4th Year GCSE Physics Trinity Term

- HT5 - To finish Waves topic ahead of summer exam;
- HT5 - sit summer exam;
- HT6 - post-exam feedback and corrections.
- HT6 - Compulsory practicals for the last two years need checking / doing / redoing as a particular area of weakness and 15% + will be on exams.
- HT6 – targeted consolidation of topics of weakness from cohort summer exam results.
- Have attached Waves 1-3 checklists - students can use to check and review understanding.
- *Use BBC Bitesize and Kerboodle.com access (online textbook) for independent consolidation.*

Full specification: https://filestore.aqa.org.uk/resources/physics/specifications/AQA-8463-SP-2016.PDF

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P12.1 The nature of waves	I can state that waves can transfer energy and information without the transfer of matter.	☐	I can investigate wave motion through a spring model.	☐	I can explain the features of a longitudinal wave in terms of compressions and rarefactions by using a particle model.	☐
	I can identify waves as either transverse or longitudinal.		I can compare transverse and longitudinal waves in terms of direction of vibration and propagation.	☐	I can discuss the features of a transverse wave in terms of particle or field behaviour.	☐
	I can identify waves as either mechanical or electromagnetic.		I can compare electromagnetic and mechanical waves in terms of the need for a medium.	☐	I can compare mechanical waves and their particulate nature with electromagnetic waves and their field	☐
P12.2 The properties of waves	I can outline the derivation of the wave speed equation.	☐	I can outline the derivation of the wave speed equation.	☐	I can explain how the wave speed equation can be derived from fundamental principles.	☐
	I can calculate the period of a wave from its frequency.		I can calculate the period of a wave from its frequency.		I can perform calculations involving rearrangements of the period equation and the wave speed equation.	
	I can measure the speed of a water wave.		I can calculate the wave speed from the frequency and wavelength.		I can perform multi-stage calculations linking period, frequency, wave speed, and wavelength.	
P12.3 Reflection and refraction			I can describe refraction at a boundary in terms of wavefronts.	☐	I can use a wavefront model to explain refraction and reflection.	☐
			I can describe refraction including the reflected rays.		I can describe the relationship between the angle of incidence and angle of refraction.	
			I can explain partial absorption as a decrease in the amplitude of a wave and therefore the energy carried.		I can explain refraction in terms of changes in the speed of waves when they move between one medium and another.	

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P12.4 Sound waves	I can state that sound waves are produced when objects vibrate.	☐	I can explain how insulating materials can be used to absorb sound waves.	☐	I can calculate distances between objects by using the concept of echo location.	☐
	I can describe how echoes are produced through the reflection of sound waves.		I can explain why sound waves cannot travel through a vacuum.	☐	I can describe the behaviour of sound waves in terms of vibrations and regions of compression and rarefaction.	☐
	I can describe how the speed of sound in air can be measured.		I can plan an experiment to measure the speed of sound in air.	☐	I can evaluate data from speed of sound experiments to discuss the range of possible speeds for sound.	☐
P12.5 More about sound		☐	I can describe the properties of a sound in terms of amplitude and frequency.	☐	I can outline the structure of the human ear in terms of transfer of waves and vibrations.	☐
			I can identify the range of frequencies that humans can hear.		I can explain why the human ear has a limited range of frequencies it can detect.	
			I can measure the frequency of a sound wave using an oscilloscope and the relationship frequency = 1/period.		I can compare the propagation of a sound wave in a solid and a gas.	
P12.6 The uses of ultrasound		☐	I can compare ultrasound and audible sound waves in terms of frequency.	☐	I can investigate the reflection and absorption of ultrasound waves.	☐
			I can outline some uses of ultrasound in distance measurement.		I can calculate the positions of objects or flaws in metal objects using data from an ultrasound trace.	
			I can describe the operation of an ultrasound transducer in terms of partial reflection.		I can compare A- and B-type ultrasound scans.	

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P12.7 Seismic waves		☐	I can describe the internal structure of the Earth.	☐	I can explain in detail how the internal structure of the Earth can be determined by waves passing through it.	☐
			I can compare the three types of seismic waves (P, S, L) in terms of the speed they travel and whether they are transverse or	☐	I can calculate the speed of different types of seismic waves.	☐
			I can describe the operation of a seismometer.	☐	I can interpret seismographs to determine the difference in speeds of seismic waves.	☐

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P13.1 The electromagnetic spectrum	I can state that electromagnetic waves transfer energy without transferring matter.	☐	I can describe the relationship between the energy being transferred by an electromagnetic wave and the frequency of the wave.	☐	I can apply the wave model of electromagnetic radiation as a pair of electric and magnetic disturbances that do not require a medium for travel.	☐
	I can identify the position of EM waves in the spectrum in order of wavelength and frequency.	☐	I can calculate the frequency and the wavelength of an electromagnetic wave.	☐	I can use standard form in calculations of wavelength, frequency, and wave speed.	☐
	I can state that all EM waves travel at the same speed in a vacuum.	☐	I can explain why the range of wavelengths detected by the human eye is limited.	☐	I can explain the interactions between an electromagnetic wave and matter.	☐
P13.2 Light, infrared, microwaves, and radio waves	I can state that white light is a part of the EM spectrum and composed of a range of frequencies.	☐	I can describe how a range of electromagnetic waves are used in a variety of scenarios.	☐	I can determine the wavelength of radio waves in air.	☐
	I can list some simple examples of the uses of light, microwaves, and radio waves.	☐	I can explain why a particular wave is suited to its application.	☐	I can describe the interactions between a range of waves and matter, including the effect of absorption.	☐
	I can carry out a practical task to determine the penetrating power of an electromagnetic signal.	☐	I can determine whether the law of reflection applies to a microwave signal.	☐	I can plan, carry out, and evaluate in detail an investigation into the penetrating power of microwaves.	☐

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P13.3 Communications	I can state that radio waves and microwaves are used in communications through the atmosphere.	☐	I can compare the rate of information transfer through optical fibres and radio signals.	☐	I can describe in detail how carrier waves are used in the transfer of information.	☐
	I can state that the higher the frequency of a wave, the greater the rate of data transfer possible.	☐	I can outline the operation of a mobile phone network and the waves used.	☐	I can describe the structure of a radio communication system, including the effect of a radio wave on the current in the receiver.	☐
	I can describe the sub-regions of the radio spectrum.	☐	I can discuss the evidence for mobile phone signals causing damage to humans.	☐	I can discuss the relationship between wavelength data transmission and range to explain to explain why particular frequencies are chosen for particular transmissions.	☐
P13.4 Ultraviolet waves, X-rays, and gamma rays	I can state that high-frequency EM radiation is ionising.	☐	I can describe the penetrating powers of gamma rays, X-rays, and ultraviolet rays.	☐	I can describe in detail the interaction between ionising radiation and inorganic materials.	☐
	I can describe the uses and dangers of UV radiation.		I can compare X-rays and gamma radiation in terms of their origin.	☐	I can compare different regions of the electromagnetic spectrum in terms of their potential harmfulness.	☐
	I can describe the uses and dangers of X-rays and gamma radiation.		I can describe the ionisation of atoms in simple terms.	☐	I can explain how the process of ionisation can lead to cell death or cancer through damage to DNA.	☐
P13.5 X-rays in medicine	I can state some safety procedures that take place during the operation of devices that produce ionising radiation.	☐	I can describe the operation of an X-ray machine.	☐	I can compare the operation of a CT-scanner and that of a simple X-ray device.	☐
	I can describe the formation of an X-ray photograph in terms of absorption or transmission.		I can explain why contrast media can be used during X-rays.		I can evaluate the doses of ionising radiation received in a variety of occupations or medical treatments.	
	I can state that X-ray therapy can be used to kill cancerous cells in the body.		I can describe the factors that affect the radiation doses received by people.		I can explain in detail how various safety features reduce exposure to ionising radiation.	

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P14.1 Reflection of light	I can state the law of reflection.	☐	I can construct accurate ray diagrams showing the reflection of light rays.	☐	I can draw a ray diagram showing the position of an image in a plane mirror.	☐
	I can describe the properties of an image in a mirror in simple terms and investigate reflection with guidance.		I can explain why some surfaces form images during reflection but other do not.	☐	I can use a ray diagrams to discuss why some surfaces form images during reflection but others do not.	☐
	I can state that a real image can be formed on a screen but a virtual image cannot.		I can investigate the law of reflection through practical techniques.	☐	I can evaluate the data from an investigation to discuss the precision and accuracy of any results.	☐
P14.2 Refraction of light	I can state that the path of a ray of light will change at a boundary between two transparent materials.	☐	I can construct a ray diagram showing the refraction of a ray of light at a boundary between two different media.	☐	I can explain how the refraction of light can cause the depth of a material to appear less than it actually is.	☐
	I can identify the angle of incidence and angle of refraction in a ray diagram.		I can describe the dispersion of white light as it passes through a prism.		I can explain the dispersion of light as it passes through a prism in terms of different changes of speed for different wavelengths of light.	
	I can measure the angle of incidence and angle of refraction for a simple refraction.		I can investigate the refraction of light through a glass or Perspex block.		I can analyse the data from a refraction investigation to test different substances to determine whether it fits a suggested relationship.	
P14.3 Light and colour	I can describe the visible spectrum as a continuous series of colours or wavelengths.	☐	I can describe the colours of objects in different colours of light.	☐	I can explain the apparent colour of surfaces using the concept of reflection and absorption when illuminated by white light or combinations of primary colours.	☐
	I can explain the colour of objects in white light in terms of reflection of parts of the spectrum.		I can describe how combinations of filters transmit light.		I can describe the effects of combinations of coloured light and filters on the appearance of a variety of coloured objects.	
	I can explain the effect of a single filter on white light.		I can determine the appearance of a white object when illuminated by combinations of primary coloured light.		I can determine the apparent colour of a coloured surface when illuminated by different combinations of red, green, and blue light.	

P14.4 Lenses	I can distinguish whether a lens is converging or diverging based on a simple ray diagram.	☐	I can identify real and virtual images by using ray diagrams.	☐	I can explain ray paths through a lens in terms of refraction and the focal point.	☐
	I can identify convex (converging) and concave (diverging) lenses from their shapes.		I can calculate the magnification of a lens based on object and image size.		I can perform calculations involving the rearrangement of the magnification equation.	
	I can form images by using a range of lenses.		I can investigate the image-forming properties of a converging lens.		I can construct complete ray diagrams showing image formation by a convex lens with a variety of object positions.	
P14.5 Using lenses	I can identify the optical axis and focal point for a diagram showing image formation.	☐	With support, I can construct ray diagrams showing the formation of images by a convex lens and a concave lens.	☐	Form first principles, I can construct ray diagrams showing the formation of images by a convex lens and a concave lens.	☐
	I can identify the position of the image formed by a lens using pre-existing rays on a diagram.		I can describe the image formed by a magnifying glass.		I can describe fully the properties of an image (real, virtual, magnified, diminished, upright, and inverted) based on a ray diagram.	
	I can describe how a focused image can be formed by a camera lens.		I can describe the image formed by a camera lens.		I can use scale diagrams to determine the size of an image produced by a lens.	