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Light, shadows and reflections





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Light, shadows and reflections

Which object makes light?



THE IDEA

A luminous source emits light. Other objects are visible when they reflect light into an eye. The Sun and stars produce light.

The Moon and a mirror reflect light. A bright appearance alone cannot distinguish a source from a reflector.

CHECK YOUR THINKING

Which object remains a source without a lamp shining on it?

A A plain mirror.

B A lit candle.

B. A lit candle.

A RELATED EXAMPLE

Three panels in one light

Clear glass transmits a clear view. Frosted glass transmits and scatters light. Wood blocks the view. Transparent, translucent and opaque describe how a sample transmits light. Compare thickness, lighting and the target behind each panel.

Light, shadows and reflections

Why the holes must line up



THE IDEA

Light travels along straight paths in a uniform medium. In the model a lamp is visible through aligned openings.

Shifting the middle card blocks that direct path. The lamp can still be on while the observer can no longer see it.

CHECK YOUR THINKING

Which change restores the view?

A Making a sharp bend in the path without a mirror.

B Realigning the opening with the lamp and eye.

B. Realigning the opening with the lamp and eye.

A RELATED EXAMPLE

A mirror makes an image

A smooth plane mirror reflects light in an orderly way. The image appears upright, the same size and as far behind the mirror as the object is in front. It appears laterally inverted. Unlike a shadow, a mirror image can show colour and detail.

Light, shadows and reflections

Build a shadow



THE IDEA

A source, an object that blocks light and a surface receiving light can produce a shadow. The shadow is the region reached by less direct light.

Its outline depends on shape and orientation. It does not show the object's surface colours.

CHECK YOUR THINKING

What would happen if the screen moved out of the beam?

A The object would stop blocking light.

B The shadow would no longer appear on that screen.

B. The shadow would no longer appear on that screen.

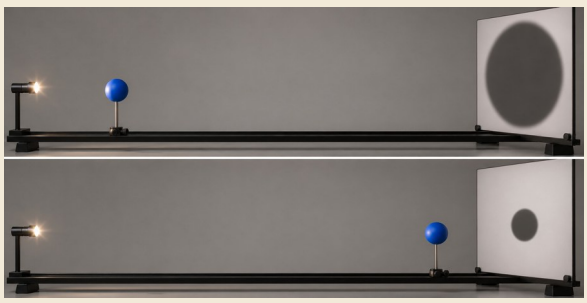
LOOK AGAIN

Which three parts make this shadow possible?

Identify a source, an object that blocks some light and a surface where the shadow can be seen. Moving any of the three can change the result.

Light, shadows and reflections

Move the object, change the size



THE IDEA

With a small fixed source and a fixed screen, an object nearer the source usually casts a larger shadow. Light spreads out from the source.

The same object blocks a wider part of the beam at the screen. A broad source can also create a partly shaded, less sharp edge.

CHECK YOUR THINKING

Which position usually gives the smaller shadow on the same screen?

A Closer to the small source.

B Closer to the screen.

B. Closer to the screen.

LOOK AGAIN

Cover the two shadows with your hand. Predict which is wider, then compare.

With a small fixed lamp and a fixed screen, move the object towards the lamp. It blocks a greater fraction of the spreading light and its shadow usually widens.

Light, shadows and reflections

Light crosses at the pinhole



THE IDEA

Imagine a red ribbon tied to the very top of this tree. Where would it appear on the screen? Light from the ribbon travels straight through the tiny hole to the bottom of the screen.

Light from the base reaches the top. A wider hole lets light from different parts overlap, so the image blurs.

CHECK YOUR THINKING

A friend predicts a wider opening always makes a clearer image. What would you expect?

A More light gets in, so the outline must become sharper.

B More light gets in, but overlapping light can blur the outline.

B. More light gets in, but overlapping light can blur the outline.

LOOK AGAIN

Which part of the image corresponds to the tree top?

Light from the top of the tree reaches the lower part of the image. A narrow opening limits how many paths from each point overlap on the screen.

ONE LAST CHALLENGE

How can light from above an obstacle reach your eye?

Two plane mirrors sit parallel inside a simple periscope. Each is tilted at about 45° to the tube.



THE REVEAL

It reflects twice.

The top mirror directs the light down the tube. The lower mirror reflects it towards your eye.

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