

Refraction of waves

Dr Dransfield: What is the refraction of a wave and how can you draw it?

Refraction is the change in direction of a wave when it passes from one medium to another.

Take a look at this straw in a glass of water.

It's a great example of refraction.

When light waves travel through a medium such as air or water, they travel in straight lines.

For example, light from this part of the straw travels straight to your eyes.

However, when light passes from one medium to another, it bends or refracts.

This means that light from this part of the straw is bent as it leaves the water, so it appears at a different angle.

So, why does refraction happen?

The Normal is an imaginary line drawn at 90 degrees to the boundary between the two media; in this case, air and water.

When a light wave enters a denser medium, like from air to water, the speed of the light ray changes.

As it hits the water, it slows down and bends towards the normal.

And similarly, when light waves enter a less dense medium, like from water to air in our glass, it speeds up and bends away from the normal.

So, how do you draw a ray diagram that illustrates refraction?

To draw this accurately, you'll need to:

Draw the boundary between the two types of mediums.

Draw the normal at a right angle where the light ray will hit the boundary.

Draw the incident ray hitting the boundary at an angle.

This angle is the Angle of Incidence or i .

Draw the refracted ray on the other side of the boundary.

If the ray is moving into a denser medium, it will bend towards the normal.

If the ray is moving into a less dense medium, it will bend away from the normal.

This angle is the Angle of Refraction (r).

By labelling these key parts, you can clearly show how refraction of a wave works.

And remember, when drawing ray diagrams, draw the normal at 90 degrees to the boundary first.

Then, measure your angles between the normal and the ray.

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