Holy Family Catholic School – Faculty of Science and Physiology Science Autumn Term 1 Year 9

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
Week 1 Lesson 1						
Week 1 Lesson 2 How do forces affect objects and the way they move? P5 L1 introduction to forces.pptx	resultant force, normal reaction force, weight, upthrust, friction, drag	Mechanics	KS2 ideas of forces as pushes and pulls. Some names may be already known	1. Name different forces, such as weight, friction, upthrust, drag. 2. Identify the forces acting on moving and stationary objects, and the directions in which they act. 3. Explain the effects of balanced and unbalanced forces in a range of situations. 4. Use scale drawings to find the resultant of forces in two dimensions.	A book is resting on a table. Which statement is correct? **A.** Gravity acts downwards and the table exerts an equal normal reaction force upwards. ✅ **B.** No forces act because the book is not moving. **C.** Gravity is larger than the normal reaction force. **D.** The normal reaction force causes the weight.	A student has drawn force arrows on this hamster. Give students WWW and EBI feedback and correct their diagram.
Week 1 Lesson 3 How do we calculate speed? What is Speed.pptx	speed, distance, time, equation!	Mechanics	possible that speed has been covered before	1. Know common speeds 2. Explain how the distance travelled and the time taken affects the speed. 3. Use the formula relating speed, distance and time.	Two students travel the same distance. Student A takes 10 s and Student B takes 20 s. Which is correct? **A.** Student A is travelling twice as fast as Student B. ✅ **B.** Student A is travelling half as fast as Student B. **C.** They have the same speed because they	You want to find the speed of a racing tortoise. Describe what you need in order to be able to calculate the speed of the tortoise. Describe how you would take the measurements.

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					travelled the same distance. **D.** Speed cannot be calculated without knowing mass.	
Week 2 Lesson 1 How do we draw and interpret distance time graphs? P5 L3 Distance time graphs.pptx	gradient	Mechanics	speed distance time relationship. Note that velocity and displacement are not covered	1. Calculate speeds from the gradient of a distance–time graph. 2. Calculate the relative speed between two objects moving along the same line. 3. Represent simple journeys on a distance–time graph. 4. Describe changes of speed shown on a distance–time graph. 5. Explain what relative speed means. 6. Work out the direction of relative motion for objects not moving along the same line.	On a distance-time graph, a horizontal line means: **A.** The object is travelling at a constant speed. **B.** The object is accelerating. **C.** The object is stationary. ✅ **D.** The object is moving back towards the start.	Looking at the graph, answer the following questions. What is the speed during the first 20 seconds? How far is the object from the start after 60 seconds? What is the speed during the last 40 seconds? When was the object travelling the fastest?
Week 2 Lesson 2 How can you increase the size of a force?	pivot, effort, load, lever	Mechanics	What forces do pushes and pulls	1. Describe how a simple lever can magnify force or distance. 2. Identify the pivot, load and effort in Class 1 levers. 3. Explain how levers are	Which change will make it easier to lift a heavy load with a lever? **A.** Move the effort closer to the pivot.	Describe three devices that use levers to work. These could be ones you have seen in the lesson, ones at home or ones from the list below: A shower control lever, a spanner,

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Levers.pptx				used in common devices. 4. Identify the pivot, load and effort in Class 2 and Class 3 levers.	**B.** Move the load closer to the pivot. ✅ **C.** Move both the load and effort closer to the pivot. **D.** Increase the mass of the lever.	a door handle, cooker controls
Week 2 Lesson 3 How do Moments and Balance make it easier to move things? moments FM.pptx	moment, clockwise, anticlockwise	Mechanics	ideas of forces pushing down on a see-saw from childhood	1. State what is meant by a moment of a force and recall its units. 2. Recall that an object will balance if the moments are equal and opposite. 3. Describe the factors that affect the size of a moment.	Two forces produce equal-sized moments in opposite directions. What will happen? **A.** The object will turn clockwise. **B.** The object will turn anticlockwise. **C.** The object will be balanced. ✅ **D.** The object will move upwards.	Stick in the Garfield and Odie picture. Choose numbers for the forces and distances that will be balanced. Explain why the two characters are balanced on the see-saw using the idea of "moments"
Week 3 Lesson 1 **How do simple machines use pulleys and gears?** **9J_Pulleys and Gears_SDD.pptx**	**moment, clockwise, anticlockwise**	**Mechanics**	**moments and forces**	**1. Explain how gears work using ideas about moments** **2. Describe how a ramp or a simple pulley system can reduce the force needed to lift an object.** **3. Recall that if the force needed is decreased the**	**A small gear drives a larger gear. Compared with the small gear, the larger gear will:** **A. Rotate faster.** **B. Rotate slower.** ✅ **C. Rotate at the same speed.** **D. Not rotate at all.**	**Complete the evaluation of the practical carried out.**

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				distance it moves is increased.		
Week 3 Lesson 2 Which energy stores can be used to move things? Energy-Transfers-review.pptx	Energy, transfer, useful, wasted, dissipate, conservation	Mechanics	energy transfers, conservation fo energy, efficiency	1. Recall the different ways in which energy can be transferred and stored. 2. Identify situations in which energy is stored or in which an energy transfer is taking place. 3. Identify useful and wasted energies. 4. Recall the law of conservation of energy. 5. Describe the factors that affect an object's kinetic energy and gravitational potential energy.	A cyclist slows down because of friction. What happens to the cyclist's kinetic energy? **A.** It disappears. **B.** It is destroyed. **C.** It is transferred to thermal energy stores. ✅ **D.** It is converted into mass.	Write a descriptive paragraph to explain the energy transfer(s) in the image of a cyclist. Then peer assess.
Week 3 Lesson 3 How can we calculate work done? DNG_WORK_DONE.pptx	Energy Joule Distance Metres Force Newtons Equation	Mechanics	energy stores, rearranging equations	1. Describe the relationship between work done and energy transferred. 2. Describe the factors that affect the total work done. 3. Work out the mechanical advantage of simple machines. 4. Explain why the actual	A force acts on a box, but the box does not move. How much work is done on the box? **A.** A lot of work. **B.** Some work. **C.** It depends on the mass. **D.** Zero work is done. ✅	Walking up a flight of stairs, what are the energy transfers? When you roll a ball down a hill what are the energy transfers? What is the work done when a force of 5kN is applied to a ball and it moves 0.8km? What is the work done to a car if a force of 9kN is applied and it

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				mechanical advantage may not be the same as the theoretical value. 5. Use the idea that a force can be represented by two orthogonal forces.		moves 7km? What force is required if 2.5kJ moves and object 56cm?
Week 4 Lesson 1 How do temperature differences make things happen? Changing temperature.pptx	Temperature, Thermometer, Kinetic, Thermal, Degrees Celsius	Mechanics	energy stores	1. Recall what is meant by temperature differences 2. Describe how temperature differences can cause convection currents 3. State the meanings of latent heat and specific heat capacity	Why does warm air rise? **A.** Warm air has more mass. **B.** Warm air particles move faster and spread out, making the air less dense. ✅ **C.** Gravity pushes warm air upwards. **D.** Cold air pulls warm air up.	Design an experiment to find out if sweat can help to cool you down.
Week 4 Lesson 2 How is the idea of a field used in physics? 1. Fields.pptx	field, magnetic, gravitational, charge	Mechanics	forces are a push or pull. forces can be contact or non contact	1. Recall what is meant by a field 2. Understand how fields are used in physics 3. Model force fields using diagrams and interpret them	Which statement about a gravitational field is correct? **A.** It only acts when objects touch. **B.** It acts around objects with mass. ✅ **C.** It only exists on Earth. **D.** It can only attract charged objects.	A student stands on the ground with an egg in his hand. He throws the egg vertically upwards. The egg rises to a height of 10 m. Then the egg falls and lands on the ground. Describe the energy changes of the egg during this sequence of events. [6 marks]

Holy Family Catholic School – Faculty of Science and Physiology Science Autumn Term 1 Year 9

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Week 4 Lesson 3 How are causes linked to effects? 2. Cause and Effect.pptx	cause and effect	Mechanics	force pairs, reaction forces, predictions and conclusions	1. Recall that gravity is a force that acts between any two objects with a mass 2. Identify action-reaction pairs in simple situations 3. Apply the cause and effect to everyday occurrences	A swimmer pushes water backwards. What happens next? **A.** The water pushes the swimmer forwards. ✅ **B.** The swimmer moves forwards with no force acting. **C.** The water moves backwards but exerts no force. **D.** The swimmer's force disappears.	Spot the effect challenge. Scenario 1: What effect does the osprey have on the fish? What effect does the fish have on the osprey? What effects do the osprey and the air have on each other? Scenario 2: What effects do the gymnast and the Earth have on each other? What effects do the bars and the floor have on each other? What effects will the gymnast and the bar have on each other when she grabs the bar?
Week 5 Lesson 1 How can variables be related mathematically? 3. Variables in graphing.pptx	linear, proportional, graph, plot, gradient, line of best fit	Mechanics	drawing graphs, describing graphs	1. Identify linear and proportional relationships from graphs 2. Develop skills in representing scientific data graphically 3. Draw graphs from given data	Which graph shows a proportional relationship? **A.** Any straight-line graph. **B.** A curved graph through the origin. **C.** A straight line passing through the origin. ✅ **D.** A horizontal line.	Draw a graph for the given data set. Describe the graph. Swap and peer assess the graphs using the success criteria.

Holy Family Catholic School – Faculty of Science and Physiology Science Autumn Term 1 Year 9

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Week 5 Lesson 2 How are models used in science? 4. Models.pptx	model, physical, mathematical, conceptual	Mechanics	recall of models used in science (particle, atoms, electricity)	1. Define what a scientific model is and give examples. 2. Describe why scientists use models. 3. Identify the strengths and limitations of a scientific model. 4. Compare different types of models (e.g., physical, mathematical, diagrammatic). 5. Evaluate a model used in a scientific context.	Which statement best describes a scientific model? **A.** It is an exact copy of reality. **B.** It is always physical. **C.** It helps explain or predict scientific ideas but has limitations. ✅ **D.** It can never be changed when new evidence appears.	Evaluate the model in the text by answering the questions.
Week 5 Lesson 3 What are ceramics and what are their properties? 9E1 Ceramics.pptx	Ceramic properties metals non-metal	Particles and Matter Bonding and Properties	particle model, properties of known materials	1. Explain how the properties of ceramics make them useful. 2. Justify the use of a ceramic material for a given application. 3. Explain why crystal size depends on the speed of cooling. 4. Explain how the properties of a substance depend on the bonding and arrangement of atoms (in terms of strength and number of bonds only).	Ceramics are often used for bathroom tiles. Which property is MOST important for this use? A. They conduct heat easily B. They are flexible and bend without breaking C. They are hard and resistant to scratching D. They dissolve slowly in water Misconception targeted: Students think ceramics dissolve or are flexible.	Use your knowledge of solids, liquids, melting and energy to explain why ceramics have very high melting temperatures

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Week 6 Lesson 1 What are polymers and what are their properties? 9E2 Polymers.pptx	Polymers properties	Particles and Matter Bonding and Properties	particle model, properties of known materials	1. Link the properties of common plastics to their uses. 2. Explain how the properties of a substance depend on the bonding and arrangement of atoms	What are polymers (plastics) made from? A. Long chains of small molecules called monomers B. Layers of metal atoms C. Tiny crystals that grow when cooled D. Single atoms joined in a giant lattice	Use the data in the table to compare the properties of these polymers. You should use comparison words like stronger, strongest. (6 marks)
Week 6 Lesson 2 What are composites and what are their properties? 9E3 Composites.pptx	Composites properties	Particles and Matter Bonding and Properties	particle model, properties of known materials	1. Explain how the properties of composites make them useful. 2. Justify the use of a composite material for a given application.	Why are composites like fibreglass useful for building boat hulls? A. They are heavy and absorb water B. They combine materials to give strength and low weight C. They conduct electricity well D. They rust slowly in seawater Targets misconception: Composites rust or conduct electricity.	Rebecca makes 3 blocks of a composite material from cement, sand and gravel She puts different amounts of the raw materials in each block and then leaves the blocks to set. How could Rebecca compare the strengths of the different blocks? Plan an experiment to test the strength of the concrete blocks.

Holy Family Catholic School – Faculty of Science and Physiology Science Autumn Term 1 Year 9

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Week 6 Lesson 3 What problems can we come across with different materials? Lesson-6---Problems-with-fuels --formatting.pptx	Combustion Global warming Acid rain Pollution Biodegradability	Bonding and Properties The Earth and Environment	pollution, landfill, bioaccumulation of toxins	1. List types of pollution caused by making materials 2. Research different types of pollution and the problems 3. Explain solutions to tackle these problems	Hinge Question: Which option correctly identifies a type of pollution caused by material production AND its impact? A. Noise pollution — causes acid rain B. Water pollution — harms aquatic life C. Light pollution — increases carbon dioxide D. Air pollution — increases oxygen levels Targets misconception: Mixing up pollution types and effects.	Design an information leaflet summarising either, global warming, toxic substances or biodegradability.
Week 7 Lesson 1 How can we recycle materials? Lesson-7---Recycling --formatting.pptx	Recycling Pollution Biodegradability	Bonding and Properties The Earth and Environment	pollution, landfill, bioaccumulation of toxins	1. Suggest reasons why recycling is important 2. Explain and give example of three types of recycling.	Hinge Question: Which statement BEST explains why recycling metals is important? A. It creates new metal ores B. It uses less energy than extracting metals from ores C. It makes metals stronger D. It stops all pollution from metal use Targets misconception:	You have been asked to write a report for your local council on a proposed new recycling plant in your area. Use the bullet points to give you some ideas to include in your report.

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					Recycling creates ore or eliminates pollution.	
Week 7 Lesson 2 Why are some reactions explosive? Lesson-1---Explosions.pptx	Explosion Physical reaction Chemical reaction Reactants Pressure	Chemical Reactions The Earth and Environment	signs of a chemical reaction, atoms are rearranged in a chemical reaction	1. Apply knowledge of explosive reactions to explain why they occur more or less rapidly when the particle size or the oxidiser is changed. 2. Describe how some explosive mixtures obtain enough oxygen to explode. 3. Explain why energy input may be needed to start some reactions or keep them going.	Why can a sealed container explode when a gas inside it is heated? A. The gas particles get heavier and push downwards B. The gas pressure increases because particles move faster and hit the walls more often C. The container fills with new particles that appear when heated D. The pressure decreases because particles spread out and stop colliding	The particle theory states that: all matter is made up of tiny particles the particles are moving all the time. The diagram below shows gas particles in a container. Describe the movement of the particles in a gas. Explain, in terms of the particle theory, why the pressure of a gas increases as the temperature increases. Explain, in terms of the particle theory, why the pressure of a gas increases as the size of the container decreases. Explain, in terms of the particle theory, why the pressure of a gas increases as the number of gas particles in the container increases.

Holy Family Catholic School – Faculty of Science and Physiology Science Autumn Term 1 Year 9

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Week 7 Lesson 3 How can energy increase or decrease in a chemical reaction? Lesson-2---exo-and-endo.pptx	Exothermic Endothermic	Chemical Reactions Energy and Rates	energy stores and transfers, atoms are rearranged in a chemical reaction	1. Describe bond breaking and making in terms of energy transfer 2. Summarise energy changes by drawing simple energy level diagrams 3. Classify changes as exothermic or endothermic from temperature changes.	Which statement correctly describes an exothermic reaction? A. It takes in energy and the surroundings get colder B. It releases energy and the surroundings get warmer C. It takes in energy and the surroundings get warmer D. It releases energy but the temperature stays the same Misconception targeted: Students often think "exo = cold" or that temperature doesn't change.	1. Methane burns in oxygen to form carbon dioxide and water in an exothermic reaction. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ Draw a labelled energy level diagram to represent the energy change taking place during the reaction. 2. Nitrogen reacts with oxygen to form nitrogen monoxide in an endothermic reaction. $N_2 + O_2 \rightarrow 2NO$ Draw a labelled energy level diagram to represent the energy change taking place during the reaction.
Week 8 Lesson 1 How reactive are different metals? Lesson-3---Reactivity.pptx	Reactivity series Metal oxide Metal hydroxide	Chemical Reactions Energy and Rates	metals names and properties	1. Describe the reactions of metals with water, dilute acids and air 2. Explain how metals are placed in the reactivity series. 3. Explain how physical barriers and sacrificial protection prevent rusting.	A metal reacts vigorously with water. What does this tell you about its position in the reactivity series? A. It is low in the series B. It is high in the series C. It is unreactive D. It must be a transition metal Targets misconception: Water reaction = unreactive.	Three beakers were labelled A, B and C. They were half-filled with water. Beaker A contained an iron nail. Beaker B contained an iron nail with a piece of silver wire wrapped around it. Beaker C contained an iron nail with a piece of aluminium wire wrapped around it. They were left for 1 week. The results are shown below. Explain the results.

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						image [Beaker 1 - slightly rusty, Beaker 2 - very rusty., Beaker 3 - not rusty]
Week 8 Lesson 2 How does reactivity affect the reactions of different metals? Lesson-4---Displacement.pptx	Reactivity series Displacement Reaction	Chemical Reactions Energy and Rates	signs of a chemical reaction, atoms are rearranged in a chemical reaction metals names and properties	1. Explain why a displacement reaction may or may not occur. 2. Use evidence to decide whether a displacement reaction has or has not occurred. 3. Use results from displacement reactions to produce an order of reactivity.	A metal reacts very quickly with acid, producing lots of bubbles. What does this tell you about the metal? A. It is low in the reactivity series B. It is high in the reactivity series C. It is not reacting at all D. It must be a very heavy metal Misconception targeted: Students think fast reactions mean “heavy” metals or that bubbling doesn’t indicate reactivity.	Write a paragraph using your practical results to help you link reactivity and displacement.

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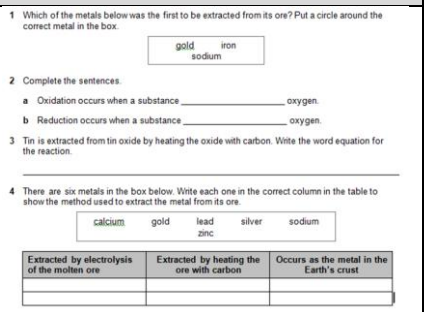
Week 8 Lesson 3 How can we extract metals? Lesson-5---Extracting-metals.pptx	Native state ores Reduced Reactivity	Chemical Reactions Energy and Rates The Earth and Environment	metals names and properties	1. Explain why some elements have been isolated for much longer than others. 2. Explain what happens in oxidation and reduction. 3. Describe how metals are extracted from their ores by heating with carbon and electrolysis.	Why can some metals (like iron) be extracted by heating their ores with carbon? A. Because carbon is more reactive than those metals B. Because carbon melts the ore C. Because the metals are found pure in the ground D. Because carbon adds oxygen to the metal Misconception targeted: Students think carbon melts or adds oxygen rather than displacing it.	 1 Which of the metals below was the first to be extracted from its ore? Put a circle around the correct metal in the box. gold iron sodium 2 Complete the sentences. a Oxidation occurs when a substance _____ oxygen. b Reduction occurs when a substance _____ oxygen. 3 Tin is extracted from tin oxide by heating the oxide with carbon. Write the word equation for the reaction. 4 There are six metals in the box below. Write each one in the correct column in the table to show the method used to extract the metal from its ore. calcium gold lead silver sodium zinc Extracted by electrolysis of the molten ore / Extracted by heating the ore with carbon / Occurs as the metal in the Earth's crust