# P6 Waves

| | | | | |
|---|---|---|---|---|
| Waves in air fluids and solids | Define a wave – a transfer of energy from one place to another with no net movement of the medium.<br>Describe the differences between a longitudinal wave and a transverse wave in terms of their **oscillations**.<br>Explain evidence for the medium not moving.<br>Explain wave motion in terms of:<br>• **Amplitude**<br>• **Frequency**<br>• **Wavelength**<br>• **Period**<br>Also know the definitions of the terms above. | Green | Amber | Red |
| Period | **Frequency(Hz) = 1/period(s)**<br>Wave speed = frequency x wavelength<br>(v = fλ) SI units (m/s, Hertz, metre) | Green | Amber | Red |
| **Required Practical 8** | Measuring frequency, wavelength and calculating wave speed for a wave in water and on a string. | Green | Amber | Red |
| Reflection of waves | Be able to draw ray diagrams to show reflection at a smooth plane surface. | Green | Amber | Red |
| **Required Practical 9 (physics only)** | Investigate the reflection of light at different surfaces and the refraction of light at different surfaces. | Green | Amber | Red |
| Sound waves (Physics only) | Sound waves can travel through solids, causing vibrations within.<br>The way the ear enables us to hear sound.<br>Conversion of sound waves in air to vibrations in solids – examples.<br>Limit of human hearing – 20Hz – 20,000Hz | Green | Amber | Red |
| Waves for detection and exploration (Physics only) | Definition of ultrasound<br>Principle of ultrasound – ultrasound is partially reflected and partially transmitted at a boundary/change of density.<br>Ultrasound – uses for looking at internal structure by measuring time delay between emitted and returning sound to include sonar, medical imaging).<br><br>Seismic waves: properties of S (transverse waves that can only pass through solids) and P (longitudinal waves that can pass through solids and liquids) waves; use in finding the structure of the earth – shadow zones. | Green | Amber | Red |
| Electromagnetic waves | The order of the electromagnetic spectrum.<br>What changes as you go from Radio waves to Gamma rays (wavelengths, frequency, energy) | Green | Amber | Red |

| | | | | |
|---|---|---|---|---|
| | Speed of light in a vacuum. | | | |
| Electromagnetic waves<br>Properties | Different materials absorb, reflect or transmit electromagnetic waves.<br>How a change in speed causes refraction.<br>Ray construction to demonstrate refraction (normal, angle of incidence, angle of refraction).<br>Wave front (ripple) diagrams to demonstrate refraction.<br>**Explanations of refraction involving descriptions of changes of speed to wavefronts as they cross a boundary for one medium to another and its consequence**. | Green | Amber | Red |
| Required Practical 10 | Investigate how the amount of infrared absorbed or radiated by a surface depends on the nature of that surface. | Green | Amber | Red |
| Properties of Electromagnetic waves 2 | How radio waves are produced and their effects on materials and circuits when absorbed allowing them to be received. (HT only).<br>Origins of visible light from atoms and gamma rays from nuclei.<br>Ultraviolet, X rays and gamma rays and their relative dangers to humans: dose in Sieverts.<br>Ultraviolet and skin cancer (mutations in DNA) | Green | Amber | Red |
| Uses and Applications of Electromagnetic waves | Know the uses and applications of each type of wave (see the specification and revision guide for more details).<br><br>Describe their uses (HT only) | Green | Amber | Red |
| Lenses (Physics only) | Refraction of light in convex lenses – ray diagrams locating images.<br>Refraction of light in concave lenses– ray diagrams locating images.<br>Nature of images (real/virtual, upright/inverted, magnified/diminished)<br>Magnification = image height/object height | Green | Amber | Red |
| Visible Light | Each colour within the visible light spectrum has its own narrow band of wavelength and frequency.<br>Reflection from a smooth surface in a single direction = specular reflection.<br>Reflection from a rough surface causes scattering: this is called diffuse reflection.<br>How colour filters work.<br>How the colour of an opaque object is<br>Why some objects appear white and other black.<br>Objects that transmit light are either transparent or translucent.<br>Students should be able to explain:<br>• how the colour of an object is related to the differential absorption, transmission and reflection of different wavelengths of light by the object | Green | Amber | Red |

| | | | | |
|---|---|---|---|---|
| | • the effect of viewing objects through filters or the effect on light of passing through filters<br>• why an opaque object has a particular colour. | | | |
| Black Body Radiation and Perfect Black Bodies | Emission of infrared related to temperature.<br>Definition of a perfect black body.<br>The wavelengths of IR (light) is a distribution that is temperature-dependent.<br><br>Things to know:<br>• (HT only) A body at constant temperature is absorbing radiation at the same rate as it is emitting radiation.<br>• The temperature of a body increases when the body absorbs radiation faster than it emits radiation.<br>• (HT only) The temperature of the Earth depends on many factors including: the rates of absorption and emission of radiation, reflection of radiation into space.<br>• (HT only) Students should be able to explain how the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted, using everyday examples to illustrate this balance, and the example of the factors which determine the temperature of the Earth.<br>• (HT only) Students should be able to use information, or draw/<br>• interpret diagrams to show how radiation affects the temperature of the Earth's surface and atmosphere. | Green<br><br>Green | Amber<br><br>Amber | Red<br><br>Red |