

Reflection and Refraction

Monday, 16 June 2025

Answer the following questions:

1. State the definition of the peak of a wave.
The highest point on a wave
2. State the definition of wavelength.
The distance from one point on one wave to the identical point on the next wave.
3. State the definition of amplitude.
The maximum distance of a point on the wave from its rest position.
4. Explain the meaning of the term density.
The amount of matter (mass) in a given volume.
5. Describe how to calculate the density of a material.
Density = Mass/volume

Stretch: Draw a transverse wave and label it



Reflection and Refraction

P3.3.5

Science
Mastery



P3.3.1 Prior Knowledge Review

P3.3.2 Types of Wave

P3.3.3 Properties of Waves

Maths in Science Lesson 20

P3.3.4 Velocity of Waves

➤ **P3.3.5 Reflection and Refraction**

P3.3.6 Investigating Reflection and Refraction

P3.3.7 Investigating Waves

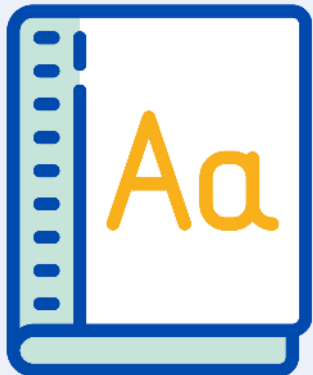
P3.3.8 Using Waves



Following this lesson, students will be able to:

- State the law of reflection
- Describe what happens when light is refracted
- Describe the relationship between wavelength and frequency

Key Words:



reflection

refraction

medium

wavelength

frequency

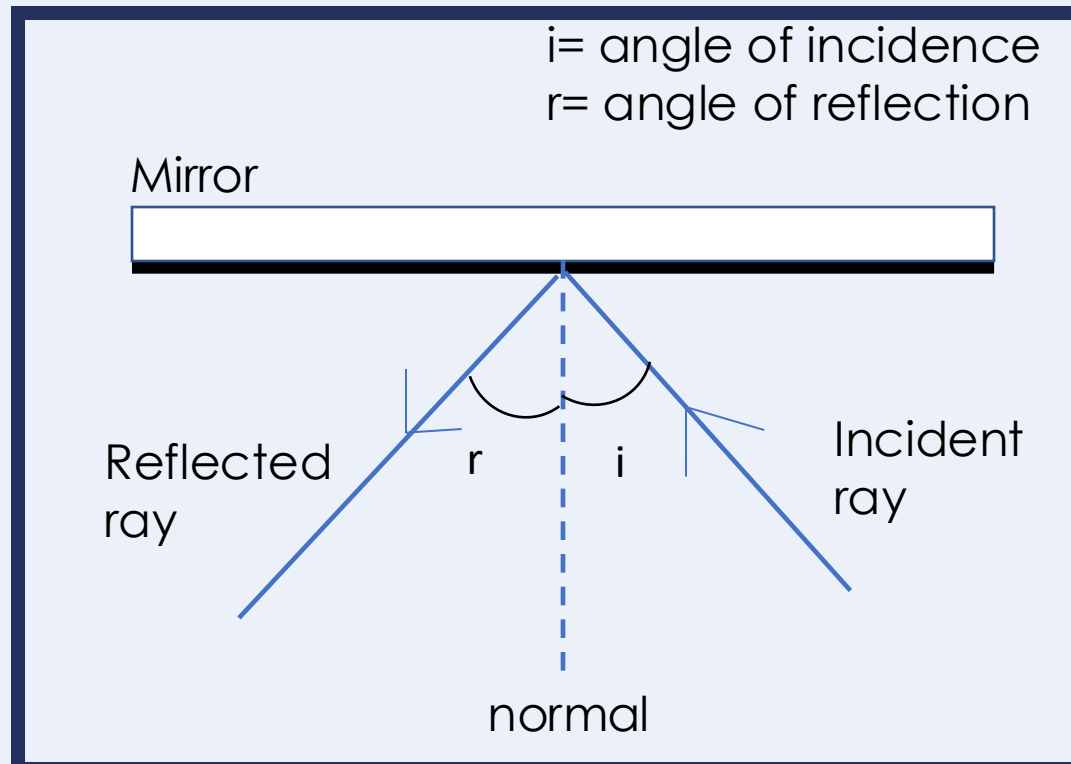
speed

The Law of Reflection

Reflection happens when rays of light bounce back from a surface, mostly a smooth surface.

The angle of incidence is always equal to the angle of reflection.

If the angle of incidence was 30° the angle of reflection would also be 30° .



Answer the following questions:

1. Name the line drawn at 90° to the surface

The normal

2. What two things are needed to form a reflection?

Light and a reflective/smooth surface

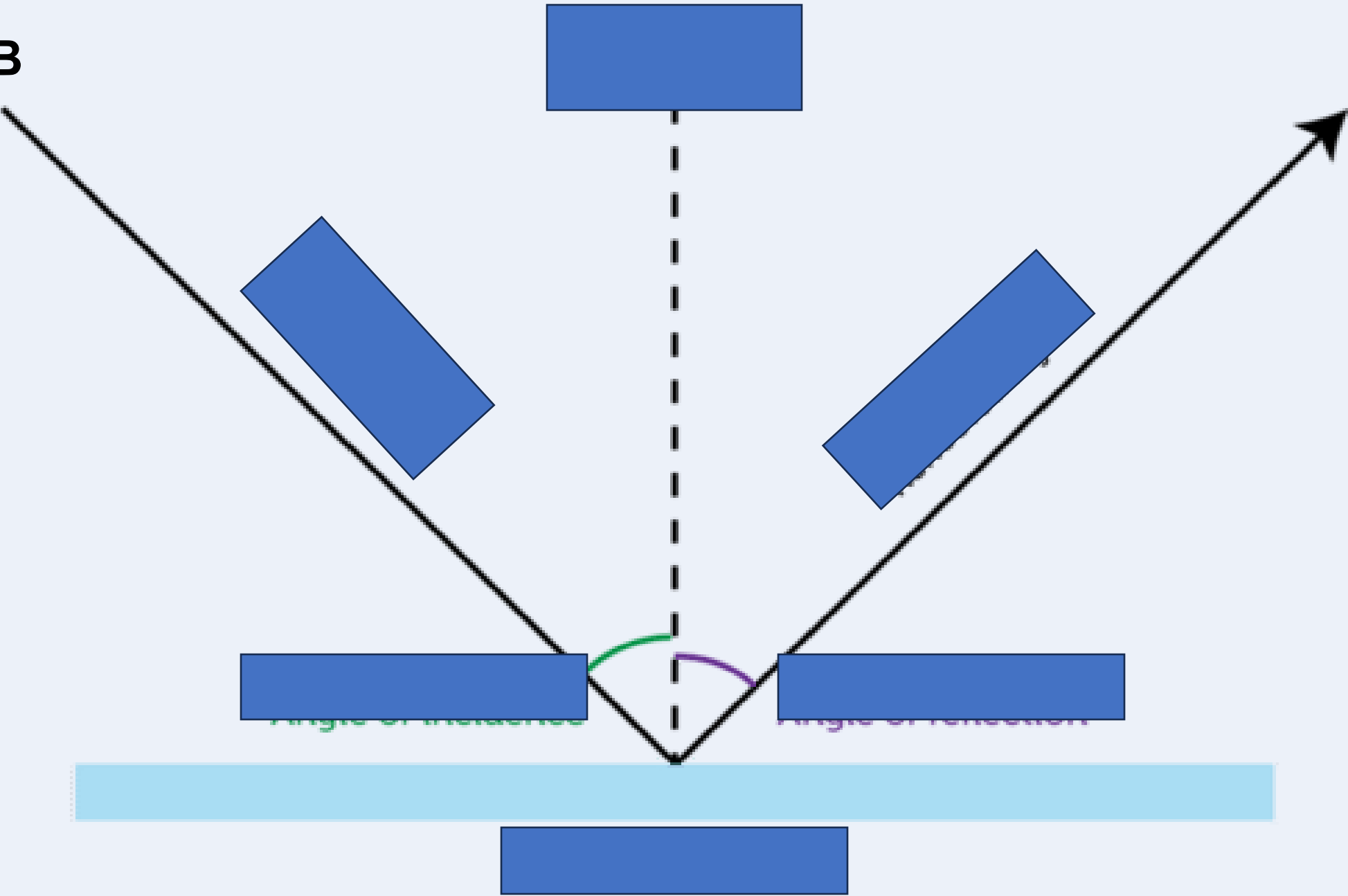
3. What is the name of the ray that comes back from the reflective surface?

Reflected ray

4. Describe what happens to a ray of light that hits a reflective surface

It is reflected back in a different direction (at an angle equal to the angle of incidence).

MWB

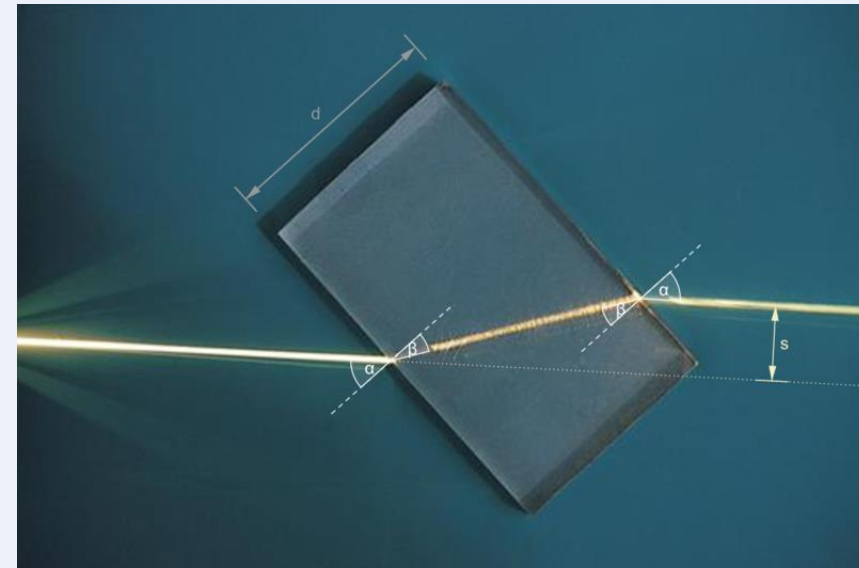
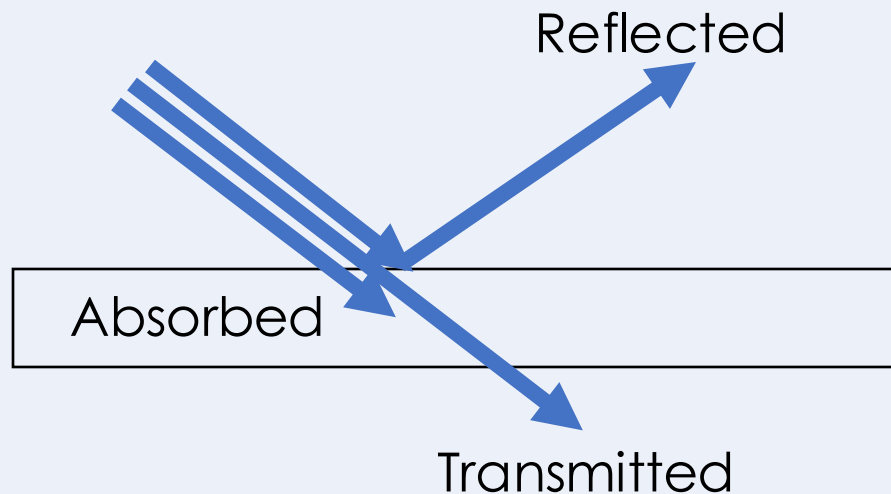


Check for understanding

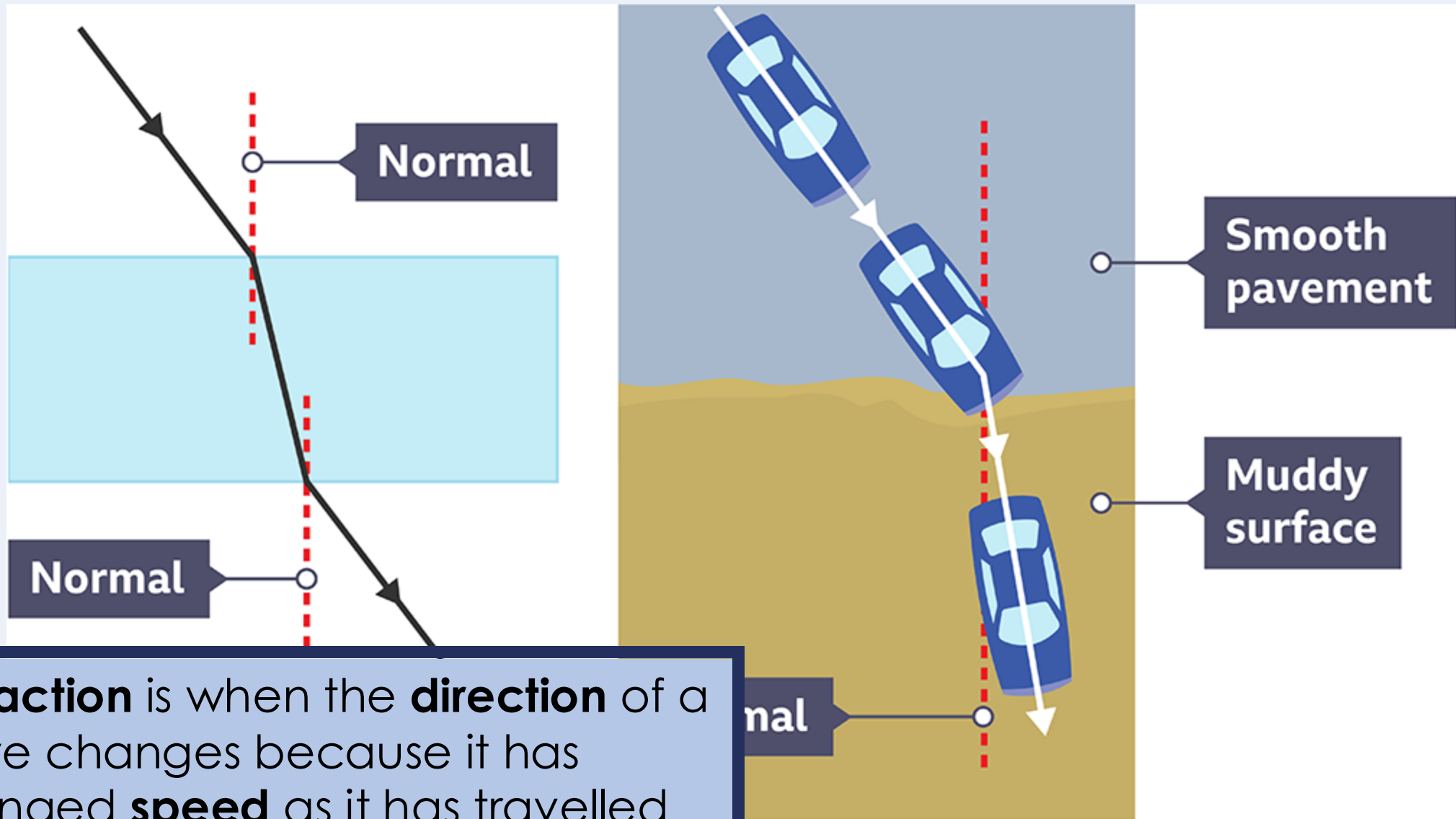
Waves at a boundary

When waves arrive at a **boundary** between two different materials they can be **reflected**, **absorbed** or **transmitted**.

When waves enter a new material, they change speed and therefore change direction. This is called **refraction**.

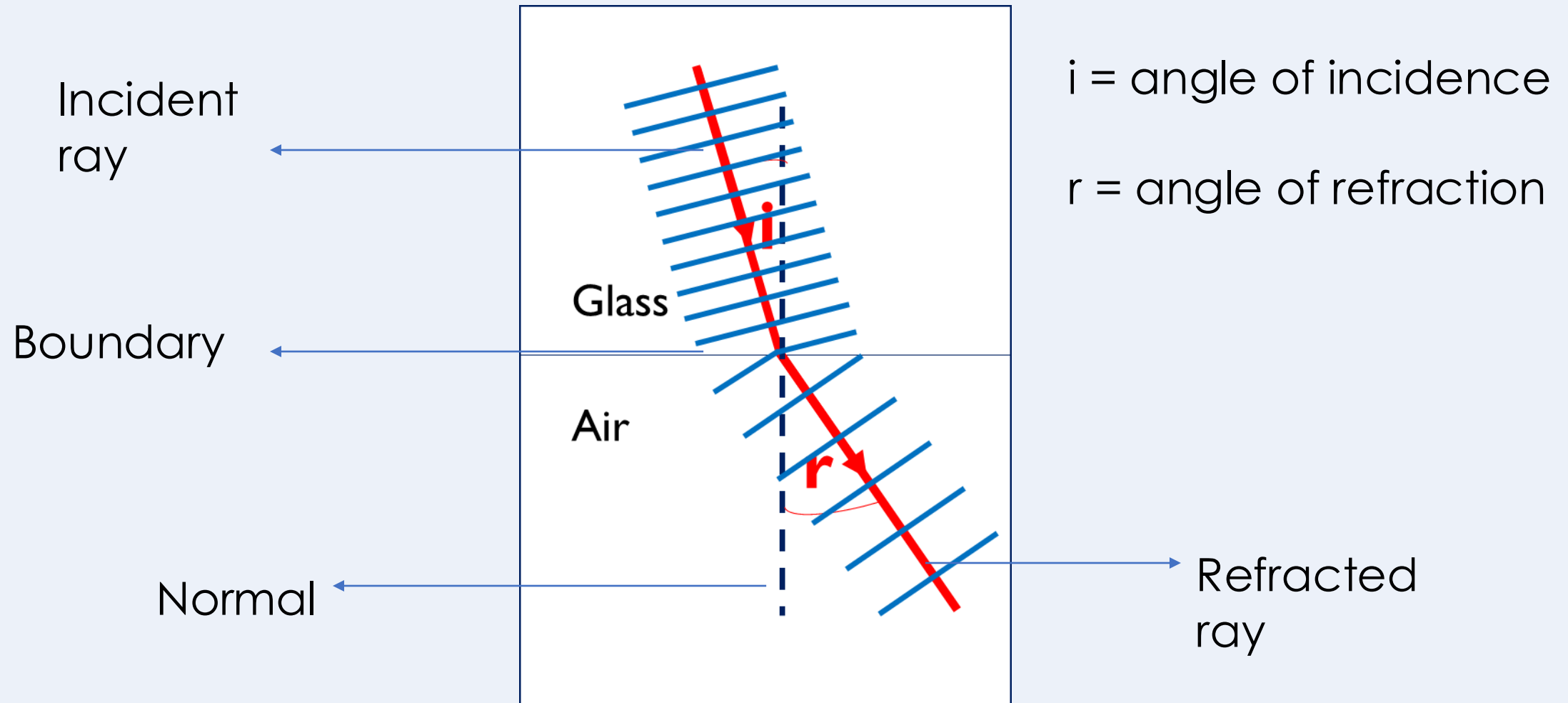


Refraction

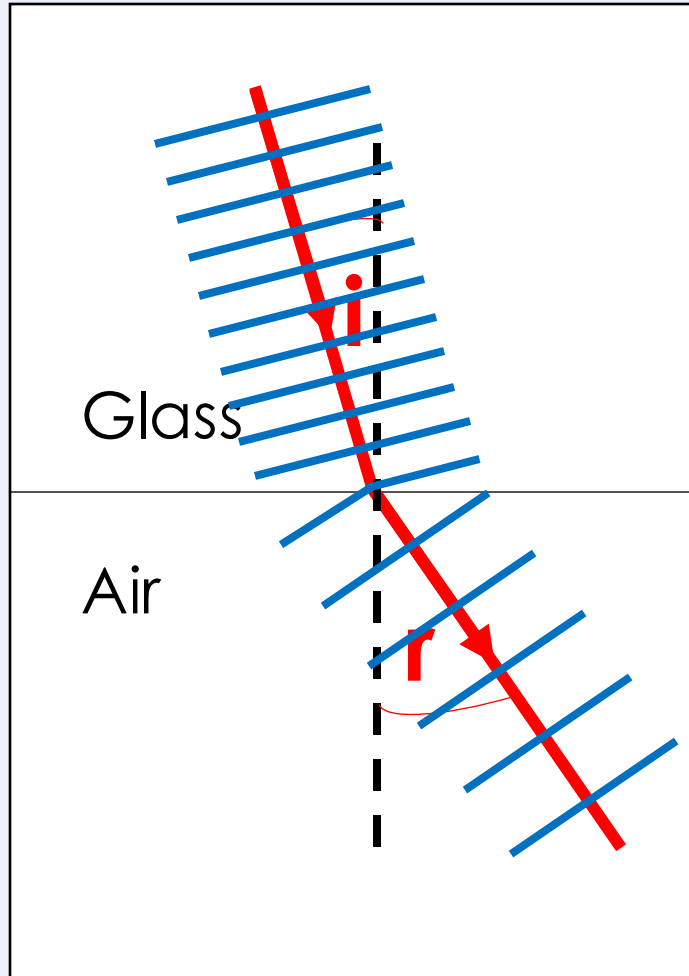


Refraction is when the **direction** of a wave changes because it has changed **speed** as it has travelled from one **medium** to another

Refraction



Refraction and angles

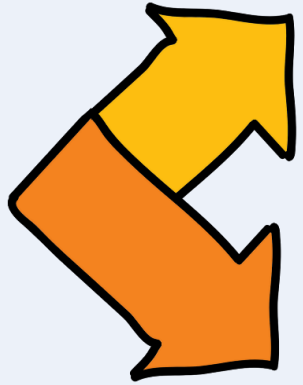


When light moves from a denser medium to a less dense medium it bends away from the normal and speeds up

We can see that because the refracted ray is further from the normal than the incident ray is.

When light moves from a less dense medium to a denser medium it bends towards the normal and slows down

Explain the difference between reflection and refraction (2 marks)



Reflection

Reflection is... , but refraction is...

Refraction

Stretch:

1. When a wave moves from material A to material B, it is refracted away from the normal. What does this tell you about the density of material A compared to material B?

Answers

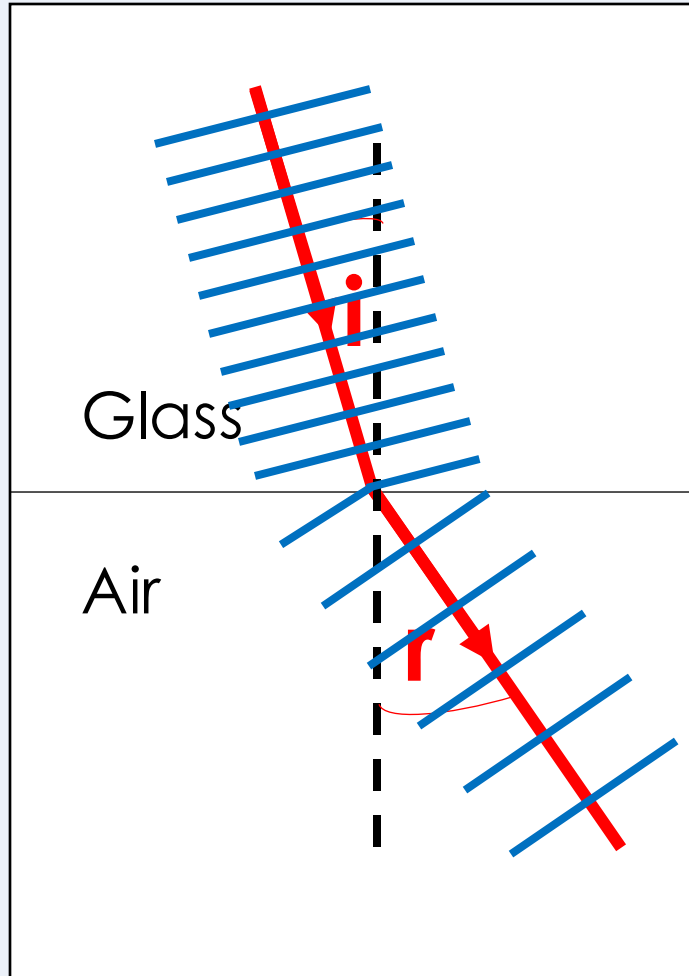
Reflection is when a light ray hits a reflective object and bounces off the surface. The angle of incidence is equal to the angle of reflection.

Refraction is when the direction of light changes because it has changed speed as it has travelled from one medium to another. Light would not change speed during reflection because it has bounced off the new medium at the boundary, not entered it so would still be travelling in the same medium.

Stretch:

1. Material A must be more dense than material B.
2. When a wave arrives at a boundary it is either absorbed, transmitted or reflected

Refraction and angles



The blue lines are called **wave fronts** and represent the peak of a wave.

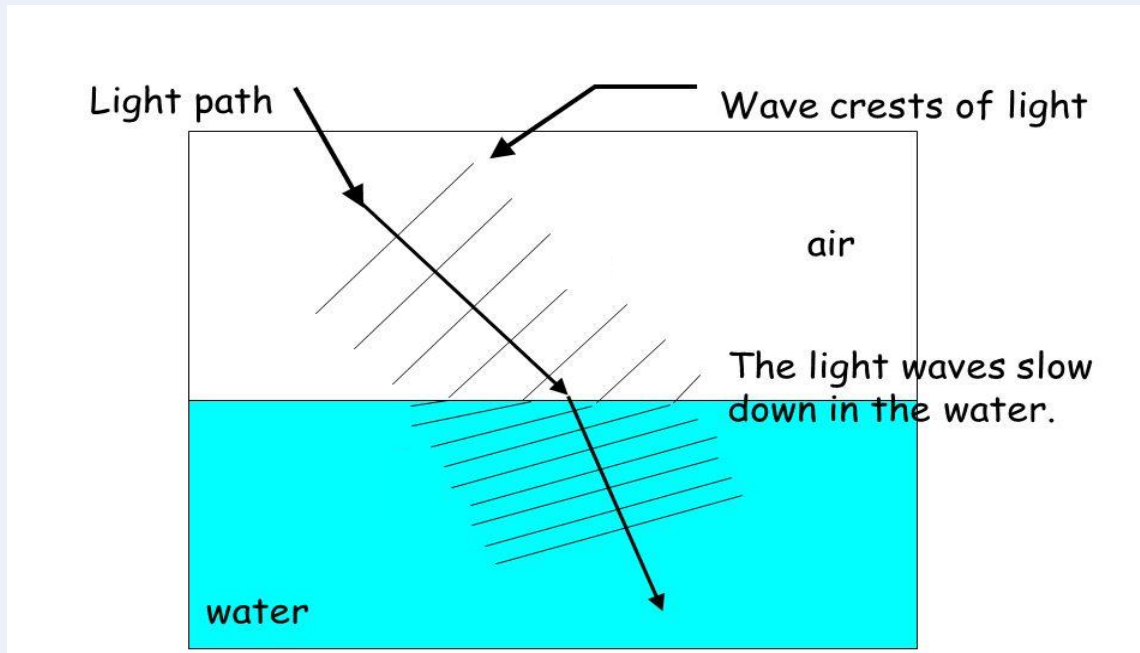
What do you notice about the wave fronts before and after refraction?

- The wave fronts change direction
- The wave fronts are closer together in glass than in air, this is because the wavelength is smaller in glass than in air

When a wave enters a new medium the **wavelength** and **speed** change but the **frequency** stays the same.


MWB: Quick Check

What happens when light moves from air to water?
(Must include what's happening the wavelength)




When light moves from a less dense medium to a more dense medium it bends **towards** the **normal**, slows down and the wavelength becomes shorter

Complete the worksheet

 Science Mastery

5. Does light move towards or away from the normal as it travels from water to air?

 Science Mastery

Reflection and Refraction

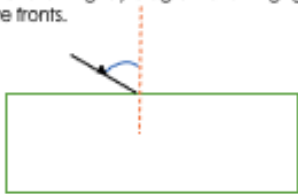
- A person makes ripples on a pond by gentle tapping the surface of the water.
 - What must they do to increase the frequency of the wave?


 - If the speed stays the same, what effect does this have on the wavelength of the wave?

 - What effect does hitting the water harder have?

- A person observes that ripples on a pond are passing her at a rate of 1 every 3 minutes. What is the frequency of the waves?

- Explain why refraction happens in glass.

- Complete the following ray diagram showing light entering a glass prism from air, include wave fronts.




Answers

1. A person makes ripples on a pond by gentle tapping the surface of the water.

a. What must they do to increase the frequency of the wave?

Tap the water more often (more times each second).

b. If the speed stays the same, what effect does this have on the wavelength of the wave?

If frequency increases, wavelength decreases.

c. What effect does hitting the water harder have?

It increases the amplitude of the wave.

Answers

2. A person observes that ripples on a pond are passing her at a rate of 1 every 3 minutes. What is the frequency of the waves?

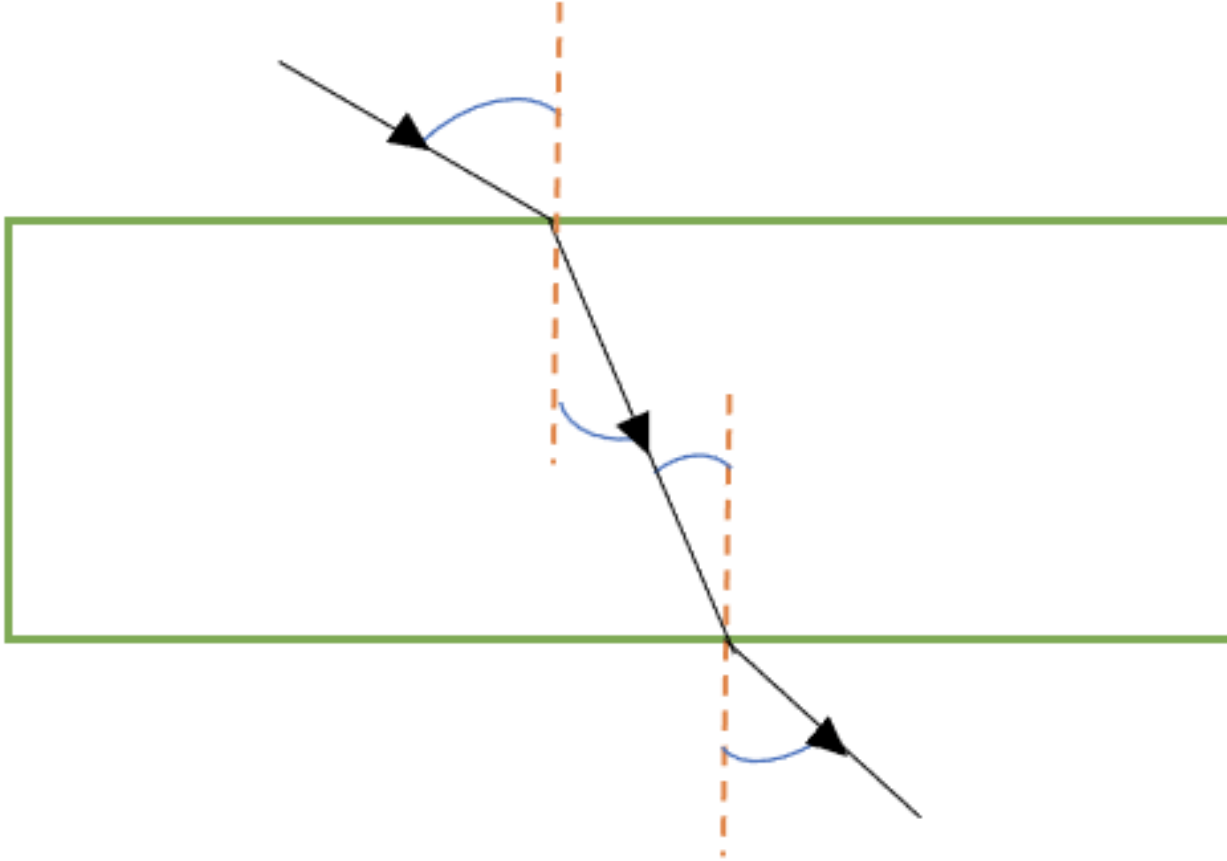
$$3\text{mins} = 3 \times 60 \text{ s} = 180\text{s}$$

$$1 \div 180 = 0.006\text{Hz}$$

3. Explain why refraction happens in glass.

Refraction happens in glass because glass is more dense than air. As light crosses from air into glass, the speed of light will slow down.

Answers



Answers

5. Does light move towards or away from the normal as it travels from water to air?

Light moves away from the normal as it travels from water to air because air is less dense than water.



Answer the questions below.

1. Which objects does light reflect off?

- ☐ A. No objects
- ☒ B. All objects we can see
- ☐ C. Only mirrors

2. What is the law of reflection?

- ☐ A. The angle of reflection is bigger than the angle of incidence
- ☐ B. The angle of incidence is equal to the angle of refraction
- ☒ C. The angle of incidence is equal to the angle of reflection

3. What happens when light enters a more dense medium at an angle?

- ☐ A. It does not change direction
- ☒ B. It changes direction towards the normal
- ☐ C. It changes direction away from the normal

Lesson P3.3.5

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link. Thank you!](#)