Holy Family Catholic School – Faculty of Science and Physiology

Science Spring Term 1 Year 10

Learning Intention	Vocab	Concept	Retrieval	Success Criteria	Hinge Questions for this lesson	Red Zone
Week 16 Lesson 1 How can we describe waves?	Frequency, Wavelength, Amplitude, Longitudinal, Transverse	Waves	KS3 ideas of sound waves and properties of waves like speed, amplitude, frequencies etc.	1. Recall that waves transfer energy and information but do not transfer matter. 2. Describe waves using the terms frequency, wavelength, amplitude, period and velocity. 3. Describe the differences between longitudinal and transverse waves. 4. Give examples of transverse and longitudinal waves	Which statement about waves is correct? A. Waves transfer matter from one place to another B. Waves transfer energy but not matter C. Waves only transfer sound	How can we describe waves?
Week 16 Lesson 2 How do we measure and calculate the speed of a wave?	Velocity Frequency, Wavelength, Period, Amplitude	waves	Recall distance-time and speed formula; know how to measure distance and time accurately.	1. Recall the equation relating wave speed, frequency and wavelength. 2. Use the equation relating wave speed, frequency and wavelength. 3. Recall the equation relating wave speed, distance and time. 4. Use the equation relating wave speed, distance and time. 5. Describe how to measure the velocity of sound in air. 6. Describe how to measure the velocity of waves on the surface of water.	Which equation correctly links wave speed, frequency and wavelength? A. speed = frequency ÷ wavelength B. speed = frequency × wavelength C. speed = wavelength ÷ frequency	How do we measure and calculate the speed of a wave?

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Week 16 Lesson 3 Core practical: Investigating waves	Amplitude, Frequency, Wavelength, Ripple tank	waves	Recall dependent, independent and control variables, safety rules in practicals; understand measuring methods using rulers and stopwatches.	1. To investigate speed of wave by measuring the frequency, wavelength, and using the wave equation (speed = frequency x wavelength) to calculate the wave speed	Which quantity must be measured to calculate wave speed using $v = f \times \lambda$? "A. Amplitude only B. Frequency and wavelength C. Period only"	Core practical: Investigating waves
Week 16 Lesson 4 How are waves refracted?	Incident ray, Refracted ray, Normal, refraction	Light	Recall properties of light: reflection and straight-line travel; know how light behaves on surfaces.	1. Describe what refraction is. 2. Describe how the direction of a wave changes when it goes from one material to another. 3. Explain some effects of the refraction of light (explanations in terms of changing speeds are not expected). **4. (HT) Explain how a change in wave speed can cause a change in direction.**	What happens to light when it enters a different material at an angle? A. It always reflects B. It changes direction (refracts) C. It stops moving	How are waves refracted?

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Week 16 Lesson 5 Review and revise for PAZ						
Week 17 Lesson 1 Review and revise for PAZ						
Week 17 Lesson 2 Review and revise for PAZ						
Week 17 Lesson 3 Review and revise for PAZ						
Week 17 Lesson 4 Review and revise for PAZ						
Week 18 Lesson 1 PAZ Week				Complete biology paper		
Week 18 Lesson 2 PAZ Week				Complete chemistry paper		
Week 18 Lesson 3 PAZ Week				Complete physics paper		
Week 18 Lesson 4 PAZ Week				Review papers		
Week 18 Lesson 5 Core practical: Investigating refraction	Prism, Angle of incidence, Angle of refraction, Normal line	Light	Recall how to use a ray box and protractor to measure light angles.	To investigate the refraction of light using transparent block prisms by measuring the angles of incident and refraction	Which two angles are measured when investigating refraction? A. Reflection and diffraction angles B. Incident and refracted	Core practical: Investigating refraction

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					angles C. Incident and critical angles	
Week 19 Lesson 1 What are electromagnetic waves?	Electromagnetic Radiation, Frequency, Wavelength	Electromagnetic Spectrum	Recall difference between light and sound waves; review longitudinal vs transverse waves	1. Recall examples of electromagnetic waves. 2. Describe the common features of electromagnetic waves. 3. Describe the transfer of energy by electromagnetic waves. 4. Describe the range of electromagnetic waves that our eyes can detect. **5. (HT) Describe an effect caused by the different velocities of electromagnetic waves in different substances.**	Which statement is true for all electromagnetic waves? A. They need a medium to travel through B. They travel at the same speed in a vacuum C. They are longitudinal waves	What are electromagnetic waves?
Week 19 Lesson 2 What is the EM spectrum?	Visible light, Infrared, Ultraviolet, X-ray,	Electromagnetic Spectrum	Recall that light is a type of wave; know colours of visible light (ROYGBIV).	1. Recall the groups of waves in the electromagnetic spectrum in order. 2. Recall the colours of the visible spectrum in order. 3. Describe how the waves in the electromagnetic spectrum are grouped. **4. (HT) Describe some differences in the ways**	Which order is correct from longest to shortest wavelength? A. Gamma → X-ray → UV → visible → radio B. Radio → microwave → infrared → visible → UV → X-ray → gamma C. Visible → infrared → radio → gamma	What is the EM spectrum?

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				that different parts of the electromagnetic spectrum are absorbed and transmitted. **5. (HT) Describe some differences in the ways that different parts of the electromagnetic spectrum and refracted and reflected.**		
Week 19 Lesson 3 How do we use the long waves in the EM spectrum?	Radio waves, Microwaves, Infrared, Communication	Use of Electromagnetic Waves	Recall examples of EM waves; everyday uses of mobile phones and Wi-Fi.	1. Describe some uses of radio waves. 2. Describe some uses of microwaves. 3. Describe some uses of infrared. 4. Describe some uses of visible light. **5. (HT) Describe how radio waves are produced and detected by electrical circuits.** **6. (HT) Describe how long wavelength electromagnetic waves are affected by different substances.** **7. (HT) Explain the effects caused by long wavelength electromagnetic waves**	Which EM wave is mainly used for communication like radio and TV? A. Gamma rays B. X-rays C. Radio waves D. Microwave	How do we use the long waves in the EM spectrum?

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				travelling at different velocities in different substances.		
Week 19 Lesson 4 How do we use the short waves in the EM spectrum?	Ultraviolet, X-rays, Gamma rays, Ionising	Use of electromagnetic spectrum	Recall uses of visible and radio waves; basic ideas of radiation and health effects.	1. Describe some uses of ultraviolet radiation. 2. Describe some uses of X-rays. 3. Describe some uses of gamma radiation. **4. (HT) Describe how short wavelength electromagnetic waves are affected by different substances.** **5. (HT) Explain the effects caused by short wavelength electromagnetic waves travelling at different velocities in different substances.**	Which type of radiation can damage DNA because it is ionising? A. Infrared B. Ultraviolet C. Radio waves	How do we use the short waves in the EM spectrum?
Week 20 Lesson 1 What are the dangers of EM radiation?	Ionising, Frequency, Absorption, Mutation	Electromagnetic radiation	Recall that high-frequency radiation carries more energy; understand radiation as transfer of energy.	1. Describe how the potential danger of electromagnetic radiation depends on its frequency. 2. Describe the harmful effects of microwave and infrared radiation. 3. Describe the harmful effects of ultraviolet	Why are higher-frequency EM waves more dangerous? A. They travel faster B. They carry more energy and can ionise atoms C. They are easier to detect	What are the dangers of EM radiation?

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				radiation, X-rays and gamma rays. 4. Recall the nature of radiation produced by changes in atoms and their nuclei. 5. Recall that absorption of radiation can cause changes in atoms and their nuclei.		
Week 20 Lesson 2 How has the model of the atom changed over time?	Atom, Nucleus, Plum pudding, Rutherford	Atomic Structure	Recall that elements are made of atoms; use of atomic number and mass number.	1. Describe the structure of an atom (in terms of nucleus and electrons). 2. State where most of the mass of an atom is found. 3. State the sizes of atoms and small molecules. 4. Describe an early model of the atom. 5. Describe how and why our model of the atom has changed over time, including the plum pudding model and the Rutherford alpha particle scattering.	What did Rutherford's experiment show about atoms? A. Atoms are solid throughout B. Positive charge is spread evenly C. Most mass is in a tiny central nucleus	How has the model of the atom changed over time?
Week 20 Lesson 3 What's inside an atom?	proton neutron electron shell isotope	Atomic Structure	Recall that elements are made of atoms; use of atomic	1. State what is meant by an isotope. 2. Represent isotopes using symbols. 3. State the sizes of atoms	Why does an atom have no overall charge? A. Protons and neutrons cancel B. Electrons have no charge	What's inside an atom?

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			number and mass number.	and small molecules. 4. Explain how atoms of different elements are different (in terms of numbers of electrons and protons). 5. Recall the charges and relative masses of the three subatomic particles. 6. Explain why all atoms have no overall charge.	C. Number of protons equals number of electrons	
Week 20 Lesson 4 How are electrons arranged in an atom?	proton neutron electron shell isotope	Atomic Structure	Recall charges of subatomic particles; idea that electrons move around the nucleus.	1. Describe where electrons are found inside atoms. 2. Describe when electrons can change orbit. 3. Recall what an ion is. 4. Describe how ionisation occurs. 5. Describe some of the evidence for the Bohr model of the atom.	What happens when an electron gains energy? A. It moves closer to the nucleus B. It moves to a higher energy level (shell) C. It turns into a proton	How are electrons arranged in an atom?
Week 20 Lesson 5 What is background radiation?	Background radiation, Count rate, Source, Radon	Radioactivity	Recall idea of radiation; understand that some radiation is natural and always present.	1. State what is meant by background radiation. 2. Describe some sources of background radiation. 3. Describe how radiation is detected and measured. 4. Describe a method to calculate the count rate of a sample, after taking into	Which is a natural source of background radiation? A. Mobile phones B. Radon gas from rocks C. X-ray machines	What is background radiation?

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				account background radiation.		
Week 21 Lesson 1 What are the types of radiation and what are their properties?	Alpha, Beta, Gamma, Ionising	Radioactivity	Recall idea of nucleus decay; energy transfer by radiation.	1. Recall that alpha, β- (beta minus), β+ (positron), gamma rays and neutron radiation are emitted from unstable nuclei in a random process. 2. Recall that alpha, β- (beta minus), β+ (positron) and gamma rays are ionising radiations. 3. Recall that an alpha particle is equivalent to a helium nucleus, a beta particle is an electron emitted from the nucleus and a gamma ray is electromagnetic radiation. 4. Compare alpha, beta and gamma radiations in terms of their abilities to penetrate and ionise.	Which type of radiation is the most penetrating? A. Alpha B. Beta C. Gamma	What are the types of radiation and what are their properties?
Week 21 Lesson 2 How do different atoms decay?	Alpha decay, Beta decay, Gamma radiation, Nucleus	Radioactivity	Recall idea of unstable nuclei; particles in atoms.	1. Describe the process of β– decay (a neutron becomes a proton plus an electron). 2. Describe the process of β+ decay (a proton becomes a neutron plus a positron).	What happens to the mass number during beta decay? A. It increases B. It decreases C. It stays the same	How do different atoms decay?

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				3. Explain the effects on the atomic (proton) number and mass (nucleon) number of radioactive decays (α, β, γ and neutron emission). 4. Recall that nuclei that have undergone radioactive decay often undergo nuclear rearrangement with a loss of energy as gamma radiation.		
Week 21 Lesson 3 How quickly do atoms decay?	Half-life, Activity, Decay, Becquerel	Radioactivity	Recall radioactive decay as random process; concept of measuring rate of change.	1. Describe how the activity of a radioactive source decreases over a period of time. 2. Recall that the unit of activity of a radioactive isotope is the Becquerel, Bq. 3. Explain that the half-life of a radioactive isotope is the time taken for half the undecayed nuclei to decay or the activity of a source to decay by half. 4. Explain that it cannot be predicted when a particular nucleus will decay but half-life enables the activity of a very large number of nuclei	What does half-life mean? A. Time for all atoms to decay B. Time for half the nuclei to decay C. Time for activity to stop completely	How quickly do atoms decay?

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				to be predicted during the decay process.		
Week 21 Lesson 4 What are the dangers of ionising radiation?	Ionising, Mutation, Tissue damage, Precaution	Radioactivity	Recall difference between ionising and non-ionising radiation; link radiation to medical uses and safety.	1. State the dangers of ionising radiation in terms of tissue damage and possible mutations and relate this to the precautions needed. 2. Describe the dangers of ionising radiation in terms of tissue damage and possible mutations and relate this to the precautions needed. 3. Explain how the dangers of ionising radiation depend on half-life and relate these to the precautions needed. 4. Explain the precautions taken to ensure the safety of people exposed to radiation, including limiting the dose for patients and the risks to medical personnel.	Why is ionising radiation dangerous to living tissue? A. It heats cells B. It damages DNA and causes mutations C. It reflects off skin	What are the dangers of ionising radiation?