

Physics

Forces · sound · light

Pushes and pulls, and the two ways energy reaches us: sound and light.

This belongs to **Henry**.

Skills

Biology

Chemistry

Physics

The thread through Physics

Forces change how things move. Sound and light both travel as waves, but in different ways. One clear difference: light is far faster than sound.

Forces

Big idea: A force is a push or a pull. Forces change how something moves or its shape.



Balanced forces are equal and opposite, so motion does not change. Unbalanced forces make an object speed up, slow down or change direction.

What you must know

- Forces are measured in **newtons (N)**.
- Types: gravity (weight), friction, air resistance, upthrust, magnetism.
- **Balanced** forces: no change in motion. **Unbalanced** forces: motion changes.
- **Mass** is how much matter there is (kg). **Weight** is the pull of gravity on it (N).

MUST KNOW

Force is a push or pull, in newtons. Balanced vs unbalanced.

SHOULD KNOW

The difference between mass and weight.

NICE TO KNOW

Weight = mass \times gravity.

Common mistakes

- Mass (kg) and weight (N) are not the same thing.
- Balanced forces do not always mean still. An object can move at a steady speed.

Forces: questions

Key vocabulary

Force a push or a pull, measured in newtons

Friction a force that slows things sliding

Weight the pull of gravity on an object

Balanced equal and opposite forces

QUICK CHECK

1. What unit are forces measured in?

2. Name two forces.

EXPLAIN WHY

3. A car drives at a steady speed. Explain what this tells you about the forces on it.

WORKED EXAMPLE ANSWER

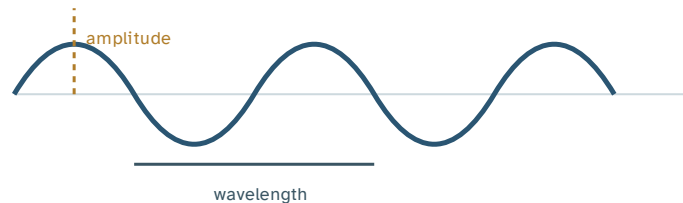
If the car moves at a steady speed, the forces on it must be balanced. The driving force forwards is equal to the friction and air resistance pushing back. Because the forces are equal and opposite, the motion does not change, so the speed stays the same.

EXAM STYLE

4. Explain the difference between mass and weight. [2 marks]

Sound

Big idea: Sound is made by vibrations, and it travels as a wave through a material.



A bigger amplitude means a louder sound. Waves closer together (higher frequency) mean a higher pitch.

What you must know

- Sound is made by something **vibrating**.
- It needs a material to travel through. It **cannot** travel through a vacuum (empty space).
- Bigger vibrations (amplitude) = **louder**.
- Faster vibrations (frequency) = **higher pitch**.
- The ear picks up the vibrations so we hear them.

MUST KNOW

Sound = vibrations. Loudness from amplitude, pitch from frequency.

SHOULD KNOW

Sound needs a material, not a vacuum.

NICE TO KNOW

Sound travels faster in solids than in air.

Common mistakes

- Sound cannot travel through space, because space is a vacuum.
- Louder means a bigger amplitude, not a higher pitch.

Sound: questions

QUICK CHECK

1. What makes a sound?

2. What changes to make a sound louder?

3. Can sound travel through space? Why?

EXPLAIN WHY

4. In a thunderstorm, why do you see the lightning before you hear the thunder?

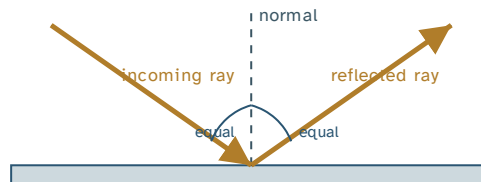
WORKED EXAMPLE ANSWER

The lightning and thunder happen at the same time, but light travels much faster than sound. The light reaches your eyes almost instantly, while the sound takes longer to travel through the air to your ears. So you see the flash first, then hear the thunder a moment later.

5. Explain the difference between a loud sound and a high pitched sound, using the words amplitude and frequency. **[2 marks]**

Light

Big idea: Light travels in straight lines. We see things when light reaches our eyes.



When light reflects off a mirror, the angle going in equals the angle coming out.
Both are measured from the normal, the dashed line.

What you must know

- Light travels in **straight lines**, called rays. It is much faster than sound.
- **Luminous** objects make their own light (the Sun). We see other objects because light **reflects** off them into our eyes.
- **Reflection:** the angle going in equals the angle coming out.
- **Refraction:** light bends when it passes into glass or water.
- Shadows form because light is blocked and cannot bend round the object.

MUST KNOW

Light travels in straight lines.
We see by reflected light.
Angles equal in reflection.

SHOULD KNOW

Refraction is light bending in
glass or water.

NICE TO KNOW

A prism splits white light into
colours.

Common mistakes

- Eyes do not send light out. We see because light goes **into** the eye.
- Angles are measured from the normal (the dashed line), not from the mirror surface.

Light: questions

Key vocabulary

Ray a straight line showing the path of light

Reflection light bouncing off a surface

Refraction light bending as it enters glass or water

Luminous makes its own light

QUICK CHECK

1. How does light travel?

2. What is the normal in a ray diagram?

EXPLAIN WHY

3. Explain how you are able to see a book that does not make its own light.

WORKED EXAMPLE ANSWER

The book is not luminous, so it does not give out light. Instead, light from a source such as the Sun or a lamp hits the book and reflects off it. That reflected light travels in straight lines into your eyes, and that is how you see the book.

EXAM STYLE

4. A ray of light hits a mirror at 30 degrees to the normal. At what angle does it reflect, and why? **[2 marks]**

Physics: answers

Topic 7: Forces

1. Newtons (N).
2. Any two: gravity, friction, air resistance, upthrust, magnetism.
3. The forces are balanced, so the speed stays the same.
4. Mass is the amount of matter (kg). Weight is the pull of gravity on it (N).

Topic 8: Sound

1. Something vibrating.
2. A bigger amplitude (bigger vibration).
3. No, because space is a vacuum and sound needs a material to travel through.
4. Light is much faster than sound, so the flash reaches you first.
5. Loudness depends on amplitude (bigger = louder). Pitch depends on frequency (faster = higher).

Topic 9: Light

1. In straight lines (as rays).
2. A line at right angles to the surface, used to measure angles.
3. Light reflects off the book into your eyes.
4. 30 degrees, because the angle going in equals the angle coming out.

If time is short, protect these

The highest return across the four parts. These carry the most marks.

1 The science skills

Variables, fair tests, tables and graphs. They appear in every section.

2 Cell parts and diffusion

The four animal parts, three extra plant parts, and what diffusion is.

3 The particle model

Arrangement and movement in solids, liquids and gases.

4 Element vs compound vs mixture

And the signs of a chemical reaction.

5 Forces, and reflection

Balanced vs unbalanced, and the equal angles rule for light.

The must know floor, to pass comfortably

- Name and explain the variables in a fair test.
- Label an animal and a plant cell, and say what diffusion is.
- Describe particles in each state, and name the changes of state.
- Tell an element, a compound and a mixture apart.
- Know forces are in newtons, and balanced forces mean no change in motion.
- Sound is vibrations and needs a material. Light travels in straight lines and reflects with equal angles.