Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
Week 16 Lesson 1 How does nitrogen cycle through the environment?	Fixation, Nitrification, Denitrification, Decay	Ecosystems and Environmental Interactions	- Nitrogen is needed for growth - Bacteria help convert nitrogen into usable forms	1. Describe the importance of recycling nitrogen. 2. Describe the nitrogen cycle. 3. Explain the movements of nitrogen through the nitrogen cycle including all process. 4. Explain how farmers can use the nitrogen cycle to improve crop yields.	Which of the following statements best explains why the nitrogen cycle is essential for agriculture and ecosystems? A) Nitrogen is abundant in the atmosphere, so plants can easily absorb it without any conversion. B) The nitrogen cycle converts atmospheric nitrogen into forms that plants can use, supporting growth and food production. C) Recycling nitrogen is unnecessary because plants produce their own nitrogen compounds. D) Farmers avoid using the nitrogen cycle because it reduces crop yields.	4MQ: Describe the role of bacteria in the nitrogen cycle.
Week 16 Lesson 2 What are hydrocarbons and where do they come from?	non-renewable, fossil fuel, crude oil, feedstock	The Earth and Environment	What are fossil fuels and how are they made? What is a finite resource?	1. Recall that hydrocarbons are compounds that contain carbon and hydrogen only 2. Describe crude oil as: a) a complex mixture of hydrocarbons b) containing molecules in	What are hydrocarbons? A; compounds containing carbon and hydrogen only. B: compounds containing hydrogen, carbon and oxygen. C: compounds containing hydrogen and	Explain what hydrocarbons are and why the compound C_2H_6O is not a hydrocarbon. Include the elements present in hydrocarbons and where they originate from.

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
				which carbon atoms are in chains or rings (names, formulae and structures of specific ring molecules not required) c) an important source of useful substances (fuels and feedstock for the petrochemical industry) d) a finite resource 3. Recall that petrol, kerosene and diesel oil are non-renewable fossil fuels obtained from crude oil and methane is a non-renewable fossil fuel found in natural gas.	nitrogen. D: compounds containing carbon and chlorine.	
Week 16 Lesson 3 How do we separate the useful parts out of crude oil, how do we make some parts more useful?	fractional distillation, crude oil, fraction, viscosity	The Earth and Environment	What is distillation used for? What is a hydrocarbon? What is boiling point? Why do mixtures have a range of boiling points?	1. Describe and explain the separation of crude oil into simpler, more useful mixtures by the process of fractional distillation 2. Recall the names and uses of: gases, petrol, kerosene, diesel oil, fuel oil, and bitumen. 3. Explain how hydrocarbons in different fractions differ from each other in:	How are the useful parts of crude oil separated? A; filtration. B: simple distillation. C: evaporation. D: fractional distillation	Describe how fractional distillation separates crude oil into fractions and explain why boiling point, not density, determines where each fraction condenses.

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
				a) the number of carbon and hydrogen atoms their molecules contain b) boiling points c) ease of ignition d) viscosity		
Week 16 Lesson 4 What are alkanes and what are their properties?	homologous series, alkane, alkene, saturated	The Earth and Environment	How do we write and draw chemical formula?	1. Explain how hydrocarbons are members of the alkane homologous series. 2. Explain an homologous series as a series of compounds which: a) have the same general formula b) differ by CH2 in molecular formulae from neighbouring compounds c) show a gradual variation in physical properties, as exemplified by their boiling points d) have similar chemical properties 3. Name and draw the first 6 molecules in the alkane series.	Which of these is an alkane? A: C2H4. B: C3H8. C: C2H2. D: C6H6	Compare the two compounds C_4H_{10} and C_4H_8. Identify which is an alkane and explain your reasoning, including reference to saturation and general formula.
Week 16 Lesson 5 RC: Walking talking mock						

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
Week 17 Lesson 1 What are the products of complete combustion?	combustion, exothermic, energy	The Earth and Environment	What are the products of a combustion reaction? How do we write chemical equations?	1. Describe the complete combustion of hydrocarbon fuels as a reaction in which: a) carbon dioxide and water are produced b) energy is given out	What are the products of complete combustion of a hydrocarbon? A; carbon monoxide + water. B: carbon dioxide + water. C: carbon and hydrogen. D: oxygen and carbon dioxide	Write the equation for the complete combustion of methane. Include in your answer why this reaction is exothermic.
Week 17 Lesson 2 What are the products of incomplete combustion?	carbon monoxide, soot	The Earth and Environment	How do we write chemical equations?	1. Explain why the incomplete combustion of hydrocarbons can produce carbon and carbon monoxide 2. Explain how carbon monoxide behaves as a toxic gas 3. Describe the problems caused by incomplete combustion producing carbon monoxide and soot in appliances that use carbon compounds as fuels	What is a product of incomplete combustion? A: carbon dioxide. B: oxygen. C: nitrogen. D: carbon monoxide	Write the equation for the incomplete combustion of methane. Explain why this reaction is dangerous to humans and the conditions required to cause incomplete combustion.
Week 17 Lesson 3 How does burning fuels produce pollution like acid rain?	catalytic converter, impurity, acid rain, oxide	The Earth and Environment	What are the products of combustion? What is a hydrocarbon? What are the hazards of acids?	1. Recall the names of the pollutants responsible for acid rain. 2. Describe some effects of acid rain. 3. Explain how some hydrocarbon fuels produce sulfur dioxide in use. 4. Explain why oxides of	Which gas from burning fuels causes acid rain? A: sulfur dioxide. B: sulfur. C: carbon dioxide. D: methane.	Name 3 pollutants released by burning fossil fuels. In your answer, state where the pollutants are formed from and the negative effects they could have on humans and/or the environment.

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
				nitrogen are produced when fuels are burned in engines. 5. Explain how catalytic converters can reduce harmful gases.		
Week 17 Lesson 4 How do we make some parts of crude oil more useful?	cracking, saturated, fraction, catalyst	The Earth and Environment	What is fractional distillation used for? What is an alkene and an alkane?	1. Describe what happens during cracking. 2. Explain why cracking is necessary. 3. Explain why alkanes are saturated and alkenes are unsaturated. 4. Evaluate hydrogen as an alternative fuel to petrol for cars.	What does cracking do? A: builds longer-chain hydrocarbons from shorter chains. B: breaks longer-chain hydrocarbons into smaller ones. C: dissolves crude oil into more useful substances. D: burns fuel.	Describe the process of cracking and explain why it is important for making hydrocarbons more useful. Include the products formed and their uses.
Week 18 Lesson 1 What was the early atmosphere made of?	volcanoes, photosynthesis, condensation, greenhouse gas	The Earth and Environment	Which state change happens when a gas changes to a liquid?	1. Describe how the Earth's oceans were formed. 2. Explain how the gases in the Earth's atmosphere were produced. 3. Describe what the Earth's atmosphere used to be like.	What was the Earth's early atmosphere mainly made of? A: oxygen. B: nitrogen. C: carbon dioxide. D: hydrogen	Describe the composition of Earth's early atmosphere and explain why oxygen was not present in large amounts. Include the role of volcanic activity.
Week 18 Lesson 2 How did the atmosphere change over time?	splint, respiration, photosynthesis, combustion	The Earth and Environment	What is respiration? What is photosynthesis?	1. Describe the chemical test for oxygen. 2. Explain how the amount of oxygen in the atmosphere has increased. 3. Explain how the amount of carbon dioxide in the atmosphere has decreased.	What caused oxygen levels in the atmosphere to increase? A: photosynthesis. B: volcanic eruptions. C: combustion. D: respiration	Explain the Earth's atmosphere has changed over time.

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
Week 18 Lesson 3 What is the atmosphere like now?	greenhouse effect, radiation, infrared, greenhouse gas	The Earth and Environment	What is combustion?	1. State and explain the link between combustion of fossil fuels and climate change 2. Describe how the greenhouse effect is caused 3. State the names of the greenhouse gases	Which of these is NOT a greenhouse gas? A: methane. B: oxygen. C: carbon dioxide. D: water vapour	Describe the main gases in today's atmosphere and their approximate percentages. Explain why carbon dioxide, although small, is important.
Week 18 Lesson 4 What is climate change?	greenhouse effect, global warming, climate change, draught	The Earth and Environment	What are the problems with greenhouse gases?	1. Describe the problems associated with climate change. 2. Suggest possible solutions.	Which of these is NOT a possible effect of climate change? A: increased global temperatures. B: reduction in food security. C: loss of habitats. D: increase in biodiversity.	Explain the difference between the natural greenhouse effect and the enhanced greenhouse effect. Include causes of the enhanced effect and its consequences.
Week 18 Lesson 5 RC: Walking talking mock						
Week 19 Lesson 1 How does the particle model describe solids, liquids, and gasses?	Particle model, State of matter		Particles in a solid are arranged in a fixed, regular pattern and vibrate about fixed positions.	1. Describe the different states of matter in terms of the movement and arrangement of particles. 2. Explain the different states of matter in terms of the movement and arrangement of particles. 3. Explain the differences in density between the different states of matter.	Which statement best describes particles in a liquid? A) They are fixed in place and cannot move B) They move freely and randomly with no forces between them C) They are close together but can slide past each other	Explain why gases can be compressed easily but solids cannot, using the particle model.

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
					D) They are far apart and move at very high speeds	
Week 19 Lesson 2 How do we calculate density of regular and irregular objects?	Density, Volume displacement		Density = Mass ÷ Volume	1. Describe how to take measurements needed to calculate the density of a regular object. 2. Describe how to measure the volume of irregular shapes. 3. Recall and use the equation: ρ = m/V	A metal cube has a mass of 270 g and a side length of 3 cm. What is its density? A) 10 g/cm^3 B) 30 g/cm^3 C) 270 g/cm^3 D) 3 g/cm^3	Design a method to measure the density of an irregular stone using only a balance and a measuring cylinder.
Week 19 Lesson 3 Core practical: Investigate the densities of solid and liquids.	Systematic error, Meniscus		Water has a density of approximately 1 g/cm^3.		Which of these would reduce random error in a density experiment? A) Using a more precise balance B) Repeating measurements and calculating a mean C) Using a liquid with known density D) Measuring the meniscus from above	Explain why air bubbles in a submerged object can affect the accuracy of density measurements.
Week 19 Lesson 4 What happens to particles when substances change state (kinetic theory)?	Kinetic energy, Change of state		Melting occurs when particles gain enough energy to overcome their fixed positions.	1. Describe what happens to particles when substances change state. 2. Recall the difference between chemical and physical changes. 3. Recall the law of the conservation of mass.	When a substance boils, what happens to the particles? A) They lose energy and move closer together B) They gain energy and move further apart C) They stay the same	Explain why temperature remains constant during melting even though energy is still being transferred.

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
					distance apart but vibrate faster D) They lose energy and stop moving	
Week 20 Lesson 1 What is specific Latent heat and how do we calculate it?	Latent heat, Phase change		Specific latent heat is the energy required to change the state of 1 kg of a substance without changing its temperature.	1. Define SHC and SLH. 2. Explain the difference between SHC and SLH. 3. Explain the changes that occur when heating a system. (energy/temp/state) 4. Use the equation: Q = m × L	A 2 kg block of ice melts at 0°C. The specific latent heat of fusion for ice is 334,000 J/kg. How much energy is needed? A) 668,000 J B) 334,000 J C) 167,000 J D) 1,000,000 J	Explain why the energy required for vaporization is usually greater than for fusion.
Week 20 Lesson 2 What is specific heat capacity and how do we calculate it?	Specific heat capacity, Thermal energy		Energy = mass × specific heat capacity × temperature change.	1. Use the equation: ΔQ = m × c × Δθ 2. Explain ways of reducing unwanted energy transfer through thermal insulation.	A 500 g block of copper is heated from 20°C to 70°C. Its specific heat capacity is 385 J/kg°C. How much energy is transferred? A) 9,625 J B) 19,250 J C) 38,500 J D) 192,500 J	Explain why substances with a high specific heat capacity are useful for thermal storage.
Week 20 Lesson 3 Core Practical: Investigate the properties of water by determining the specific heat	Calibration, Temperature-time graph		Water has a specific heat capacity of about 4,200 J/kg°C.		Which factor would most reduce systematic error in this experiment? A) Using a digital thermometer B) Stirring the water during heating	Explain why the temperature-time graph for melting ice has a flat section and what this represents.

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
capacity of water and obtaining a temperature-time graph for melting ice.					C) Repeating the experiment three times D) Measuring the mass of water accurately	
Week 20 Lesson 4 What is gas pressure, and how does temperature affect gas pressure?	Pressure, Collisions		Gas pressure increases when temperature increases at constant volume.	1. Explain the pressure of a gas in terms of the motion of its particles. 2. Explain the effect of changing the temperature on gas particles. (velocity/pressure) 3. Define absolute zero. 4. Convert between Celsius and Kelvin.	Why does gas pressure increase when temperature rises? A) Particles move slower and collide less often B) Particles move faster and collide more often C) Volume decreases so collisions reduce D) Particles lose energy and stick together	Explain why a sealed container might burst if heated significantly.
Week 20 Lesson 5 Walking talking mock						
Week 21 Lesson 1 What is elastic distortion and how do we calculate it?	Elastic limit, Hooke's law		Elastic distortion occurs when an object returns to its original shape after the force is removed.	1. Explain, using springs and other elastic objects, that stretching, bending or compressing an object requires more than one force. 2. Describe the difference between elastic and inelastic distortion.	A spring stretches 0.2 m when a 10 N force is applied. What is its spring constant? A) 2 N/m B) 5 N/m C) 20 N/m D) 50 N/m	Explain why a spring that has passed its elastic limit cannot obey Hooke's law.

Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 11

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
Week 21 Lesson 2 How much energy is transferred in springs, what is the relationship between force and extension?	Work done, Extension		Energy stored in a spring = ½ × spring constant × extension^2.	1. Recall and use the equation: F = k × x 2. Use the equation: E = ½ × k × x2 3. Describe the difference between linear and non-linear relationships between force and extension.	A spring with k = 200 N/m is stretched by 0.1 m. How much energy is stored? A) 1 J B) 2 J C) 10 J D) 20 J	Explain why the energy stored in a spring increases with the square of the extension.
Week 21 Lesson 3/4 Core Practical: Investigate the extension and work done when applying forces to a spring. (2 lessons)	Gradient, Elastic potential energy		Hooke's law states that force is directly proportional to extension up to the elastic limit.		Which graph shape indicates Hooke's law is obeyed? A) A straight line through the origin B) A curve starting at the origin C) A horizontal line D) A straight line not through the origin	Explain how you would calculate work done from a force-extension graph.