sheet 3.9; Technician’s notes 3.9 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 7/8 | 3.10 | Calculating power | * Calculate power.
* Use power equations to solve problems.
* Consider power ratings and changes in stored energy.
 | P3.2l (part) | Worksheets 3.10.1, 3.10.2 and 3.10.3; Practical sheet 3.10; Technician’s notes 3.10 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 7/8 | 3.11 | Practical: Investigating series and parallel circuits | * Use a circuit to determine resistance.
* Gather valid data to use in calculations.
* Apply the circuit to determine the resistance of combinations of components.
 | Prac P6, M4a,  | Worksheets 3.11.1, 3.11.2 and 3.11.3; Practical sheet 3.11; Technician’s notes 3.11 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 9/10 | 3.12 | Key concept: What’s the difference between potential difference and current? | * Understand and be able to apply the concepts of current and potential difference.
* Use these concepts to explain various situations.
 | Key concept | Worksheets 3.12.1, 3.12.2 and 3.12.3; Practical sheet 3.12; Technician’s notes 3.12 | Quick starter Homework worksheetHomework quizVideoSlideshow |
| 9 | 3 | 9/10 | 3.13 | Maths skills: Using algebra in electric circuit calculations | * Solve algebraic equations including using appropriate substitutions, numerical values and units.
* Change the subject of an equation.
* Use the symbols =, <, <<, >>, >, ~.

 | P3.2m, M1a, c, M3a, b, c, d | Worksheets 3.13.1, 3.13.2 and 3.13.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 9/10 | 3.14  | 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.
 | PM3.1i, 3.2i to iv, M1a, c, M3a, b, c, d, M4a, b, d | Worksheets 3.14.1, 3.14.2 and 3.14.3; Practical sheet 3.14, Technician’s notes 3.14 | Quick starter Homework worksheetHomework quizVideo |
| 9 | 3 | 11/12 | 3.15 | Magnetism and magnetic forces | * Explain what is meant by the poles of a magnet.
* Plot the magnetic field around a bar magnet.
* Describe magnetic materials and induced magnetism.
 | P3.3a, b | Worksheet 3.15; Practical sheet 3.15; Technician’s notes 3.15; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 11/12 | 3.16 | Compasses and magnetic fields | * Describe the Earth’s magnetic field.
* Describe the magnetic effect of a current.
 | P3.3c, d, e, f | Worksheet 3.16; Practical sheet 3.16; Technician’s notes 3.16; PowerPoint presentation | Quick starter Homework worksheetHomework quizVideoSlideshow |
| 9 | 3 | 11/12 | 3.17 **(HT)** | Magnetic effects | * Draw the magnetic field around a conducting wire and a solenoid.
* Describe the force on a wire in a magnetic field. **(HT)**
 | P3.3g, h, i | Worksheets 3.17.1 and 3.17.2; Practical sheet 3.17; Technician’s notes 3.17; PowerPoint presentation | Quick starter Homework worksheetHomework quizSlideshow |
| 10 | 1 | 1/2 | 3.18 | Calculating the force on a conductor **(HT only)** | * Explain the meaning of magnetic flux density, *B*.
* Calculate the force on a current-carrying conductor in a magnetic field.
 | P3.3j | Worksheet 3.18; PowerPoint presentation | Quick starter Homework worksheetHomework quizSlideshow |
| 10 | 1 | 1/2 | 3.19 | Electric motors **(HT only)** | * List equipment that uses motors.
* Describe how motors work.
* Describe how to change the speed and direction of rotation of a motor.
* Explain how a dynamo generates direct current.
 | P3.3k | Worksheets 3.19.1 and 3.19.2; Practical sheet 3.19; Technician’s notes 3.19; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 1/2 | 3.20 | Key concept: The link between electricity and magnetism **(HT only)** | * Explore how electricity and magnetism are connected.
 | Key concept | Worksheets 3.20.1 and 3.20.2; Practical sheets 3.20.1, 3.20.2, 3.20.3 and 3.20.4; Technician’s notes 3.20; PowerPoint presentation | Quick starter Homework worksheetHomework quizSlideshowVideo |
| 10 | 1 | 3/4 | 3.21 | Maths skills: Rearranging equations **(HT only)** | * Change the subject of an equation.
* Explain how the potential differences in two circuits linked by a transformer depend on the ratio of the numbers of turns.
 | PM3.3i, M1a, b, c, M3b, c, d | Worksheets 4.10.1 and 4.10.2 | Quick starter Homework worksheetHomework quizVideo |
| 10 | 1 | 3/4 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins ConnectEnd of teaching block test Collins ConnectEnd of year test Collins Connect |
| **Chapter 4: Waves and radioactivity (21 lessons)** |
| 10 | 1 | 5/6 | 4.1 | Describing waves | * Describe wave motion.
* Define wavelength and frequency.
* Apply the relationship between wavelength, frequency and wave velocity.
 | P4.1a, b, c, d, M3b, c, d | Worksheets 4.1.1, 4.1.2, 4.1.3 and 4.1.4 | Quick starter Homework worksheetHomework quizVideo |
| 10 | 1 | 5/6 | 4.2 | Transverse and longitudinal waves | * Compare the motion of transverse and longitudinal waves.
* Explain why water waves are transverse waves.
* Explain why sound waves are longitudinal waves.
 | P4.1e | Worksheets 4.2.1, 4.2.2 and 4.2.3; PowerPoint presentation | Quick starter Homework worksheetHomework quizVideo |
| 10 | 1 | 5/6 | 4.3 | Measuring wave speeds **(HT)** | * Explain how the speed of sound in air can be measured.
* Explain how the speed of water ripples can be measured.
* Describe the use of echo sounding. **(HT)**
 | P4.1f (part) | Worksheets 4.3.1, 4.3.2 and 4.3.3, Practical sheet 4.3, Technician’s notes 4.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 7/8 | 4.4 | Practical: Measuring the wavelength, frequency and speed of waves in a ripple tank and waves in a solid | * Develop techniques for making observations of waves.
* Select suitable apparatus to measure frequency and wavelength.
* Use data to answer questions.
 | P4.1f (part), Prac P4 | Practical sheet 4.4; Technician’s notes 4.4 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 7/8 | 4.5 | Maths skills: Using and rearranging equations | * Select and apply the equations *T* = 1/*f* and *v* = *fλ*.
* Substitute numerical values into equations using appropriate units.
* Change the subject of an equation.
 | PM4.1i, M3b, c, d | Worksheets 4.5.1, 4.5.2 and 4.5.3 | Quick starter Homework worksheetHomework quizVideo |
| 10 | 1 | 9/10 | 4.6 | Key concept: Transferring energy or information by waves | * Understand that all waves have common properties.
* Understand how waves can be used to carry information.
* Understand various applications of energy transfer by different types of electromagnetic waves.
 | Key concept | Worksheet 4.6 | Quick starter Homework worksheetHomework quizVideoSlideshow |
| 10 | 1 | 9/10 | 4.7 | The electromagnetic spectrum | * Recall the similarities and differences between transverse and longitudinal waves.
* Recognise that electromagnetic waves are transverse waves.
* Describe the main groupings and wavelength ranges of the electromagnetic spectrum.
 | P4.2a, b, c, d, e, f | Worksheets 4.7.1, 4.7.2 and 4.7.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 9/10 | 4.8 | Gamma rays and X-rays **(HT)** | * List the properties of gamma rays and X-rays.
* Recall examples of the practical uses of X-rays and gamma rays.
* Compare gamma rays and X-rays. **(HT)**
 | P4.2g (part), h (part) | Worksheets 4.8.1, 4.8.2 and 4.8.3 | Quick starter Homework worksheetHomework quizVideoSlideshow |
| 10 | 1 | 11/12 | 4.9 | Ultraviolet and infrared radiation | * Describe the properties of ultraviolet and infrared radiation.
* Describe some uses and hazards of ultraviolet radiation.
* Describe some uses of infrared radiation.
 | P4.2g (part), h (part) | Worksheet 4.9; Practical sheet 4.9; Technician’s notes 4.9 | Quick starter Homework worksheetHomework quizSlideshow |
| 10 | 1 | 11/12 | 4.10 | Microwaves | * List some properties of microwaves.
* Describe how microwaves are used for communications.
 | P4.2g (part), h (part) | Worksheet 4.10 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 11/12 | 4.11 | Radio and microwave communication **(HT)** | * Describe how radio waves are used for television and radio communications.
* Describe how microwaves are used in satellite communications.
* Describe the reflection and refraction of radio waves. **(HT)**
 | P4.2g (part), i | Worksheets 4.11.1, 4.11.2 and 4.11.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 1/2 | 4.12 | Reflection, refraction and wave fronts **(HT only)** | * Explain reflection and refraction and how these may vary with wavelength.
* Construct ray diagrams to illustrate refraction.
* Use wave front diagrams to explain refraction in terms of the difference in velocity of the waves in different substances.
 | P4.2j (part), k | Worksheets 4.12.1, 4.12.2 and 4.12.3; Practical sheet 4.12; Technician’s notes 4.12 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 1/2 | 4.13 | Practical: Investigate the reflection of light by different types of surface and the refraction of light by different substances | * Make and record observations of how light is reflected and transmitted at different surfaces.
* Measure angles and discuss the method, apparatus and uncertainty in measurements.
* Draw conclusions from experimental results.
 | P4.2j (part), Prac P4 | Worksheets 4.13.1 and 4.13.2; Practical sheets 4.13.1, 4.13.2, 4.13.3 and 4.13.4; Technician’s notes 4.13 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 1/2 | 4.14 | Atomic structure | * Describe the structure of the atom.
* Use symbols to represent particles.
* Describe ionisation.
 | P4.3a, b, c, h | Worksheets 4.14.1, 4.14.2 and 4.14.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 3/4 | 4.15 | Radioactive decay | * Describe radioactive decay.
* Describe the types of nuclear radiation.
* Understand the processes of alpha decay and beta decay.
 | P4.3d, e | Worksheets 4.15.1, 4.15.2 and 4.15.3; Technician’s notes 4.15 | Quick starter Homework worksheetHomework quizSlideshow |
| 10 | 2 | 3/4 | 4.16 | Nuclear equations | * Understand nuclear equations.
* Write balanced nuclear equations.
 | P4.3f, g, h | Worksheets 4.16.1, 4.16.2 and 4.16.3 | Quick starter Homework worksheetHomework quizVideo |
| 10 | 2 | 3/4 | 4.17 | Radioactive half-life **(HT)** | * Explain what is meant by radioactive half-life.
* Calculate half-life. **(HT)**
* Choose the best radioisotope for a task.
 | P4.3j, M4a, c | Worksheets 4.17.1, 4.17.2 and 4.17.3; Practical sheet 4.17; Technician’s notes 4.17 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 5/6 | 4.18 | Background radiation | * Recall sources of background radiation.
* Describe how different types of radiation have different ionising power.
 | P4.3i, l | Worksheets 4.18.1, 4.18.2 and 4.18.3 | Quick starter Homework worksheetHomework quizVideo |
| 10 | 2 | 5/6 | 4.19 | Maths skills: Using ratios and proportional reasoning **(HT)** | * Draw a curve of best fit to calculate radioactive half-life.
* Calculate the net decline. **(HT)**
 | P4.3k, M1c, M3c, M4a, c |  | Quick starter Homework worksheetHomework quizVideo |
| 10 | 2 | 5/6 | 4.20 | Hazards and uses of radiation | * Describe radioactive contamination.
* Give examples of how radioactive tracers can be used.
 | P4.3m (part) | Worksheets 4.20.1, 4.20.2 and 4.20.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 7/8 | 4.21 | Irradiation | * Explain what is meant by irradiation.
* Understand the distinction between contamination and irradiation.
* Appreciate the importance of communication between scientists.
 | P4.3m (part) | Worksheets 4.21.1, 4.21.2 and 4.21.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 7/8 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins ConnectEnd of teaching block test Collins Connect |
| **Chapter 5: Energy (9 lessons)** |
| 10 | 2 | 9/10 | 5.1 | 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.
 | P5.1b (part), e (part) | Worksheets 5.1.1, 5.1.2 and 5.1.3; Practical sheets 5.1.1 and 5.1.2; Technician’s notes 5.1  | Quick starter Homework worksheetHomework quizSlideshow |
| 10 | 2 | 9/10 | 5.2 | Work done and energy transfer | * Recall what is meant by work done.
* Use the relationship between work done and force applied.
* Identify the transfers between energy stores.
 | P5.1b (part), c (part) | Worksheets 5.2.1, 5.2.2 and 5.2.3;Practical sheets 5.2.1 and 5.2.2; Technician’s notes 5.2  | Quick starter Homework worksheetHomework quizSlideshow |
| 10 | 2 | 9/10 | 5.3 | Specific heat capacity | * Understand how things heat up.
* Find out about heating water.
* Find out about specific heat capacity.
 | P5.1c (part)  | Worksheets 5.3.1, 5.3.2 and 5.3.3; Practical sheet 5.3; Technician’s notes 5.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 11/12 | 5.4 | Energy and power | * Recall that energy cannot be created or destroyed, only transferred.
* Describe the energy transfers in different domestic appliances.
* Describe power as a rate of energy transfer.
* Calculate the energy transferred.
 | P5.1c (part), d, P5.2b, c | Worksheets 5.4.1, 5.4.2 and 5.4.3, Practical sheet 5.4, Technician’s notes 5.4 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 11/12 | 5.5 | 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.
 | P5.2a, g | Worksheets 5.5.1, 5.5.2 and 5.5.3; Practical sheets 5.5.1, and 5.5.2, Technician’s notes 5.5 | Quick starter Homework worksheetHomework quizVideoSlideshow |
| 10 | 2 | 11/12 | 5.6 | Energy efficiency | * Explain what is meant by energy efficiency.
* Calculate the efficiency of energy transfers.
* Find out about conservation of energy.
 | P5.1a, P5.2d, e (part), g, PM5.2i, M1c, M4a, c, d, e | Worksheets 5.6.1 and 5.6.2; Practical sheets 5.6.1, 5.6.2, 5.6.3 and 5.6.4 | Quick starter Homework worksheetHomework quizVideo |
| 10 | 3 | 1/2 | 5.7 | 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.
 | P5.2e (part), f, Prac P5 | Worksheet 5.7; Practical sheet 5.7; Technician’s notes 5.7 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 1/2 | 5.8 | Key concept: Energy transfer | * Understand why energy is a key concept in science.
* Use ideas about stores and transfers to explain what energy does.
* Understand why accounting for energy transfers is a useful idea.
 | Key concept | Worksheet 5.8, Practical sheets 5.8.1 and 5.8.2, Technician’s notes 5.8.1 and 5.8.2 | Quick starter Homework worksheetHomework quizSlideshow |
| 10 | 3 | 1/2 | 5.9 | Maths skills: Calculations using significant figures | * Substitute numerical values into equations and use appropriate units.
* Change the subject of an equation.
* Give an answer to an appropriate number of significant figures.
 | M1a, c, M2a, b, c, d  | Worksheets 5.9.1, 5.9.2 and 5.9.3, Technician’s notes 5.9 | Quick starter Homework worksheetHomework quizVideo |
| 10 | 3 | 3/4 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins Connect |
| **Chapter 6: Global challenges (5 lessons)** |
| 10 | 3 | 3/4 | 6.1 | Keeping safe on the road | * Explain the factors that affect stopping distance.
* Explain the dangers caused by large deceleration.
 | P6.1d, e, f | Worksheets 6.1.1, 6.1.2 and 6.1.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 3/4 | 6.2 | Transmitting electricity | * Describe how electricity is transmitted using the National Grid.
* Explain why energy is transmitted at high potential differences.
* Understand the role of transformers.
 | P6.2c, d, e | Worksheet 6.2 | Quick starter Homework worksheetHomework quizVideo 1Video 2 |
| 10 | 3 | 5/6 | 6.3 | 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.
 | P6.2a | Worksheet 6.3, Practical sheet 6.3, Technician’s notes 6.3 | Quick starter Homework worksheetHomework quizVideo 1Video 2 |
| 10 | 3 | 5/6 | 6.4 | Global energy supplies | * Analyse global trends in energy use.
* Understand what the issues are when using energy resources.
 | P6.2b | Worksheets 6.4.1, 6.4.2 and 6.4.3; Practical sheet 6.4, Technician’s notes 6.4 | Quick starter Homework worksheetHomework quizVideoSlideshow |
| 10 | 3 | 5/6 | 6.5 | Electricity in the home | * Recall that the domestic supply in the UK is a.c. at 50 Hz and about 230 V.
* Describe the main features of live, neutral and earth wires.
 | P6.2f, g, h, i | Worksheets 6.5.1, 6.5.2 and 6.5.3 | Quick starter Homework worksheetHomework quizVideoSlideshow |
| 10 | 3 | 7/8 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins ConnectEnd of teaching block test Collins ConnectEnd of year test Collins ConnectEnd of course test Collins Connect |