| **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 lesson 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 in the second term of Year 11 to allow time for revision and GCSE examinations in the summer term.****Please note that some of these lessons only require partial coverage or are shorter than others and therefore sometimes there are more 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 (16 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 | Worksheets 1.1.1, 1.1.2, 1.1.3 and 1.1.4 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 1/2 | 1.2 | Atomic structure | * Describe the structure of the atom.
* Use symbols to represent particles.
* Describe ionisation.
 | P1.1b, c  | Worksheets 1.2.1, 1.2.2 and 1.2.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 1/2 | 1.3 | Density | * Use the particle model to explain the different states of matter.
* Describe differences in density for different states of matter.
* Calculate density.
 | P1.1d, f  | Worksheet 1.3; Practical sheet 1.3; Technician’s notes 1.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 3/4 | 1.4 | 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 1.4; Practical sheet 1.4; Technician’s notes 1.4 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 3/4 | 1.5 | 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.
 | Prac P1 (materials) | Worksheet 1.5; Practical sheet 1.5; Technician’s notes 1.5 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 3/4 | 1.6 | 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 1.6; Practical sheet 1.6; Technician’s notes 1.6 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 5/6 | 1.7 | 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 1.7; Practical sheets 1.7.1, 1.7.2, 1.7.3, 1.7.4, 1.7.5 and 1.7.6; Technician’s notes 1.7 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 5/6 | 1.8 | 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 1.8; Practical sheet 1.8; Technician’s notes 1.8 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 5/6 | 1.9 | 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 1.9; Practical sheet 1.9; Technician’s notes 1.9 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 7/8 | 1.10 | 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.
* Comment on the specific heat capacity and specific latent heat of a substance.
 | PM1.2 I, ii  | Worksheet 1.10, Practical sheet 1.10, Technician’s notes 1.10 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 7/8 | 1.11 | Required practical: Investigating specific heat capacity | * Use theories to develop a hypothesis.
* Evaluate a method and suggest improvements.
* Perform calculations to support conclusions.
 | Prac P5 | Worksheet 1.11; Practical sheet 1.11; Technician’s notes 1.11 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 7/8 | 1.12 | 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.
 | P1.3 a, b, c | Worksheet 1.12; Practical sheet 1.12; Technician’s notes 1.12 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 9/10 | 1.13 | Increasing the pressure of a gas **(HT)** | * 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.
 | P1.3d, e | Worksheet 1.13; Practical sheet 1.13; Technician’s notes 1.13 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 9/10 | 1.14 | Pressure in a fluid **(HT)** | * Explain how pressure acts in a fluid.
* Calculate pressure at different depths in a liquid. **(HT)**
* Explain what causes upthrust. **(HT)**
 | P1.3h, I, j | Worksheets 1.14.1, 1.14.2 and 1.14.3; Practical sheet 1.14; Technician’s notes 1.14 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 9/10 | 1.15 | Atmospheric pressure | * Show that the atmosphere exerts a pressure.
* Explain variations in atmospheric pressure with height.
* Describe a simple model of the Earth’s atmosphere and atmospheric pressure.
 | P1.3f, g | Worksheets 1.15.1, 1.15.2 and 1.15.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 11/12 | 1.16 | 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.
 | M2 c, f | Worksheets 1.16.1, 1.16.2 and 1.16.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 1 | 11/12 | **Assessment** | End of Chapter test Student BookEnd of Chapter test Collins Connect |
| **Chapter 2: Forces (22 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.
 | P2.1.2c, d | Worksheets 2.1.1, 2.1.2 and 2.1.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 1/2 | 2.2 | Speed | * Calculate speed using distance travelled divided by time taken.
* Calculate speed from a distance–time graph.
* Measure the gradient of a distance–time graph at any point.
 | P2.1a, b, c, e (part), g | Worksheets 2.2.1, 2.2.2 and 2.2.3; Practical sheet 2.2; Technician’s notes 2.2 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 1/2 | 2.3 | Acceleration | * Describe acceleration.
* Calculate acceleration.
* Explain motion in a circle.
 | 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 uniform motion.
* Use an equation for uniform motion.
* 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 | 3/4 | 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)**
 | P2.1f | Worksheets 2.5.1, 2.5.2 and 2.5.3; Practical sheet 2.5; Technician’s notes 2.5 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 3/4 | 2.6 | Maths skills: Making estimates of calculations | * Estimate the results of simple calucations
* Round numbers to make an estimate
* Calculate order of magnitude
 | PM2.3i to vi | Worksheets 2.6.1, 2.6.2 and 2.6.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 3/4 | 2.7 | Forces explain how objects interact **(HT)** | * Describe a force
* Recognise the difference between contact and non-contact forces
 | P2.2d, e | Worksheets 2.7.1, 2.7.2 and 2.7.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 5/6 | 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 | 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 | 5/6 | 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) | 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 | 7/8 | 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 | 7/8 | 2.12 | Required 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 | 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.
 | P2.2p | Worksheets 2.13.1, 2.13.2 and 2.13.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 9/10 | 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.
 | P2.2m, n | Worksheet 2.14; Practical sheets 2.14.1 and 2.14.2; Technician’s notes 2.14 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 9/10 | 2.15 | Understanding power | * Define power.
* Compare the rate of energy transfer by various machines and electrical appliances.
* Calculate power.
 | P2.2o | Worksheet 2.15; Practical sheets 2.15 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 | * 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.
 | KC | Practical sheets 2.16.1, 2.16.2 and 2.16.3; Technician’s notes 2.16 | Quick starter Homework worksheetHomework quiz |
| 9 | 2 | 11/12 | 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 quiz |
| 9 | 2 | 11/12 | 2.18 | Required 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 | 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 | Worksheet 2.19; Practical sheet 2.19; Technician’s notes 2.19 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 1/2 | 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, j | 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 | 3 | 1/2 | 2.21 | Moments | * Describe the turning effect of a force about a pivot.
* Explain and use the principle of moments.
* Explain what is meant by the centre of mass of an object.
 | P2.3k, l | Worksheets 2.21.1, 2.21.2 and 2.21.3; Practical sheet 2.21; Technician’s notes 2.21 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 1/2 | 2.22 | Levers and gears | * Describe how levers and gears can be used to transmit the rotational effect of a force.
* Explain how levers and gears transmit forces.
 | P2.3m | Worksheets 2.22.1, 2.22.2 and 2.22.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 3/4 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins ConnectEnd of teaching block test Collins Connect |
| **Chapter 3: Electricity (14 lessons)** |
| 9 | 3 | 3/4 | 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 quiz |
| 9 | 3 | 3/4 | 3.2 | Electric fields and currents | * 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.
* Recall that an electric current is a rate of flow of electric charge
 | P3.1d | Worksheets 3.2.1, 3.2.2 and 3.2.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 5/6 | 3.3 | Electric currents 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.
 | P3.1e, f, g | Worksheets 3.3.1, 3.3.2, 3.3.3 and 3.3.4 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 5/6 | 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 quiz |
| 9 | 3 | 5/6 | 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 | Practical sheet 3.5; Technician’s notes 3.5 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 7/8 | 3.6 | Required practical: Use circuit diagrams to set up and check appropriate circuits for investigating resistance | * Use a circuit to determine resistance.
* Gather valid data to use in calculations.
* Apply the circuit to determine the resistance of combinations of components.
 | P3.2h, k (part) | Practical sheet 3.6 Technician’s notes 3.6 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 7/8 | 3.7 | Investigating circuits | * Classify materials as either conducting or insulating.
* 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 | 7/8 | 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 | 9/10 | 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 | 9/10 | 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 | 9/10 | 3.11 | Required practical: Investigating series and parallel circuits | * Use series circuits to test components and make measurements.
* Carry out calculations on series circuits.
 | PRAC P7 | Worksheet 3.11; Practical sheets 3.11.1, 3.11.2 and 3.11.3; Technician’s notes 3.11 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 11/12 | 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.
 | P3.2 c, i | Worksheet 3.12, Practical sheets 3.12.1, 3.12.2 and 3.12.3, Technician’s notes 3.12 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 11/12 | 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 =, <, <<, >>, >, ~.

 |  | Worksheets 3.13.1, 3.13.2 and 3.13.3 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 11/12 | 3.14 | Maths skills: Using formulae andunderstanding graphs | * Recognise how algebraic equations define the relationships between variables
* Solve simple algebraic equations by substituting numerical values
* Describe relationships expressed in graphical form.
 |  | Worksheets 3.14.1, 3.14.2 and 3.14.3; Practical sheet 3.14; Technician’s notes 3.14 | Quick starter Homework worksheetHomework quiz |
| 9 | 3 | 11/12 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins Connect |
| **Chapter 4: Magnetism and magnetic fields (10 lessons)** |
| 10 | 1 | 1/2 | 4.1 | 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.
 | P4.1a, b | Worksheet 4.1; Practical sheet 4.1; Technician’s notes 4.1; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 1/2 | 4.2 | Compasses and magnetic fields | * Describe the Earth’s magnetic field.
* Describe the magnetic effect of a current.
 | P4.1c, d, e, f | Worksheet 4.2; Practical sheet 4.2; Technician’s notes 4.2; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 1/2 | 4.3 | Magnetic effects **(HT)** | * Draw the magnetic field around a conducting wire and a solenoid.
* Describe the force on a wire in a magnetic field. **(HT)**
* Apply the left-hand rule to work out the direction of a magnetic field, a current or a force around a wire. **(HT)**
 | P4.1g | Worksheets 4.3.1 and 4.3.2; Practical sheet 4.3; Technician’s notes 4.3; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 3/4 | 4.4 | 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.
 | P4.2c | Worksheets 4.4.1 and 4.4.2; Technician’s notes 4.4; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 3/4 | 4.5 | The generator effect **(HT only)** | * Describe how a current is induced in a wire when it moves in a magnetic field.
* Identify the factors that affect the size and direction of the induced current or induced potential difference.
 | P4.2e | Worksheet 4.5; Practical sheet 4.5; Technician’s notes 4.5; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 3/4 | 4.6 | 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.
 | P4.2d | Worksheets 4.6.1 and 4.6.2; Practical sheet 4.6; Technician’s notes 4.6; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 5/6 | 4.7 | Generators and transformers **(HT only)** | * Explain how an alternator generates alternating current.
* For an alternator, draw and interpret graphs of potential difference generated in the coil against time.
* Understand how induced alternating electric currents are used in transformers.
* Apply the transformer equation linking the numbers of turns and the potential differences induced.
 | P4.2g | Worksheets 4.7.1, 4.7.2 and 4.7.3, Practical sheet 4.7, Technician’s notes 4.7; PowerPoint 4.7 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 5/6 | 4.8 | Loudspeakers and microphones **(HT only)** | * Describe how a moving-coil loudspeaker works.
* Compare loudspeakers and headphones.
* Describe how a moving-coil microphone works.
 | P4.2j | Worksheets 4.8.1 and 4.8.2; Technician’s notes 4.8; PowerPoint presentation 4.8 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 5/6 | 4.9 | Key concept: The link between electricity and magnetism **(HT only)** | * Explore how electricity and magnetism are connected.
* Describe how electromagnetic induction occurs.
* Describe the principle of the electric motor.
 | Key concept | Worksheets 4.9.1 and 4.9.2; Practical sheets 4.9.1, 4.9.2, 4.9.3 and 4.13.4; Technician’s notes 4.9; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 7/8 | 4.10 | Maths skills: Rearranging equations **(HT only)** | * Know how to rearrange equations.
* Know how to use the transformer equation.
* Know how to calculate the force on a conductor.
 | P4.2h, i | Worksheets 4.10.1 and 4.10.2 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 7/8 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins ConnectEnd of teaching block test Collins ConnectEnd of year test Collins Connect |
| **Chapter 5: Waves in matter (19 lessons)** |
| 10 | 1 | 7/8 | 5.1 | Describing waves | * Describe wave motion.
* Define wavelength and frequency.
* Apply the relationship between wavelength, frequency and wave velocity.
 | P5.1a, b, c, d | Worksheets 5.1.1, 5.1.2, 5.1.3, 5.1.4 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 9/10 | 5.2 | 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.
 | P5.1e, f, k | Worksheets 5.2.1, 5.2.2 and 5.2.3; PowerPoint presentation | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 9/10 | 5.3 | Reflection and refraction of waves | * Describe reflection, transmission and absorption of waves.
* Construct ray diagrams to illustrate reflection.
* Construct ray diagrams to illustrate refraction.
 | P5.1g | Worksheets 5.3.1, 5.3.2 and 5.3.3; Practical sheets 5.3.1, 5.3.2 and 5.3.3; Technician’s notes 5.3.1 and 5.3.2 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 9/10 | 5.4 | Sound waves **(HT only)** | * Describe how we hear sound and state the range of frequencies we can hear.
* Explain that sound travels faster in a denser medium.
* Explain about reflection, absorption and transmission of sound.
 | P5.1h, i | Worksheets 5.4.1, 5.4.2  | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 11/12 | 5.5 | Exploring ultrasound **(HT)** | * Explain what ultrasound is
* Describe how ultrasound can be used in industry to investigate or detect hidden or buried objects.
* Explain how ultrasound is used in medicine.
 | P5.2i | Worksheets 5.5.1 and 5.5.2 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 11/12 | 5.6 | Required 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.
 | P5.1j | Practical sheet 5.6; Technician’s notes 5.6 | Quick starter Homework worksheetHomework quiz |
| 10 | 1 | 11/12 | 5.7 | 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.
 | PM5.1i | Worksheets 5.7.1, 5.72 and 5.7.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 1/2 | 5.8 | 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.
 | KC | Worksheet 5.8 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 1/2 | 5.9 | 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.
 | P5.2a, b, c, d, e, f | Worksheets 5.9.1, 5.9.2 and 5.9.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 1/2 | 5.10 | Gamma rays and X-rays **(HT)** | * List the properties of gamma rays and X-rays.
* Compare gamma rays and X-rays. **(HT)**
 | P5.2g (part), h | Worksheets 5.10.1, 5.10.2 and 5.10.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 3/4 | 5.11 | 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.
 | P5.2g (part), h (part) | Worksheet 5.11; Practical sheet 5.11; Technician’s notes 5.11 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 3/4 | 5.12 | Microwaves **(HT)** | * List some properties of microwaves.
* Describe how microwaves are used for communications.
 | P5.2g (part), i (part) | Worksheet 5.12 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 3/4 | 5.13 | 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)**
 | P5.2g (part), j | Worksheets 5.13.1, 5.13.2 and 5.13.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 5/6 | 5.14 | 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.
 | P5.3a (part), b | Worksheets 5.14.1, 5.14.2 and 5.14.3; Practical sheet 5.14; Technician’s notes 5.14 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 5/6 | 5.15 | Required practical: Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface **(HT only)** | * Explain reasons for the equipment used to carry out an investigation.
* Explain the rationale for carrying out an investigation.
* Apply ideas from an investigation to a range of practical contexts.
 | P5.3a (part) | Practical 5.15, Technician’s notes 5.15 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 5/6 | 5.16 | Required 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.
 | P5.3c (part) | Worksheets 5.16.1 and 5.16.2; Practical sheets 5.16.1, 5.16.2, 5.16.3 and 5.16.4; Technician’s notes 5.1 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 7/8 | 5.17 | Lenses | * Understand what a lens does.
* Draw ray diagrams to show the formation of images by lenses.
* Describe the difference between a real and a virtual image.
 | P5.3c (part) | Worksheets 5.17.1, 5.17.2 and 5.17.3; Technician’s notes 5.17 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 7/8 | 5.18 | Images and magnification | * Draw ray diagrams to show the formation of real and virtual images by lenses.
* Calculate the magnification of an image.
 | P5.3c (part) | Worksheets 5.18.1, 5.18.2 and 5.18.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 7/8 | 5.19 | Colour | * Describe what happens when light of different wavelengths lands on an object.
* Explain what determines the colour of an opaque object.
* Explain the effect of coloured filters.
 | P5.3e | Worksheets 5.19.1, 5.19.2 and 5.19.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 9/10 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins Connect |
| **Chapter 6: Radioactivity (12 lessons)** |
| 10 | 2 | 9/10 | 6.1 | Atomic structure | * Describe the structure of the atom.
* Use symbols to represent particles.
* Describe ionisation.
 | P6.1a, b, c, h | Worksheets 6.1.1, 6.1.2 and 6.1.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 9/10 | 6.2 | Radioactive decay | * Describe radioactive decay.
* Describe the types of nuclear radiation.
* Understand the processes of alpha decay and beta decay.
 | P6.1d, e | Worksheets 6.2.1, 6.2.2 and 6.2.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 11/12 | 6.3 | Nuclear equations | * Understand nuclear equations.
* Write balanced nuclear equations.
 | P6.1f, g | Worksheets 6.3.1, 6.3.2 and 6.3.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 11/12 | 6.4 | Radioactive half-life **(HT)** | * Explain what is meant by radioactive half-life.
* Calculate half-life. **(HT)**
* Choose the best radioisotope for a task.
 | P6.1j | Worksheets 6.4.1, 6.4.2 and 6.4.3; Practical sheet 6.4; Technician’s notes 6.4 | Quick starter Homework worksheetHomework quiz |
| 10 | 2 | 11/12 | 6.5 | Background radiation | * Recall sources of background radiation.
* Describe how different types of radiation have different ionising power.
 | P6.1l | Worksheets 6.5.1, 6.5.2 and 6.5.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 1/2 | 6.6 | Maths skills: Using ratios and proportional reasoning **(HT)** | * Draw a curve of best fit to calculate radioactive half-life.
* Calculate the net decline **(HT)**
 | M1c, M3c |  | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 1/2 | 6.7 | Hazards and uses of radiation | * Describe radioactive contamination.
* Give examples of how radioactive tracers can be used.
 | P6.2a (part), b, c (part) | Worksheets 6.7.1, 6.7.2 and 6.7.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 1/2 | 6.8 | Irradiation | * Explain what is meant by irradiation.
* Understand the distinction between contamination and irradiation.
* Appreciate the importance of communication between scientists.
 | P6.2a (part) | Worksheets 6.8.1, 6.8.2 and 6.8.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 3/4 | 6.9 | Uses of radiation in medicine | * Compare gamma rays and X-rays.
* Describe some uses of nuclear radiation for medical diagnosis and therapy.
 | P6.2c | Worksheets 6.9.1, 6.9.2, 6.9.3 and 6.9.4 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 3/4 | 6.10 | 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.
 | P6.2c | Worksheets 6.10.1, 6.10.2 and 6.10.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 3/4 | 6.11 | Nuclear fission | * Describe nuclear fission.
* Explain how a chain reaction occurs.
* Explain how fission is used.
 | P6.2d | Worksheets 6.11.1, 6.11.2 and 6.11.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 5/6 | 6.12 | Nuclear fusion | * Explain nuclear fusion.
* Describe the conditions needed for fusion.
* Describe how nuclear fusion may be an attractive energy source.
 | P6.2e | Worksheet 6.12  | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 5/6 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins ConnectEnd of teaching block test Collins Connect |
| **Chapter 7: Energy (9 lessons)** |
| 10 | 3 | 5/6 | 7.1 | 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.
 | P7.1b (part), e (part) | Worksheets 7.1.1, 7.1.2 and 7.1.3; Practical sheets 7.1.1 and 7.1.2; Technician’s notes 7.1  | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 7/8 | 7.2 | 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.
 | P7.1b (part), c (part) | Worksheets 7.2.1, 7.2.2 and 7.2.3Practical sheets 7.1.1 and 7.1.2; Technician’s notes 7.4  | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 7/8 | 7.3 | Specific heat capacity | * Understand how things heat up.
* Find out about heating water.
* Find out about specific heat capacity.
 | P7.1c (part)  | Worksheets 7.3.1, 7.3.2 and 7.3.3; Practical sheet 7.3; Technician’s notes 7.3 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 7/8 | 7.4 | Electrical 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.
 | P7.2a, b, c | Worksheets 7.4.1, 7.4.2 and 7.4.3, Practical sheet 7.4, Technician’s notes 7.4 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 9/10 | 7.5 | 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.
 | P7.2a, g | Worksheets 7.5.1, 7.5.2 and 7.5.3, Practical sheets 7.5.1, and 7.5.2, Technician’s notes 7.5 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 9/10 | 7.6 **(HT)** | Energy efficiency | * Explain what is meant by energy efficiency.
* Calculate the efficiency of energy transfers.
* Find out about conservation of energy. **(HT)**
 | P7.1a | Worksheets 7.6.1 and 7.6.2, one of Practical sheets 7.6.1–7.6.4  | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 9/10 | 7.7 | Required practical: Investigating ways of reducing the unwanted energy transfers in a system | * Use scientific ideas to make predictions
* Analyse data to identify trends.
* Evaluating an experimental procedure.
 | P7.2f | Worksheet 7.7; Practical sheet 7.7; Technician’s notes 7.7 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 11/12 | 7.8 | 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.
 | KC | Worksheet 7.8, Practical sheets 7.8.1 and 7.8.2, Technician’s notes 7.8.1 and 7.8.2 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 11/12 | 7.9 | Maths skills: Calculations using significant figures | * Substitute numerical values into equations and use appropriate units.
 |  | Worksheets 7.9.1, 7.9.2 and 7.9.3, Technician’s notes 7.9 | Quick starter Homework worksheetHomework quiz |
| 10 | 3 | 11/12 | **Assessment** | End of chapter test Student BookEnd of chapter test Collins Connect |
| **Chapter 8: Global challenges (15 lessons)** |
| 11 | 1 | 1/2 | 8.1 | Keeping safe on the road **(HT)** | * Explain the factors that affect stopping distance.
* Explain the dangers caused by large deceleration.
* Estimate the forces involved in the deceleration of a road vehicle. **(HT)**
* Apply the idea of rate of change of momentum to explain safety features. **(HT)**
 | P8.1d, e, f, g, h, i | Worksheets 8.1.1, 8.1.2 and 8.1.3 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 1/2 | 8.2 | Transmitting electricity **(HT)** | * Describe how electricity is transmitted using the National Grid.
* Explain why electrical power is transmitted at high potential differences.
* Understand the role of transformers.
 | P8.2c, d, e | Worksheet 8.2 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 1/2 | 8.3 | 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.
 | P8.2b | Worksheet 8.3, Practical sheet 8.3, Technician’s notes 8.3 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 3/4 | 8.4 | Global energy supplies | * Analyse global trends in energy use.
* Understand what the issues are when using energy resources.
 | P8.2b | Worksheets 8.4.1, 8.4.2 and 8.4.3, Practical sheet 8.4, Technician’s notes 8.4 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 3/4 | 8.5 | 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.
 | P8.2g, h, i, j | Worksheets 8.5.1, 8.5.2 and 8.5.3 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 3/4 | 8.6 | Red-shift  | * Describe red-shift.
* Describe evidence for the expanding Universe.
 | P8.3a, b  | Worksheet 8.6, Practical sheet 8.6, Technician’s notes 8.6  | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 5/6 | 8.7 | The Sun and other stars | * Describe how the Sun and other stars formed.
* Describe the nuclear fusion reactions in the Sun.
 | P8.7c | Worksheet 8.7, Practical sheet 8.7, Technician’s notes 8.7 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 5/6 | 8.8 | Emission and absorption of infrared radiation | * Realise that all bodies emit and absorb infrared radiation.
* Compare emission and absorption of radiation from different surfaces.
* Define a perfect black body.
* Explain that the intensity and distribution of wavelengths of any emission depend on the temperature of the body.
 | P8.3d | Worksheets 8.8.1, 8.8.2 and 8.8.3, Practical sheet 8.8, Technician notes 8.8 | Quick starter Homework worksheetHomework quiz Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 5/6 | 8.9 | The Solar System | * Describe the orbits of planets and moons in the Solar System.
* Distinguish between planets, dwarf planets and moons.
 | P8.3e (part) | Worksheet 8.9, Practical sheets 8.9.1, 8.9.2 and 8.9.3, Technician’s notes 8.9 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 7/8 | 8.10 | Orbits of planets, moons and artificial satellites **(HT)** | * Compare the orbital motion of moons, artificial satellites and planets in the Solar System.
* Describe what keeps bodies in orbit around planets and stars.
* Explain how for circular orbits an object can have a changing velocity but unchanged speed. **(HT)**
* Explain why bodies must move at a particular speed to stay in orbit at a particular distance. **(HT)**
 | P8.3e (part), f, g | Worksheet 8.10, Practical sheets 8.10.1 and 8.10.2, Technician’s notes 8.10.1 and 8.10.2 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 7/8 | 8.11 | Gravity: the force that binds the Universe | * Understand that gravity provides the force that keeps planets and satellites in orbits.
* Understand that gravity is necessary at the start of a star’s life cycle and to maintain equilibrium in a star.
* Describe how the weight of an object depends on the gravitational field strength.
* Recognise that there is still much about the universe that is not understood, e.g dark mass and dark energy.
 | KC | Worksheet 8.11, Practical sheets 8.11.1 and 8.11.2, Technician’s notes 8.11.1 and 8.11.2 | Quick starter Homework worksheetHomework quiz  |
| 11 | 1 | 7/8 | 8.12 | Temperature of the Earth | * Describe how the atmosphere absorbs radiation in a way that varies with wavelength.
* List the factors affecting the temperature of the Earth.
* Explain how the temperature of an object is related to the radiation absorbed and radiation emitted.
 | P8.3h | Worksheets 8.12.1, 8.12.2, 8.12.3 and 8.12.4 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 9/10 | 8.13 | 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.
 | P8.3i (part) | Worksheets 8.13.1, 8.13.2 and 8.13.3, Practical sheet 8.13, Technician’s notes 8.13 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 9/10 | 8.14 | Seismic waves **(HT only)** | * Describe how earthquakes are detected.
* Describe the properties of P waves and S waves.
* Explain how the properties of seismic waves allow us to investigate the inside of the Earth.
 | P8.3i (part) | Worksheets 8.14.1, 8.14.2 and 8.14.3 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 9/10 | 8.15 | Maths skills: Using scale and standard | * Understand the scale of objects in the Universe.
* Use standard form.
 |  | Worksheet 8.15 | Quick starter Homework worksheetHomework quiz |
| 11 | 1 | 11/12 | **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 |