Holy Family Catholic School – Faculty of Science & Physiology

Science Autumn Half Term 1 Year 9

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Red Zone
Week 1 Lesson 1 How do forces affect objects and the way they move?	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 student has drawn force arrows on this hamster. Give students WWW and EBI feedback and correct their diagram.
Week 1 Lesson 2 How do we calculate speed?	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.	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.
Week 1 Lesson 3 How do we draw and interpret distance time graphs?	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.	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?

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				6. Work out the direction of relative motion for objects not moving along the same line.	
Week 2 Lesson 1 How can you increase the size of a force?	pivot, effort, load, lever	**Mechanics**	What forces do pushes and pull	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 used in common devices. 4. Identify the pivot, load and effort in Class 2 and Class 3 levers.	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, a door handle, cooker controls
Week 2 Lesson 2 How do Moments and Balance make it easier to move things?	moment, clockwise, anticlockwise	**Mechanics**	ideas of forces pushing down on a seesaw 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.	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 2 Lesson 3 **Investigative Skills: What is the mystery weight?**	Moment Force distance	**Mechanics** **Thinking Like a Scientist** **Experimental and Invest. Skills** **Analysis and Evaluation**	Variables, hazards, predictions	1. State the variables of the investigation. 2. State the hazards and precautions. 3. Follow the method given. 4. Record Results. 5. Evaluate the investigation 6. Draw conclusions	Evaluate the practical.

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Week 3 Lesson 1 How do simple machines use pulleys and gears?	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 distance it moves is increased.	Complete the evaluation of the practical carried out.
Week 3 Lesson 2 Which energy stores can be used to move things?	Energy, transfer, useful, wasted, dissipate, conservation	**Mechanics**	energy transfers, conservation of 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.	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?	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	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 moves 7km? What force is required if 2.5kJ moves and object 56cm?

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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.	
Week 4 Lesson 1 How do temperature differences make things happen?	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	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?	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	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]
Week 4 Lesson 3 How are causes linked to effects?	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	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?

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Week 5 Lesson 1 How can variables be related mathematically?	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	Draw a graph for the given data set. Describe the graph. Swap and peer assess the graphs using the success criteria.
Week 5 Lesson 2 How are models used in science?	model, physical, mathematica l, 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.	Evaluate the model in the text by answering the questions.
Week 5 Lesson 3 What are ceramics and what are their properties?	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).	Use your knowledge of solids, liquids, melting and energy to explain why ceramics have very high melting temperatures
Week 6 Lesson 1	Polymers properties	Particles and Matter	particle model, properties of known materials	1. Link the properties of common plastics to their uses. 2. Explain how the properties of a	Use the data in the table to compare the properties of these polymers. You should use comparison words like stronger, strongest. (6 marks)

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What are polymers and what are their properties?		Bonding and Properties		substance depend on the bonding and arrangement of atoms	
Week 6 Lesson 2 What are composites and what are their properties?	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.	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.
Week 6 Lesson 3 What problems can we come across with different materials?	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	Design an information leaflet summarising either, global warming, toxic substances or biodegradability.
Week 7 Lesson 1 How can we recycle materials?	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.	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.
Week 7 Lesson 2 Why are some reactions explosive?	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.	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

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				3. Explain why energy input may be needed to start some reactions or keep them going.	of the particle theory, why the pressure of a gas increases as the number of gas particles in the container increases.
Week 7 Lesson 3 How can energy increase or decrease in a chemical reaction?	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.	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?	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.	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. image [Beaker 1 - slightly rusty, Beaker 2 - very rusty., Beaker 3 - not rusty]
Week 8 Lesson 2 **Investigative Skills: What is the reactivity series?**	effervescence, observation	Thinking Like a Scientist Experimental and Investigative Skills Analysis and Evaluation	metals names and properties	1. State the variables of the investigation. 2. State the hazards and precautions. 3. Follow the method given. 4. Record Results. 5. Draw a graph	Evaluate the investigation.

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				6. Evaluate the investigation 7. Draw conclusions	
Week 8 Lesson 3 **Investigative Skills: What is the reactivity series?**	effervescence, observation	Thinking Like a Scientist Experimental and Investigative Skills Analysis and Evaluation	metals names and properties	1. State the variables of the investigation. 2. State the hazards and precautions. 3. Follow the method given. 4. Record Results. 5. Draw a graph 6. Evaluate the investigation 7. Draw conclusions	Evaluate the investigation.