OCR (B) Physics GCSE

1.4 - What happens when light and sound meet different materials?

(Physics only)

Flashcards

What are the two types of reflection?

What are the two types of reflection?

Specular and **diffuse** reflection.

Define specular reflection

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Reflection off smooth surfaces (such as mirrors) in a single beam which makes the **same angle** with the normal as the incident beam.

Define diffuse reflection

Define diffuse reflection

Reflection off a rough surface, resulting in scattering of light.

Define transmission

Define transmission

The process of waves passing through a transparent material and emerging from the other side.

Define absorption

Define absorption

When the energy of a wave is taken in by a surface.

Explain how absorption occurs

Explain how absorption occurs

When the frequency of light matches the energy levels of electrons, the light is absorbed by electrons and re-emitted over time as heat.

Why do some objects appear white?

Why do some objects appear white?

Objects appear white when it scatters all colours of light that are incident upon it.

Why do some objects appear black?

Why do some objects appear black?

Objects appear black when they scatter none of the light incident upon them; in other words, they absorb all light.

Explain why objects appear coloured (e.g. green)

Explain why objects appear coloured (e.g. green)

An object appears coloured when it absorbs some wavelengths and reflects others. A green object appears green because green light is reflected.

When light passes through a concave lens...

When light passes through a concave lens...

The light rays bend away from the normal.

When light passes through a convex lens...

When light passes through a convex lens...

The light rays bend towards the normal, and meet at a **focal point**.

What is the principal focus of a lens?

What is the principal focus of a lens?

A focal point before a convex lens, from which the light rays appear to come from, or the focal point after a concave lens where all the rays meet.

What is a virtual image?

What is a virtual image?

An image produced on the same side of the lens as the object.

A virtual image cannot be formed on a screen as the light rays never cross after the lens.

What is a real image?

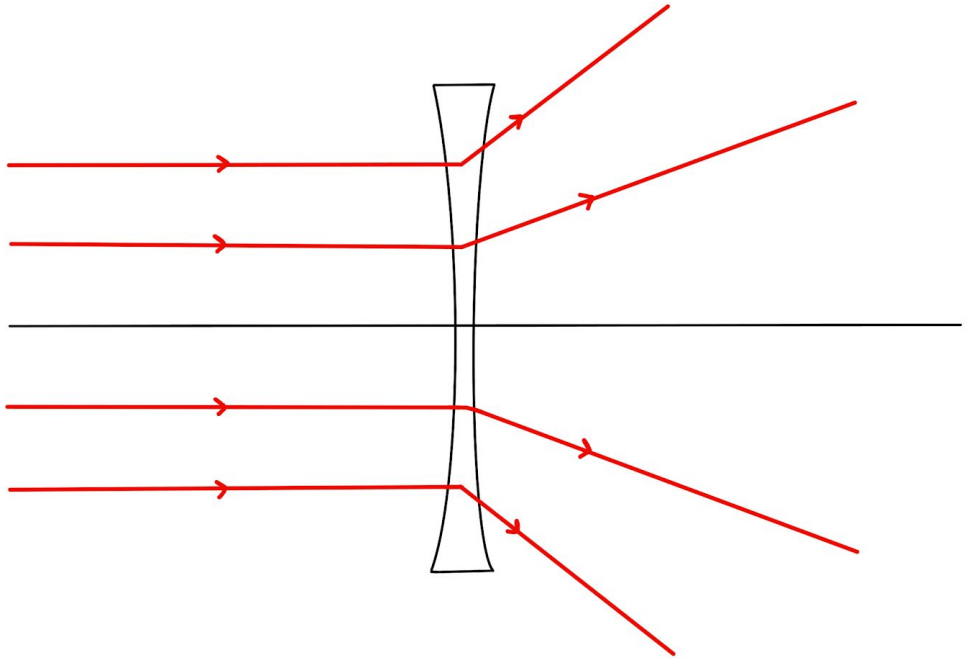
What is a real image?

An image produced on the opposite side of the lens from the object.

A real image can be formed on a screen as the light rays cross after the lens.

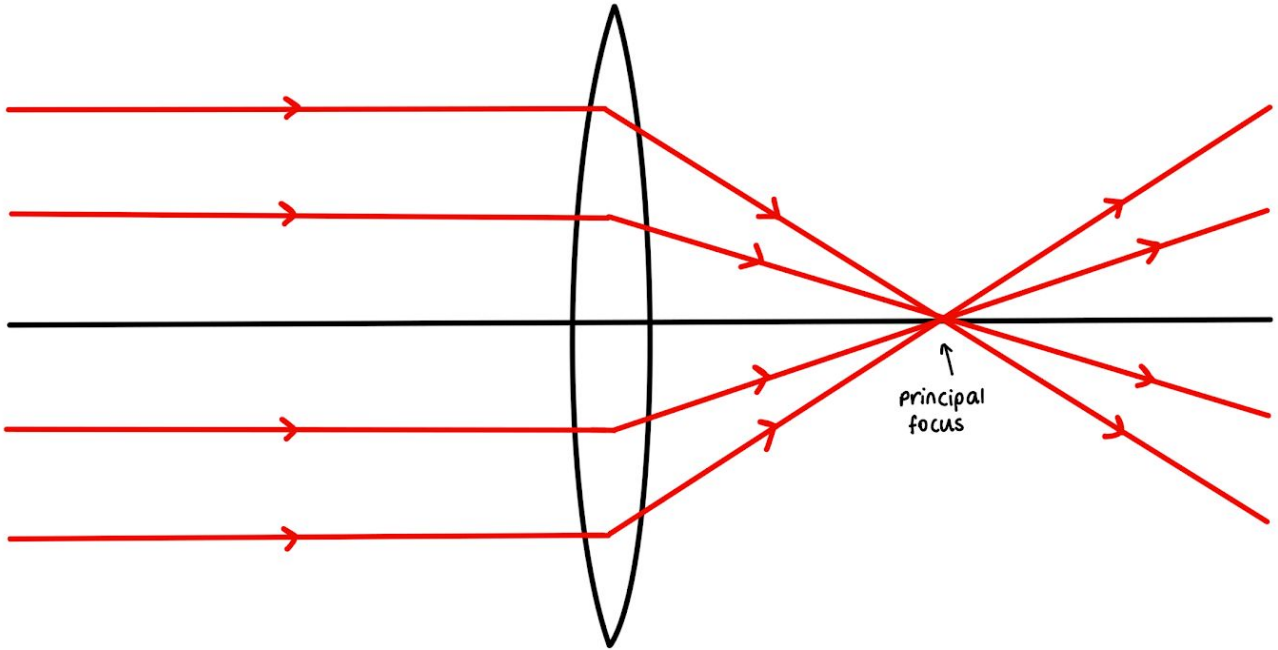
Draw a diagram of light rays through a concave lens

Draw a diagram of light rays through a concave lens



Draw a diagram of light rays through a convex lens

Draw a diagram of light rays through a convex lens



Give an example of a use of concave lenses

Give an example of a use of concave lenses

Glasses to correct short-sightedness

Give examples of uses of convex lenses

Give examples of uses of convex lenses

- Magnifying glasses
- Binoculars
- Glasses to correct long-sightedness

How does sound travel through solids? (Higher)

How does sound travel through solids? (Higher)

Sound waves cause vibrations through the solid.

Describe the function of the outer ear (Higher)

Describe the function of the outer ear (Higher)

The outer ear collects sounds and channels them down the ear canal.

What happens when sound waves hit the eardrum? (Higher)

What happens when sound waves hit the eardrum? (Higher)

- The taut membrane vibrates as the pressure waves reach it.
- The eardrum is forced in by compression and out by rarefaction.
- The eardrum vibrates at the same frequency as the sound waves.

What is the purpose of the stirrup bones? (Higher)

What is the purpose of the stirrup bones? (Higher)

They vibrate at the same frequency as the eardrum, and transmit the vibrations to the inner ear fluid, amplifying the sound waves received by the eardrum.

What is the cochlea? (Higher)

What is the cochlea? (Higher)

A spiral shaped cavity in the inner ear involved in hearing.

How are sounds conveyed to the brain? (Higher)

How are sounds conveyed to the brain? (Higher)

- As the cochlear fluid moves, small hairs which line it are also moved.
- Each hair moves according to a specific frequency, and each one is connected to a nerve cell.
- When a certain threshold frequency is reached, an electrical impulse is sent to the brain.

What is the frequency range of human hearing? (Higher)

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20-20000Hz (we are incapable of hearing sounds below 20Hz or above 20kHz).

Through what medium does sound travel best? (Higher)

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Sound travels best in solids and worst in gases, because it relies on particle collisions. In solids, the arrangement of particles is most dense, resulting in more collisions.

What is the optimum range of human hearing and why? (Higher)

What is the optimum range of human hearing and why? (Higher)

1kHz-3kHz, because this is the range of frequencies most efficiently transmitted by the stirrup bones.

How and why can human hearing deteriorate? (Higher)

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- Constant loud noise damages cochlear hairs
- Smoking
- Chemotherapy
- Diabetes
- age

Define ultrasound (Higher)

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Sound waves with frequencies above 20kHz.

How can ultrasound be used to measure distances? (Higher)

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- When waves reach a boundary between two media, they are partially reflected.
- The speed of the waves is constant.
- The time between emission and detection can be used to calculate distance (from distance = speed x time).

  (remember to halve the time; the recorded time is for the distance there **and** back)

Describe applications of ultrasound (Higher)

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Ultrasound is used largely in medical imaging, specifically pregnancy scanning, as it is non-ionising so it does not increase the risk of cancer.

What is SONAR imaging? (Higher)

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SONAR (Sound Navigation and Ranging) uses both low and high frequency sound waves for imaging eg. underwater.

What is infrasound? (Higher)

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Infrasound uses sound waves with frequencies lower than 20Hz (aka seismic waves).

Describe two types of seismic waves (Higher)

Describe two types of seismic wave (Higher)

P waves - longitudinal and can pass through solids and liquids.

S waves - transverse, slow moving and can only pass through solids.

What is infrasound used for? (Higher)

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Infrasound is used to study the structure of the Earth.

How does infrasound provide evidence for the Earth's structure? (Higher)

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Only P waves are detected across the Earth from an earthquake; the lack of S waves implies that the Earth's core is liquid as S waves cannot penetrate it.