GRID & SILICON
Teacher / parent guide

Fiber Optic Cables: Sending Data with Light

Time: about 30–40 minutes.

Suggested grade range: 4th–8th.

Materials: The explainer and printed lesson pages. Keep the labeled diagram beside the reading.

Objectives: Trace how information travels from a laser through a fiber to a receiver, and explain how the cladding and amplifier help.

Stuck on a word? Open the Glossary: gridandsilicon.com/glossary/.

Quick answer key

Word of the Week example: A mirror can reflect light onto the wall.

Warm-up A: Light pulses. · Warm-up B: They get weaker.

Multiple choice: 1. A · 2. B · 3. A · 4. B · 5. A · 6. A · 7. B · 8. A · 9. C

Fill-ins: 1. core · 2. cladding · 3. receiver.
Diagram: 1. Laser · 2. Core · 3. Cladding · 4. Amplifier · 5. Receiver.

Multiple-choice reasoning

1. A — Light pulses. Light pulses carry the message through the fiber.

Text: "A fiber optic cable carries information as light pulses (quick flashes of light)." **Other choices:** Water and air are not mentioned as carriers. **If stuck:** Read "Start with the whole system."

2. B — Laser. The text identifies this part and its job.

Text: "A laser turns electrical signals into light pulses." **Other choices:** The receiver does the opposite; the cladding keeps light inside. **If stuck:** Read the first lines of "Laser."

3. A — In the core. The text identifies this part and its job.

Text: "The core is the center of the fiber, where the light travels." **Other choices:** The light stays inside the fiber; the receiver is only at the far end. **If stuck:** Read "Core."

4. B — Makes the light reflect back into the core. The text identifies this part and its job.

Text: "The cladding makes light reflect back into the core." **Other choices:** Very little light escapes; the receiver makes electrical signals. **If stuck:** Read "Cladding."

5. A — 0. The text gives this code or calculation directly.

Text: "In the simplest code, a flash means 1 and no flash means 0." **Other choices:** The other numbers are not the no-flash value. **If stuck:** Read the second paragraph of "Laser."

6. A — Amplifier. The text identifies this part and its job.

Text: "An amplifier makes weak light pulses strong again." **Other choices:** The receiver changes light to signals; the cladding keeps light inside. **If stuck:** Read "Amplifier."

7. B — Receiver. The text identifies this part and its job.

Text: "A receiver turns light pulses back into electrical signals." **Other choices:** The laser makes light pulses; the core carries them. **If stuck:** Read "Receiver."

8. A — Fiber's signal stays strong over longer distances. The explainer states this advantage of fiber.

Text: "But fiber can carry much more information than copper wire, and its signal stays strong over longer distances." **Other choices:** Fiber is glass; fiber does use a laser. **If stuck:** Read "Put the five parts together."

9. C — One hundredth of a second. The text gives this code or calculation directly.

Text: "2,000 ÷ 200,000 = 0.01. So the light crosses the cable in about one hundredth of a second." **Other choices:** One second and one tenth do not match the calculation. **If stuck:** Read the final paragraph of "Put the five parts together."

Other answers and support

Word of the Week: Reflect: to bounce back from a surface, like light off a mirror. Example: A mirror can reflect light onto the wall. The example uses reflect to describe light bouncing from a surface. If stuck, Think of a mirror.

Warm-ups: Warm-up A: Light pulses. Warm-up B: They get weaker. Text: "A fiber optic cable carries information as light pulses (quick flashes of light). So light pulses get weaker as they travel far." The words and evidence are in the explainer. If stuck, Look back at "Start with the whole system" and "Amplifier."

Fill-ins: 1 core · 2 cladding · 3 receiver Text: "The core is the center of the fiber, where the light travels. The cladding makes light reflect back into the core. A receiver turns light pulses back into electrical signals." Each word names the part described in its sentence. If stuck, Use the word bank and the part descriptions.

Think about it 1: Both send a code with light, flash for 1 and no flash for 0; the friend is the receiver. Text: "In the simplest code, a flash means 1 and no flash means 0. Your friend is the receiver." One person sends the pattern and the other reads it. If stuck, Compare the sender and receiver.

Think about it 2: Fiber, because its signal stays strong over longer distances (or it carries more information). Accept copper only if the student uses the text fact that copper carries electrical signals and notes the distance is short; ignore spelling. Text: "But fiber can carry much more information than copper wire, and its signal stays strong over longer distances." The student should support the choice with a fact from the explainer. If stuck, Read "Put the five parts together."

Exit ticket: fiber optic cables

Ask: (1) Name the part that makes light pulses and the part that turns them back into signals (laser, receiver). (2) Explain why light stays inside the fiber (cladding reflects it back into the core). (3) Say what an amplifier does (makes weak light strong again).

Score 0–3, one point each. Accept spoken, drawn or written answers.

Teaching connection: NGSS MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. Connection: the diagram is a model; light is transmitted through the core, reflected at the cladding, and partly absorbed over long distances, which is why amplifiers exist.

Help: Read one section aloud, pause, point to its number on the diagram. Allow look-backs and breaks. **Extension:** Students make a flashlight or hand-signal code (flash = 1, no flash = 0) and send a 3-digit number to a partner who acts as the receiver. No lasers.

Standards

- NGSS MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. Connection: the diagram is a model; light is transmitted through the core, reflected at the cladding, and partly absorbed over long distances, which is why amplifiers exist.
- NGSS MS-PS4-3 (partial connection): Integrate information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. Connection: flash = 1, no flash = 0. The lesson introduces digital coding but does not compare analog and digital reliability.
- Common Core ELA RI.6.1 (cite textual evidence), RI.6.4 (word meanings in context: core, cladding, receiver, reflect), RI.6.7 (integrate diagram and text), RST.6-8.7 (technical text with a diagram).
- Common Core Math 6.RP.A.3b (unit rate and constant speed: 2,000 km at about 200,000 km per second, question 9).

Safety note

Do not use laser pointers in class. Never look into a laser or the end of a fiber.

Vocabulary Word Search — Answer Key

Find the words across, down or diagonally, reading forward.

J	F	T	B	Q	R	Y	B	S	L	K	X	F	N	B
B	B	Z	W	B	Q	J	R	B	V	K	S	T	W	K
P	R	E	C	E	I	V	E	R	K	K	S	M	B	R
W	Z	G	L	F	H	Z	M	F	N	V	R	V	J	L
F	M	L	A	M	X	T	S	I	G	N	A	L	V	I
I	Q	A	D	X	C	T	K	Q	R	H	P	W	P	G
B	D	S	D	S	V	F	H	V	Q	P	T	B	T	H
E	C	S	I	M	Y	X	X	Q	Z	H	H	V	K	T
R	B	J	N	W	W	K	Q	V	P	X	P	S	L	W
Y	B	Q	G	V	A	M	P	L	I	F	I	E	R	G
V	W	J	R	C	T	P	X	W	J	V	R	T	P	R
C	P	B	W	W	Y	R	E	F	L	E	C	T	Y	N
S	O	Y	B	K	Z	H	W	X	H	D	W	L	C	D
D	B	R	S	B	L	K	L	F	Y	H	P	M	D	H
H	L	V	E	L	A	S	E	R	H	L	Z	M	S	N

- ☐ **FIBER**
- ☐ **GLASS**
- ☐ **LIGHT**
- ☐ **LASER**
- ☐ **CORE**
- ☐ **CLADDING**
- ☐ **REFLECT**
- ☐ **SIGNAL**
- ☐ **RECEIVER**
- ☐ **AMPLIFIER**

Locations: AMPLIFIER: row 10, column 6, across · CLADDING: row 3, column 4, down · RECEIVER: row 3, column 2, across · REFLECT: row 12, column 7, across · SIGNAL: row 5, column 8, across · FIBER: row 5, column 1, down · GLASS: row 4, column 3, down · LIGHT: row 4, column 15, down · LASER: row 15, column 5, across · CORE: row 12, column 1, diagonal

GRID & SILICON
Technology explainer

Fiber Optic Cables: Sending Data with Light

In the news

On October 26, 2026, Tata Communications, a company that runs communication networks, announced a plan to build about 10,000 kilometers of new long-distance fiber optic cable across India. The company plans to spend about 400 to 450 million US dollars. The new network would link India's main data center and AI hubs so they can share information quickly. The first phase covers a route linking the cities of Mumbai, Pune, Hyderabad and Chennai. Later phases would reach more cities. The network would also connect to the company's worldwide network, linking India with AI hubs in other countries.

Original source

Tata Communications to Build India's AI Super Highway

Tata Communications · Press release · 2026-10-26

https://www.tatacommunications.com/press-release/tata-communications-to-build-indias-ai-super-highway

Read the original announcement using this link or QR code.

Fiber Optic Cables: Sending Data with Light

How can a thin strand of glass carry information?

In the news

How do data centers talk to each other across a whole country? On October 26, 2026, Tata Communications announced a plan to lay about 10,000 kilometers of new fiber optic cable across India. The new network would link the country's main data center and AI hubs. Following a flash of light through the cable shows how this kind of link works.

The technology behind it

Start with the whole system

Think about sending a text message. Your words leave your phone and reach a friend in a moment. Something has to carry that information the whole way.

AI computers send huge amounts of information. AI means computer programs that learn patterns from examples. The computers that run AI live in data centers. They need to share information with each other and with people far away.

A fiber optic cable carries information as light pulses (quick flashes of light). Each fiber is a strand of glass about as thin as a human hair. A cable bundles many fibers inside a tough cover. Fiber links computers inside data centers. It also links data centers in different cities.

Follow the diagram from left to right: Laser, Core, Cladding, Amplifier and Receiver. The sections below explain each part.

Laser

Start at the sending end. Computers work with electrical signals. A laser turns electrical signals into light pulses. These light pulses can travel through glass.

The light pulses follow a code. In the simplest code, a flash means 1 and no flash means 0. Computers store all information as patterns of 1s and 0s. Real systems use faster and more complex codes, but the idea is the same.

Safety: Never look into a laser or into the end of a fiber. The light can hurt your eyes, even when you cannot see it.

Real-world example: Imagine flashing a flashlight to a friend across a dark yard. Long flash, short flash, no flash. If you both know the code, you can send a message with light.

Core

Next, the light enters the fiber. The core is the center of the fiber, where the light travels. It is made of very clear glass. Clear glass lets light pass through without blocking much of it.

Light in glass is fast. It travels about 200,000 kilometers each second. That is about two-thirds as fast as light moving through empty space.

Real-world example: Look through a clean window. Light passes right through the glass. The core is like a very long, very thin window that light travels along.

Cladding

A fiber is not a straight path. Cables bend around corners and over hills. So what keeps the light inside? The cladding is the layer of glass around the core. The cladding makes light reflect back into the core.

To reflect means to bounce back from a surface. When light hits the edge of the core, it bounces back inside. It keeps bouncing as it travels down the fiber. Very little light escapes.

Real-world example: Roll a ball down a bowling lane with bumpers. Each time the ball hits a bumper, it bounces back into the lane. The cladding acts like bumpers for light.

Amplifier

Even clear glass is not perfect. On a very long trip, the glass absorbs a little light. Some light also scatters away. So light pulses get weaker as they travel far.

An amplifier makes weak light pulses strong again. Long routes place amplifiers along the cable, often tens of kilometers apart. Then the light can keep going across a whole country, or even under an ocean.

Real-world example: Think of a relay race. One runner gets tired, so a fresh runner carries the baton. The message keeps moving at full strength.

Receiver

Finally, the light reaches the far end. A receiver turns light pulses back into electrical signals. Now the computers at that end can use the information.

The receiver reads the pattern of flashes and no flashes. It changes them back into 1s and 0s. The message arrives in the same pattern it started with.

Real-world example: Your friend across the yard watches your flashlight and writes down each flash. Your friend is the receiver.

Put the five parts together

Look back at the diagram. The laser makes light pulses. The core carries them. The cladding keeps them inside. The amplifier makes weak pulses strong. The receiver turns them back into electrical signals.

Why not use copper wire? Copper wires carry electrical signals, and many still do. But fiber can carry much more information than copper wire, and its signal stays strong over longer distances. That is why long links between data centers use fiber.

Try the math. Suppose a fiber cable is 2,000 kilometers long. Light in glass travels about 200,000 kilometers each second. 2,000 ÷ 200,000 = 0.01. So the light crosses the cable in about one hundredth of a second.

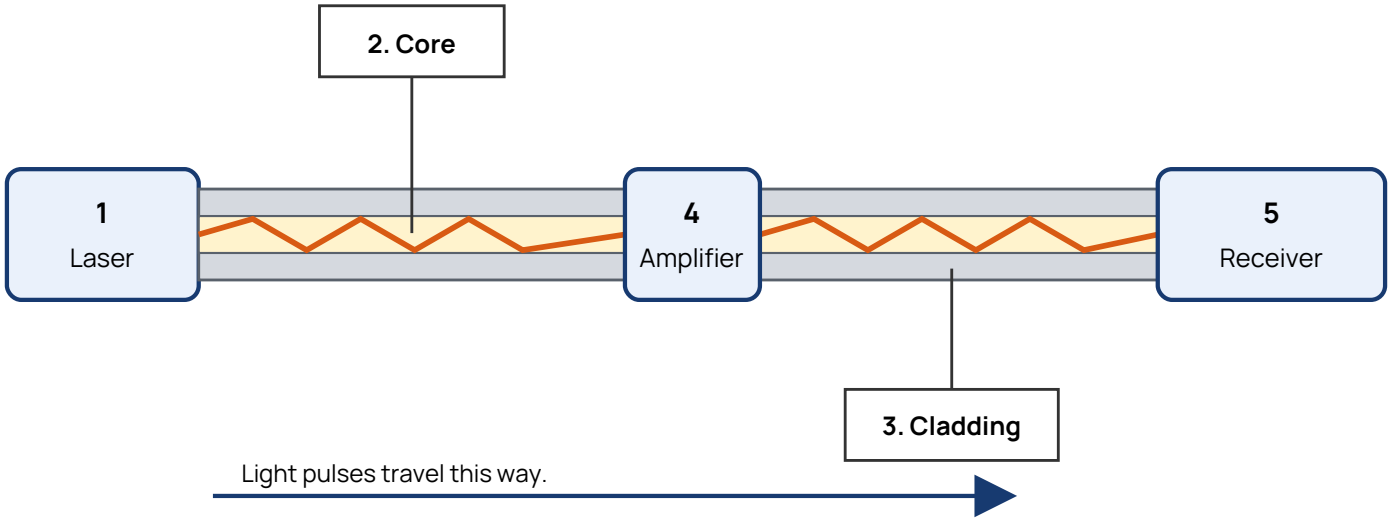
Key ideas

- A fiber optic cable carries information as light pulses.
- The core carries the light, and the cladding keeps it inside.
- Amplifiers make weak light pulses strong again on long trips.
- A receiver turns light pulses back into electrical signals.

Why this matters to you: Every video, game or message you send online may travel part of its trip as light in glass.

Words to know

Core: The center of a fiber, where light travels. · Cladding: The glass layer around the core that reflects light back inside. · Receiver: The part that turns light pulses back into electrical signals.


2. Core
1
Laser
4
Amplifier
5
Receiver
3. Cladding
Light pulses travel this way.