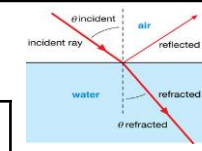


Core Practical
Investigate surface s affecting thermal energy radiation or absorption
Different surfaces, temperature at start and end, thermal energy gained or lost

He found the red end was hot but just beyond the red end was even hotter.

He split sunlight into a spectrum. He put a thermometer in each temperature and measured the temperature just beyond the red end of the spectrum

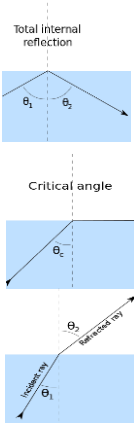
Core Practical
Investigate refraction
Light passing through a glass block.



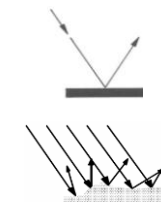
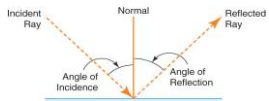
Light refracts as it slows down in a denser substance.

Total internal reflection

- When a wave hits a surface and is reflected back into the material* Only happens when a wave travels through a denser material.
- Angle of incidence is larger than the critical angle, no light leaves all light internally reflected.
- Angle of incidence is equal to the critical angle, most light leaves along the surface boundary (some internally reflected).
- Angle of incidence is less than the critical angle, most light is refracted (some internally reflected).

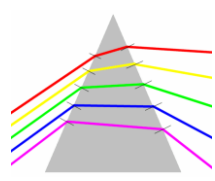


Angle of incidence = angle of reflection (i) = (r)



Specular reflection *Very smooth surface reflects light evenly*

Diffuse reflection *Rough surfaces reflect light by scattering in all directions*



White light *A mixture of different colours of light*

Can be split up into the colours of the visible spectrum by using a prism.

Herschel 1738-1822 **Discovered infra-red** He used different coloured filters to observe the sun.

Infra-red *EM waves with frequencies slight lower than visible light* Objects emit infra-red. The hotter the object is, the more infra-red is emitted.

For a body to be at constant temperature, the amount absorbed = amount radiated.

PHYSICS HIGHER ONLY

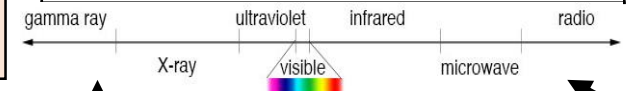
Different EM wavelengths travel at different velocities through different materials.

Electromagnetic Spectrum

EDEXCEL TOPIC 5 LIGHT AND EMS

Electromagnetic wave *Continuous spectrum of transverse waves*

Travel at the same speed in a vacuum (3×10^8 m/s).



EM waves are generated by changes in atoms and nuclei giving large range of frequencies.

e.g. changes in the nucleus of an atom creates gamma rays. Visible light is often produced by changes in an electron's energy level.

Short wavelengths, high frequency and high energy.

Our eyes only detect a small part of spectrum e.g. visible light.

Long wavelengths, low frequency and less energy.

Radio waves absorbed by metal and cause oscillations in electrical circuits connected to the aerial.

Metal can be used as an aerial to receive radio waves.

Radio waves made by oscillations in electrical circuits.

Radio	Transmitted.
Microwave	Absorbed.
Infrared	Mostly reflected or absorbed.
Visible	
Ultra violet	Absorbed.
X-ray	Absorbed by deep tissue.
Gamma	

Different substances absorb, transmit, refract and reflect EM waves depending upon wavelength.

EM waves transfer energy from source to observer e.g. infrared waves transfer energy from heater to person

EM wave	Use	Danger
Radio	Broadcasting TV, radio, communications, satellite transmissions.	Safe.
Microwave	Cooking, communication and satellites transmissions (mobile phones).	Internal heating of cells.
Infrared	Cooking, thermal imaging, short range communications, optical fibres, TV remote controls, security systems.	Skin burns.
Visible	Vision, illumination, photography.	Damage to eyes.
Ultra violet	Security marking, disinfecting water, fluorescent lamps, detecting forged bank notes.	Damage to eyes, surface cells, sunburn, cancer.
X-ray	Observing internal structure of objects, broken bones, airport security.	Cell destruction, mutation, cancer.
Gamma	Sterilising food and medical equipment, detecting and treating cancer.	

Frequency increases.

PHYSICS ONLY

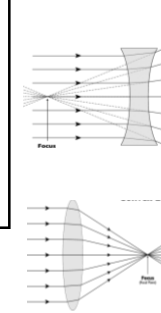
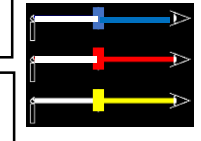
Light

PHYSICS ONLY

The more powerful the lens, the more the rays of light refract so the shorter the focal length.

Focal length is linked to the power of lens.

Power of lens increases with its curvature.



Diverging lens	<i>Thinner in the middle</i>	Focal point is the point from which the rays seem to be coming from after passing through the lens.	Only virtual images.
Converging lens	<i>Fatter in the middle</i>	Parallel rays of light converge at focal point.	Real or virtual images.

Object close to a converging lens will form a virtual image The image appears to be on the same side as the object.

2F	Image same size, upside down, real.
2F - F	Image larger, upside down, real.
< F	Image bigger, right way, virtual.

Radio waves absorbed by metal and cause oscillations in electrical circuits connected to the aerial.

Metal can be used as an aerial to receive radio waves.

Radio waves made by oscillations in electrical circuits.

Investigate surface s affecting thermal energy radiation or absorption

Different surfaces, temperature at start and end, thermal energy gained or lost

Temperature of Earth is controlled by the amount absorbed = amount radiated.

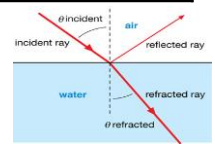
More absorbed, temperature increases.

He found the red end was hot but just beyond the red end was even hotter.

He split sunlight into a spectrum. He put a thermometer in each temperature and measured the temperature just beyond the red end of the spectrum

Investigate refraction

Light passing through a glass block.



Light refracts as it slows down in a denser substance.

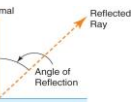
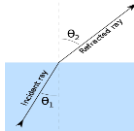
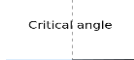
When a wave hits a surface and is reflected back into the material

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Discovered infra-red

He used different coloured filters to observe the sun.

EM waves with frequencies slight lower than visible light

Objects emit infra-red. The hotter the object is, the more infra-red is emitted.

For a body to be at constant temperature, the amount absorbed = amount radiated.

PHYSICS HIGHER ONLY

Different EM wavelengths travel at different velocities through different materials.

PHYSICS ONLY

Electromagnetic Spectrum

EDEXCEL TOPIC 5 LIGHT AND EMS

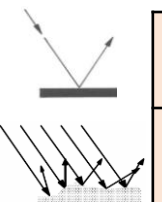
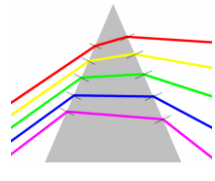
PHYSICS ONLY

Light

PHYSICS ONLY

A mixture of different colours of light

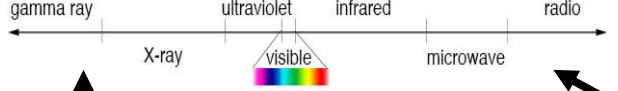
Can be split up into the colours of the visible spectrum by using a prism.



Very smooth surface reflects light evenly
Rough surfaces reflect light by scattering in all directions

Angle of incidence = angle of reflection (i) = (r)

Continuous spectrum of transverse waves
Travel at the same speed in a vacuum (3×10^8 m/s).



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e.g. changes in the nucleus of an atom creates gamma rays. Visible light is often produced by changes in an electron's energy level.

Transmitted.
Absorbed.
Mostly reflected or absorbed.
Absorbed.
Absorbed by deep tissue.

Different substances absorb, transmit, refract and reflect EM waves depending upon wavelength.

EM waves transfer energy from source to observer e.g. infrared waves transfer energy from heater to person

Short wavelengths, high frequency and high energy.

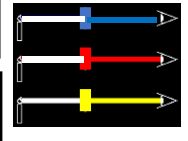
Our eyes only detect a small part of spectrum e.g. visible light.

Long wavelengths, low frequency and less energy.

The more powerful the lens, the more the rays of light refract so the shorter the focal length.

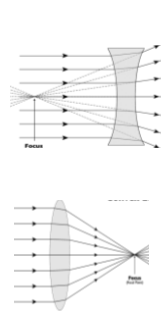
Focal length is linked to the power of lens.

Power of lens increases with its curvature.



When white light hits a coloured surface, some of the visible spectrum is absorbed and some is reflected.

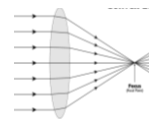
When white light passes through a filter, some colours are absorbed and some colours are transmitted.



Thinner in the middle

Focal point is the point from which the rays seem to be coming from after passing through the lens.

Only virtual images.



Fatter in the middle

Parallel rays of light converge at focal point.

Real or virtual images.

Object close to a converging lens will form a virtual image The image appears to be on the same side as the object.

Image same size, upside down, real.
Image larger, upside down, real.
Image bigger, right way, virtual.

	Use	Danger
	Broadcasting TV, radio, communications, satellite transmissions.	Safe.
	Cooking, communication and satellites transmissions (mobile phones).	Internal heating of cells.
	Cooking, thermal imaging, short range communications, optical fibres, TV remote controls, security systems.	Skin burns.
	Vision, illumination, photography.	Damage to eyes.
	Security marking, disinfecting water, fluorescent lamps, detecting forged bank notes.	Damage to eyes, surface cells, sunburn, cancer.
	Observing internal structure of objects, broken bones, airport security.	Cell destruction, mutation, cancer.
	Sterilising food and medical equipment, detecting and treating cancer.	

Frequency increases.

EDEXCEL TOPIC 5 LIGHT AND EMS

Electromagnetic Spectrum

PHYSICS HIGHER ONLY

PHYSICS ONLY

PHYSICS ONLY

PHYSICS ONLY

Radio waves absorbed

Radio waves

Radio waves

Radio	
Microwave	
Infrared	
Visible	
Ultra violet	
X-ray	
Gamma	

Different substances

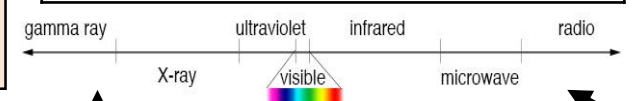
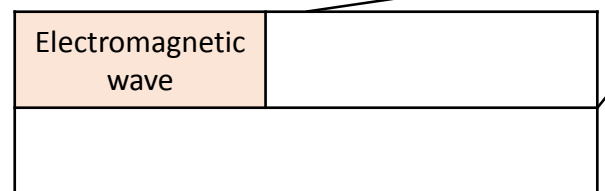
EM waves

EM wave	Use	Danger
Radio		
Microwave		
Infrared		
Visible		
Ultra violet		
X-ray		
Gamma		

Temperature of Earth
More absorbed,

For a body to be at constant temperature,

Different EM wavelengths



Short wavelengths,

Our eyes

Long wavelengths,

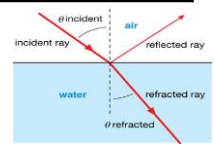
e.g. changes in the nucleus of an atom

He found
He split sunlight

Herschel 1738-1822

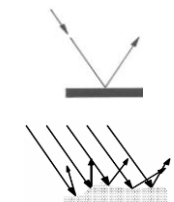
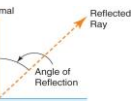
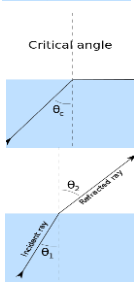
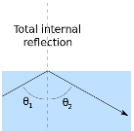
Infra-red

Core Practical



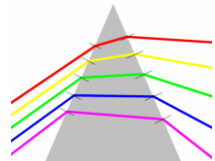
Core Practical

Total internal reflection



Specular reflection
Diffuse reflection

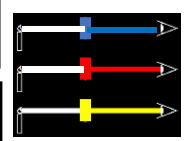
White light



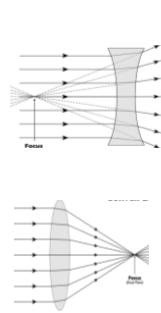
The more powerful the lens,

Focal length

Power of lens



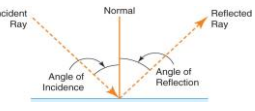
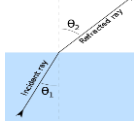
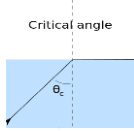
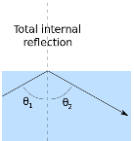
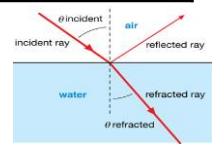
Seeing colours



Diverging lens
Converging lens

2F	
2F - F	
< F	

Frequency increases.



PHYSICS ONLY

PHYSICS HIGHER ONLY

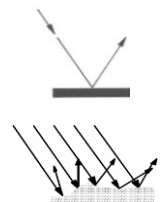
Electromagnetic Spectrum

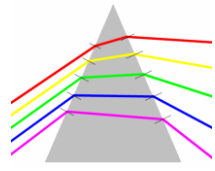
EDEXCEL TOPIC 5 LIGHT AND EMS

PHYSICS ONLY

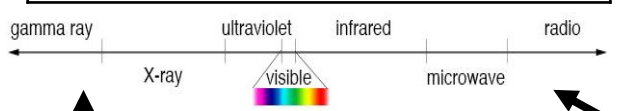
Light

PHYSICS ONLY





HIGHER ONLY



Frequency increases.

