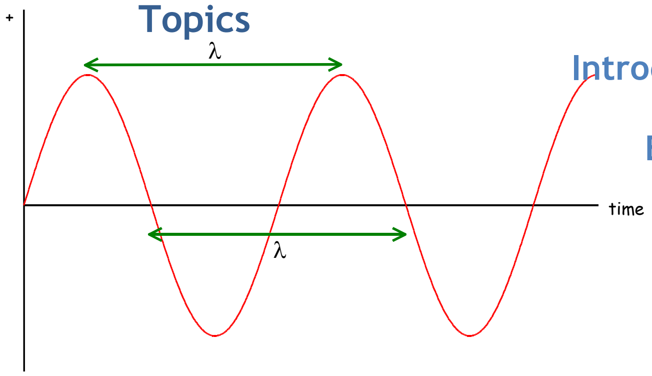
Topics



Introduction to Waves
Light
EM Spectrum
Eye
Lenses

Introduction to waves

- Know and understand the terms amplitude wavelength, frequency, period.
- Waves carry energy, the amplitude is a measure of the energy of a wave.
- Use the formulae wavelength = distance /no. of waves. Frequency is the number of waves per second. Frequency =no. of waves/time, Period is the time for one wave, period =time /no. of waves. Period=1/frequency (*T=1/f*)
- Understand and correctly use the formulae $v = f\,\lambda,\ v = d/t$
- Properties of waves, reflection, refraction, diffraction, law of reflection, angle of incidence=angle of reflection where all angles are measured from the normal
  Refraction occurs when light enters a material which is more optically dense the wave speed and wavelength reduce but frequency remains the same. Usually this is accompanied by a change in direction of the wave. Long waves diffract more than short waves.
- Describe the two types of waves, longitudinal and transverse. Give examples of each.

Light

- Light travels at 3×10^8 m/s in air and travels in straight lines. Light is a transverse wave. Light can be refracted, reflected and diffracted.
- Light is made up of a range of colours, red, orange, yellow, green, blue, indigo, and violet; where red light has a longer wavelength and lower frequency than blue light.
- The primary light colours are red, green, and blue. Red and green mix to give yellow, blue and red make magenta and green and blue make cyan. If all of these three colours are mixed in the right ratio then white light is produced.
- A prism can be used to split light into a spectrum

EM Spectrum

- There is a collection of waves that all travel at the speed of light and these form the electromagnetic spectrum.
- Know the order of the waves in the electromagnetic spectrum and know that the higher the frequency the lower the wavelength and the lower the frequency the higher the wavelength.
- The wavelength multiplied by the frequency of the e-m wave = speed which is 3×10^8 m/s
- Give a use (application), detector, protector and source for each of the waves in the electromagnetic spectrum
- See the table on page 3 of this revision sheet!

Lenses

- There are two types of lenses- convex or converging and concave or diverging. Draw these two lenses and show how light passes through them. Lenses refract the light.
- Describe how concave and convex lenses focus a parallel beam of light.
- Describe an experiment to measure the focal length of a convex lens.
- Power of a lens is measured in Dioptres and is equal to 1/focal length measured in metres.
- Convex lenses correct long sight, concave lenses correct short sight.

Eye

- Label a diagram of the eye and label the parts, cornea, iris, lens, retina and optic nerve.
- Know that light enters our eye and lands on the retina where sense cells detect the signal and pass these through the optic nerve to the brain.
- In short sight the lens is too strong or the eyeball is too long and light focuses in front of the retina, it can be corrected with a concave lens.
- In long sight the lens is too weak or the eyeball is too short and light focuses behind the retina, it can be corrected with a convex lens
- Explain that the size of the pupil changes due to the brightness of the surroundings.
- State that the image formed on the retina of the eye is upside side-down and reversed.
- Describe the position of the blind spot in the eye.

Ray Diagrams

- You can determine the image of a convex lens using ray diagrams
- A ray parallel to the Principal axis comes out through the focus, a ray through the focus comes out parallel and a ray through the centre comes straight through undeviated.
- The image can be described as real or virtual/ inverted or upright/ magnified, same size or diminished.
- >2f -> RID (real, inverted, diminished), used in cameras
- @2f-> RIS (real, inverted, same size),
- f-2f ->RIM (real, inverted, magnified), used in overhead digital projectors
- <f ->VUM (virtual, upright, magnified) used as a magnifying glass

Type of EM Waves	Use	Detector	Danger	Protector	Source
Radio & TV	communication (under the sea, in space, radio and TV)Watching TV programmes, films, listening to the news,	Aerial	Large doses of radio waves are believed to cause cancer, leukaemia and other disorders.	metal	transmitter, outer space
Microwaves	cooking through microwave ovens, communications	Aerial	cataracts	metal screen	magnetron, transmitters, outer space
Infra Red	Turning on TVs through remote controls, security systems.	Photodiode, thermocouple, thermistor	Some people claim that the very low frequency field from overhead power cables near their homes has affected their health, although this has not been reliably proven.	aluminium foil, thermal insulators	warm objects, sun
Visible	humans viewing the world, photography,	Photodiode / photographic film	cataracts	polarising glasses, filter glasses	Stars and the sun
Ultra violet	detecting forged bank notes, causing white shirts to look cleaner?	Photodiode / photographic film / fluorescent materials	skin cancer, Arc eye is caused by UV radiation. This damages the outmost protective layer of cells in the cornea.	glass / sunscreen cream	Fluorescent tubes, very hot objects, sun
X-Ray	detecting broken bones, checking suitcases at the airport,	Photodiode / photographic film	cancer premature ageing	lead	X-ray machines, stars
Gamma Rays	medical tracers to detect cancer, killing bacteria, sterilizing instruments, detecting broken pipes underground	Photodiode / photographic film / Geiger Muller Tube	cause damage to DNA, cancer	several cm of lead or several m of concrete	Radioactive nuclei, outer space (stars)

"cataracts" in your eyes, is a clouding of the lens preventing you from seeing clearly (if at all!)

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