| **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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 9 | 1 | 9/10 | 1.13 | 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. | P1.3d, e | Worksheet 1.13; Practical sheet 1.13; Technician’s notes 1.13 | Quick starter  Homework worksheet  Homework quiz |
| 9 | 1 | 9/10 | 1.14 | Pressure in a fluid | * Explain how pressure acts in a fluid. * Calculate pressure at different depths in a liquid. * Explain what causes upthrust. | 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 9 | 1 | 11/12 | **Assessment** | | End of Chapter test Student Book  End 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 9 | 2 | 3/4 | 2.5 | Velocity–time graphs | * Draw velocity–time graphs. * Calculate acceleration using a velocity–time graph. * Calculate displacement using a velocity–time graph. | 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 worksheet  Homework 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 worksheet  Homework quiz |
| 9 | 2 | 3/4 | 2.7 | Forces explain how objects interact | * 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 worksheet  Homework quiz |
| 9 | 2 | 5/6 | 2.8 | Forces and motion | * 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 worksheet  Homework quiz |
| 9 | 2 | 5/6 | 2.9 | Resultant forces | * 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. | P2.2e (part), g, h (part) | Worksheets 2.9.1, 2.9.2 and 2.9.3 | Quick starter  Homework worksheet  Homework quiz |
| 9 | 2 | 5/6 | 2.10 | 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. | P2.2i, j | Practical sheets 2.10.1, 2.10.2 and 2.10.3; Technician’s notes 2.10 | Quick starter  Homework worksheet  Homework quiz |
| 9 | 2 | 7/8 | 2.11 | Momentum | * 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 9 | 3 | 3/4 | **Assessment** | | End of chapter test Student Book  End of chapter test Collins Connect  End 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 9 | 3 | 11/12 | 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. |  | Worksheets 3.14.1, 3.14.2 and 3.14.3; Practical sheet 3.14; Technician’s notes 3.14 | Quick starter  Homework worksheet  Homework quiz |
| 9 | 3 | 11/12 | **Assessment** | | End of chapter test Student Book  End 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 1 | 1/2 | 4.3 | Magnetic effects | * Draw the magnetic field around a conducting wire and a solenoid. * Describe the force on a wire in a magnetic field. * Apply the left-hand rule to work out the direction of a magnetic field, a current or a force around a wire. | P4.1g | Worksheets 4.3.1 and 4.3.2; Practical sheet 4.3; Technician’s notes 4.3; PowerPoint presentation | Quick starter  Homework worksheet  Homework quiz |
| 10 | 1 | 3/4 | 4.4 | Calculating the force on a conductor | * 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 worksheet  Homework quiz |
| 10 | 1 | 3/4 | 4.5 | The generator effect | * 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 worksheet  Homework quiz |
| 10 | 1 | 3/4 | 4.6 | Electric motors | * 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 worksheet  Homework quiz |
| 10 | 1 | 5/6 | 4.7 | Generators and transformers | * 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 worksheet  Homework quiz |
| 10 | 1 | 5/6 | 4.8 | Loudspeakers and microphones | * 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 worksheet  Homework quiz |
| 10 | 1 | 5/6 | 4.9 | Key concept: The link between electricity and magnetism | * 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 worksheet  Homework quiz |
| 10 | 1 | 7/8 | 4.10 | Maths skills: Rearranging equations | * 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 worksheet  Homework quiz |
| 10 | 1 | 7/8 | **Assessment** | | End of chapter test Student Book  End of chapter test Collins Connect  End of teaching block test Collins Connect  End 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 1 | 9/10 | 5.4 | Sound waves | * 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 worksheet  Homework quiz |
| 10 | 1 | 11/12 | 5.5 | Exploring ultrasound | * 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 2 | 1/2 | 5.10 | Gamma rays and X-rays | * List the properties of gamma rays and X-rays. * Compare gamma rays and X-rays. | P5.2g (part), h | Worksheets 5.10.1, 5.10.2 and 5.10.3 | Quick starter  Homework worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 2 | 3/4 | 5.12 | Microwaves | * List some properties of microwaves. * Describe how microwaves are used for communications. | P5.2g (part), i (part) | Worksheet 5.12 | Quick starter  Homework worksheet  Homework quiz |
| 10 | 2 | 3/4 | 5.13 | Radio and microwave communication | * 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. | P5.2g (part), j | Worksheets 5.13.1, 5.13.2 and 5.13.3 | Quick starter  Homework worksheet  Homework quiz |
| 10 | 2 | 5/6 | 5.14 | Reflection, refraction and wave fronts | * 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 worksheet  Homework 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 | * 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 2 | 9/10 | **Assessment** | | End of chapter test Student Book  End 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 2 | 11/12 | 6.4 | Radioactive half-life | * Explain what is meant by radioactive half-life. * Calculate half-life. * 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 3 | 1/2 | 6.6 | Maths skills: Using ratios and proportional reasoning | * Draw a curve of best fit to calculate radioactive half-life. * Calculate the net decline | M1c, M3c |  | Quick starter  Homework worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 3 | 5/6 | **Assessment** | | End of chapter test Student Book  End of chapter test Collins Connect  End 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 3 | 9/10 | 7.6 | Energy efficiency | * Explain what is meant by energy efficiency. * Calculate the efficiency of energy transfers. * Find out about conservation of energy. | P7.1a | Worksheets 7.6.1 and 7.6.2, one of Practical sheets 7.6.1–7.6.4 | Quick starter  Homework worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 10 | 3 | 11/12 | **Assessment** | | End of chapter test Student Book  End of chapter test Collins Connect | | | |
| **Chapter 8: Global challenges (15 lessons)** | | | | | | | | |
| 11 | 1 | 1/2 | 8.1 | Keeping safe on the road | * 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. * Apply the idea of rate of change of momentum to explain safety features. | P8.1d, e, f, g, h, i | Worksheets 8.1.1, 8.1.2 and 8.1.3 | Quick starter  Homework worksheet  Homework quiz |
| 11 | 1 | 1/2 | 8.2 | 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. | P8.2c, d, e | Worksheet 8.2 | Quick starter  Homework worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz Quick starter  Homework worksheet  Homework 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 worksheet  Homework quiz |
| 11 | 1 | 7/8 | 8.10 | Orbits of planets, moons and artificial satellites | * 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. * Explain why bodies must move at a particular speed to stay in orbit at a particular distance. | 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 worksheet  Homework 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 worksheet  Homework 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 worksheet  Homework quiz |
| 11 | 1 | 9/10 | 8.13 | Measuring wave speeds | * 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 worksheet  Homework quiz |
| 11 | 1 | 9/10 | 8.14 | Seismic waves | * 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 worksheet  Homework 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 worksheet  Homework quiz |
| 11 | 1 | 11/12 | **Assessment** | | End of chapter test Student Book  End of chapter test Collins Connect  End of teaching block test Collins Connect  End of year test Collins Connect  End of course test Collins Connect | | | |