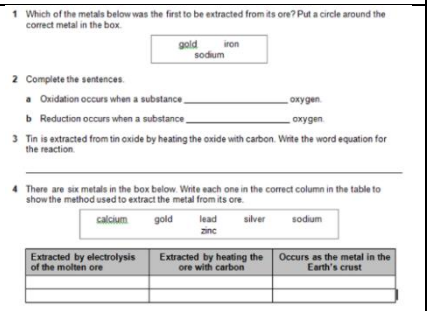
Holy Family Catholic School – Faculty of Science and Physiology

Science Autumn Half-Term 2 Year 9

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
Week 9 Lesson 1 How does reactivity affect the reactions of different metals?	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.	**Which of the following best explains whether a displacement reaction will occur?** 1. A more reactive metal will displace a less reactive metal from its compound 2. Displacement reactions happen randomly, regardless of reactivity 3. A less reactive metal can displace a more reactive metal from its salt 4. Displacement reactions only occur with gases, not metals	Write a paragraph using your practical results to help you link reactivity and displacement.
Week 9 Lesson 2 How can we extract metals?	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	**Which statement best explains why some elements were discovered earlier than others and how metals are extracted?**	 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 zinc silver sodium Extracted by electrolysis of the molten ore / Extracted by heating the ore with carbon / Occurs as the metal in the Earth's crust

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				extracted from their ores by heating with carbon and electrolysis.	1. All metals are found pure in nature and don't need extraction 2. Elements like gold were discovered early because they exist in pure form and don't require reduction 3. Oxidation is when a substance gains electrons; reduction is when it loses them 4. Electrolysis is used to extract metals that are less reactive than carbon	
Week 9 Lesson 3 How can we extract metals using electrolysis?	Electrolysis Anode Cathode Ions	Chemical Reactions Energy and Rates The Earth and Environment	metals names and properties	1. Recall that the extraction of some metals is more difficult than others, depending on the metal's reactivity 2. Describe the movement of ions in electrolysis 3. Explain why the method used to extract a metal is related to its position in the reactivity series and cost of the extraction process.	**Which of the following best explains how a metal's reactivity affects its method of extraction?** 1. All metals are extracted using electrolysis because it's the cheapest method 2. Less reactive metals are extracted using electrolysis because	Gold has been used for over 5000 years, but sodium has only been available to use for just over 200 years. Explain this difference in the length of time that gold and sodium have been used for. What extraction techniques would you use for the following metal? Explain your answer. Gold Lead

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					they don't react with carbon 3. Highly reactive metals require electrolysis because they cannot be displaced by carbon 4. Metals high in the reactivity series are easier to extract using heat alone	Zinc Aluminium
Week 10 Lesson 1 PAZ Revision of Key Content						
Week 10 Lesson 2 PAZ Assessment						
Week 10 Lesson 3 PAZ Review						
Week 11 Lesson 1 How can we extract metals using electrolysis?	Electrolysis Anode Cathode Ions	Chemical Reactions Energy and Rates The Earth and Environment	metals names and properties	1. Recall that the extraction of some metals is more difficult than others, depending on the metal's reactivity 2. Describe the movement of ions in electrolysis 3. Explain why the method used to extract a metal is related to its position in the	**Which statement best explains how a metal's reactivity affects its extraction method and the role of electrolysis?** 1. Metals low in the reactivity series are extracted using electrolysis because it's cheaper	Gold has been used for over 5000 years, but sodium has only been available to use for just over 200 years. Explain this difference in the length of time that gold and sodium have been used for. What extraction techniques would you use for the following metal? Explain your answer. Gold

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				reactivity series and cost of the extraction process.	2. Highly reactive metals require electrolysis because they cannot be displaced by carbon 3. Electrolysis is used for all metals because it doesn't involve ions 4. Less reactive metals are extracted using electrolysis to avoid oxidation	Lead Zinc Aluminium
Week 11 Lesson 2 What are atoms like?	Proton Neutron Electron Electron shell	Particles and Matter	Review use of the periodic table and element symbols	- Know the structure of atoms - Apply the elements of the Periodic Table to find the structure of atoms - Figure out the protons, neutrons, electrons, atomic mass and atomic number using given data and formulae	**Which of the following statements is correct when using the Periodic Table to determine atomic structure?** 1. The atomic number tells you the number of neutrons in an atom 2. The atomic mass equals the number of protons plus electrons 3. The number of protons equals the atomic number, and electrons match in a neutral atom	Complete the table, practising working out the PEN numbers of atoms. Stretch: what do you notice about the numbers of protons and electrons? Why do you think this happens?

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					4. The number of neutrons is always equal to the number of electrons	
Week 11 Lesson 3 How are electrons laid out in an atom?	Proton Neutron Electron Electron shell	Particles and Matter	Review use of the periodic table and element symbols	- Know the structure of atoms - Apply the elements of the Periodic Table to find the structure of atoms - Understand and apply electron configuration	**Which of the following statements is correct about atoms and their electron configuration?** 1. The atomic number tells you the number of neutrons in an atom 2. Electrons fill the outer shell before the inner shells 3. The number of electrons equals the atomic number in a neutral atom 4. All atoms have the same number of protons, neutrons, and electrons	1) An atom X has a mass number of 38 and two more protons than an atom of sulfur. a) Deduce the symbol of atom X including its atomic number and mass number. b) Write the electron configuration of atom X. c) Use the electron configuration to identify the group and period to which the element belongs on the periodic table. 2) a) An atom Y has three more electrons that an atom of carbon. Draw the electron configuration of atom Y. b) Atom Y has the same number of neutrons as an atom of neon-10. Deduce the symbol of atom Y including its atomic number and mass number.
Week 12 Lesson 1 How are symbol equations used and balanced?	atom element ratio	Particles and Matter Chemical Reactions	Review use of the periodic table and element symbols, MATHS SILL: Ratio	- Understand what is meant by symbols and equations - Write balanced symbol equations with state symbols - Apply balanced equations to a model resource	**Which of the following best describes a balanced chemical equation with correct state symbols?**	Balance the equations below. Stretch: The last equation includes state symbols: s = solid, l = liquid, g = gas, aq = aqueous (dissolved in water). Add state symbols to your answers to 1a and 1b. Assume that all the substances are at room

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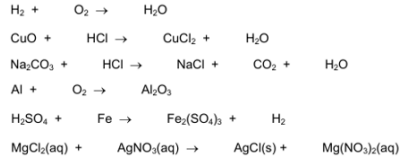
					1. It shows only the products and ignores the reactants 2. It uses chemical symbols and shows equal numbers of atoms on both sides 3. It includes state symbols like (aq) for gases and (s) for liquids 4. It shows the mass of each element instead of the number of atoms	temperature. All chlorides (apart from lead chloride and silver chloride) dissolve in water. Copper oxide is insoluble in water. 
Week 12 Lesson 2 What chemical reactions happen in plants?	Photosynthes is Respiration Enzymes Metabolism	Biological Molecules and Processes	What is the word equation for photosynthesis? How do plants use respiration to release energy?	1. State the equation for photosynthesis. 2. Describe what is meant by a limiting factor. 3. Compare respiration and photosynthesis in plants.	**Which of the following statements is correct about photosynthesis and respiration in plants?** 1. Photosynthesis releases energy, while respiration stores it 2. A limiting factor is something that speeds up photosynthesis 3. Photosynthesis uses carbon dioxide and water to make glucose and oxygen	Compare respiration and photosynthesis in plants. (6 marks)

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					4. Respiration only happens in animals, not plants	
Week 12 Lesson 3 How are plants adapted for getting what gases they need?	Stomata Diffusion Gas exchange Leaves	Cells and Systems	How does diffusion help gases move around?	1. Label the parts of a leaf 2. Describe the function of each leaf part. 3. Explain why the stomata are important for the plant.	**Which of the following statements correctly describes the structure and function of a leaf?** 1. The waxy cuticle absorbs sunlight and allows gases to enter 2. The palisade layer contains chloroplasts and is where most photosynthesis happens 3. The stomata are found in the upper epidermis and store water 4. The spongy mesophyll is tightly packed to block gas exchange	The stomata are open during the day but closed during the night to reduce water loss. - Why would they need to be open during the day? - Why is it better for them to be closed at night?
Week 13 Lesson 1 How are plants adapted for getting the water they need?	Roots Osmosis Xylem vessels Transpiration	Cells and Systems	How do roots absorb water and minerals?	1. State the role of the roots and xylem. 2. Describe what happens during transpiration.	**Which statement best describes the roles of roots, xylem, and transpiration in plants?** 1. Roots absorb oxygen and xylem transports food to the leaves	Sketch a root hair cell and describe how it is adapted to its function. Explain how water moves from the soil into the plant.

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					2. Xylem carries water from the leaves to the roots 3. Roots absorb water and minerals; xylem transports them upward; transpiration pulls water through the plant 4. Transpiration stores water in the leaves for photosynthesis	
Week 13 Lesson 2 Why do plants make lipids, carbohydrates and proteins?	Energy storage Growth Structure Metabolism	Biological Molecules and Processes	How do plants make glucose? (PS) What is glucose converted into in plants?	1. Describe how a range of different substances are made by plants from glucose and recall their uses. 2. Explain the importance of nitrates. 3. Recall the steps in seed germination.	**Which of the following statements correctly describes how plants use glucose, the role of nitrates, and seed germination?** 1. Glucose is only used for respiration; nitrates are stored in leaves; seeds germinate without water 2. Plants use glucose to make starch, cellulose, and proteins; nitrates help build amino acids; seeds need water,	Complete the plant products sheet.

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					warmth, and oxygen to germinate 3. Glucose is stored as protein; nitrates are used for photosynthesis; seeds germinate in cold, dry conditions 4. Plants use glucose to absorb minerals; nitrates are used for energy; germination starts with photosynthesis	
Week 13 Lesson 3 How do farmers make sure their crops grow well?	Fertilizers Irrigation Pest control Crop rotation	Ecosystems and Environmental Interactions	Recall of limiting factors (light, CO_2 and temperature)	1. Describe why plants are cross-bred. 2. Recall the main nutrients required by plants. 3. Explain how food production for humans can be increased 4. Explain why phosphates and potassium are important nutrients for plants	**Which of the following statements best explains how plant science helps increase food production?** 1. Plants are cross-bred to reduce their size and make harvesting easier 2. Phosphates help plants absorb sunlight, and potassium helps them grow taller 3. Plants need only water and sunlight to grow well	Modern wheat is shorter and has larger heads than the wheat grown in the 1950s. Describe how farmers used selective breeding to produce the wheat variety grown today.

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					4. Cross-breeding improves yield and disease resistance; phosphates and potassium support root growth and fruit development	
Week 14 Lesson 1 What problems can farming cause?	Soil erosion Pollution Deforestation Biodiversity loss Eutrophication	Ecosystems and Environmental Interactions	Recall definition of habitat, deforestation and pollution.	1. Explain how using fertilisers, herbicides and pesticides affects an ecosystem. 2. Make predictions about how changes in physical and biological factors will affect carbon/nitrogen supply in an ecosystem 3. Explain the effects of phosphates, nitrates and persistent pesticides on ecosystems	**Which of the following best explains how human activities affect nutrient cycles and ecosystems?** 1. Fertilisers and pesticides always improve ecosystems by increasing biodiversity and nutrient recycling 2. Nitrates and phosphates help plants grow but can cause water pollution and disrupt ecosystems 3. Persistent pesticides break down quickly and have no long-term effects on food chains 4. Changes in decomposer	Case File: The Vanishing Frogs Farmers near Greenvale Marsh recently increased use of fertilisers and herbicides. Algae blooms have appeared in the marsh. Frog population has dropped by 60%. Soil nitrogen levels are unusually high. Identify which substances are affecting the ecosystem. Predict how these changes impact the carbon and nitrogen cycles. Explain the role of phosphates, nitrates, and persistent pesticides in the scenario.

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					populations have no effect on the carbon or nitrogen cycle	
Week 14 Lesson 2 How are viruses linked to disease?	Virus structure Infection process Immune response Pathogens	Health, Disease and Body Systems	Define pathogen, bacteria, virus, MRS GREN. Recall how viruses replicate using a host cell.	1. Describe the relationship between health and disease 2. Describe different types of diseases (including communicable and non-communicable diseases) 3. Describe the interactions between different types of diseases	**Which of the following best explains the relationship between health, disease, and how different diseases interact?** 1. Health means being free from all diseases, and diseases never affect each other 2. Communicable diseases are caused by lifestyle choices, while non-communicable ones are spread by pathogens 3. Health is a state of physical and mental well-being; diseases can interact and make each other worse 4. All diseases are caused by bacteria and can be cured with antibiotics	You are a Health Reporter writing a mini-report for a science magazine aimed at teenagers. Your job is to explain how health and disease are connected, describe different types of diseases, and show how they can interact.

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Week 14 Lesson 3 How are the body's responses controlled?	Nervous system Hormones Feedback mechanisms Homeostasis	Health, Disease and Body Systems	Recall basic features of the nervous system (brain, spinal cord, neurons)	1. Identify the sense organs needed to respond to change 2. Describe the role and organisation of the nervous system 3. Explain the importance of the coordination of impulses by the brain in our responses to changes in the environment	**Which of the following best explains how the body detects and responds to changes in the environment?** 1. The brain detects changes directly without using sense organs 2. Sense organs detect stimuli; impulses travel through the nervous system to the brain, which coordinates a response 3. The spinal cord controls all responses without involving the brain 4. Muscles detect stimuli and send signals to the brain for processing	Write a first-person narrative from the point of view of a nerve impulse traveling through the human body.
Week 15 Lesson 1 How are new medicines tested to see that they are safe?	Clinical trials Laboratory testing Safety protocols Efficacy	Health, Disease and Body Systems	Recall stages of an investigation.	1. Identify why animals are used for testing drugs 2. Describe the process of drug testing - Explain ethical issues surrounding the testing of drugs on animals	**Which of the following best explains why animals are used in drug testing and the ethical concerns involved?** 1. Animals are used because they are	You are a science journalist writing a balanced article for a student magazine titled: “Should We Test Drugs on Animals?”

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					cheaper than lab equipment and don't need ethical approval 2. Drug testing skips animal trials and goes straight to humans for faster results 3. Animals are used to test safety and effectiveness before human trials, but this raises ethical concerns about animal welfare 4. Drug testing is only done on animals because humans don't respond to drugs the same way	
Week 15 Lesson 2 Why is surface area:volume ratio important?	Cell efficiency Diffusion rates Heat regulation Metabolic rate	Cells and Systems	Recall diffusion and describe how substances move in and out of cells.	- Define the term osmosis - Explain how surface area:volume ratio affects organisms - Predict what happens to plant and animal cells when placed in different solutions	**Which of the following best explains how osmosis and surface area:volume ratio affect cells in different solutions?** 1. Osmosis moves water from low to high concentration, and cells always shrink in pure water	How does osmosis affect plant and animal cells, and why does the size of a cell matter when it comes to exchanging substances? (6 marks)

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					2. Osmosis is the movement of water from high to low concentration across a membrane; cells with a high surface area:volume ratio exchange substances more efficiently 3. Osmosis only affects plant cells, and surface area:volume ratio has no impact on diffusion 4. Cells swell in salty solutions because water enters by osmosis	
Week 15 Lesson 3 SA:VOL Investigation	Cell efficiency Diffusion rates Heat regulation Metabolic rate	Cells and Systems Thinking Like a Scientist Experimental and Investigative Skills Analysis and Evaluation	Recall diffusion and describe how substances move in and out of cells.	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.