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# Physics of Sight



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## Second-Grade Teacher Resource Guide

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## Physics of Sight Lesson Summary and Vocabulary

**Lesson Summary:** The YSI *Physics of Sight* program touches on topics in biology, neuroscience, and physics to offer a basic overview of vision and light. The class begins by helping to complete a layered poster of an eye, learning about how each of its structures functions in human sight. They next apply this newfound understanding to a series of optical illusions, learning about the blind spot in the human eye and the way the brain processes visual information. Finally, students explore the nature of the light spectrum through prism experiments and build a spectroscope they can take home.

**Vocabulary:** Below are words and concepts that relate to the *Physics of Sight* program.

**Blood vessel:** Any of the vessels (arteries, veins, or capillaries) through which blood circulates.

**Cornea:** The transparent part of the sclera covering the iris and the pupil

**Fovea:** A small pit or depression in a bone or other structure.

**Iris:** The ring of muscle forming the colored portion of the eye and containing a circular opening, the pupil, in its center.

**Lens:** A convex, transparent part of the eye behind the iris that focuses light on the retina.

**Light:** Electromagnetic radiation visible to the eye.

**Optic nerve:** Cranial nerves consisting of sensory fibers that conduct impulses from the retina to the brain.

**Pupil:** The expanding and contracting opening in the iris of the eye, through which light passes to the retina.

**Refraction:** The change of direction of a ray, such as light, in passing from one medium into another in which its velocity is different.

**Reflection:** The return of light, heat, sound, etc., after striking a surface.

**Retina:** The innermost layer of the back of the eyeball that receives the image produced by the lens.

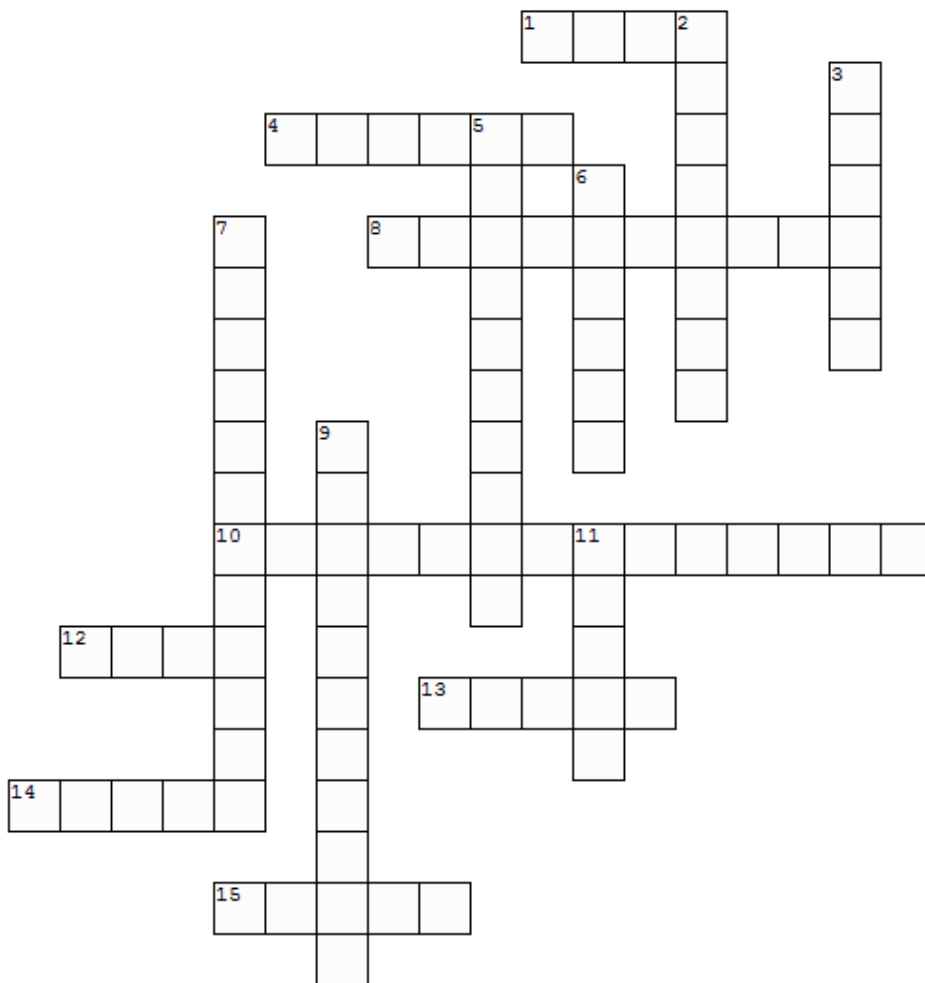
**Sclera:** A dense, white membrane that forms the external covering of the eyeball.

**Sight:** Perception of objects by use of the eyes

**Spectrum:** The band of colors produced when sunlight is passed through a prism, comprising a rainbow

**Vitreous humor:** The transparent gelatinous substance filling the eyeball behind the lens.

## Physics of Sight Language Arts Crossword Puzzle



- |              |            |        |        |       |          |                |       |
|--------------|------------|--------|--------|-------|----------|----------------|-------|
| BLOOD VESSEL | CORNEA     | FOVEA  | IRIS   | LENS  | LIGHT    | OPTIC NERVE    | PUPIL |
| REFRACTION   | REFLECTION | RETINA | SCLERA | SIGHT | SPECTRUM | VITREOUS FLUID |       |

**Across**

1. A convex, transparent part of the eye behind the iris that focuses light on the retina.
4. A dense, white membrane that forms the external covering of the eyeball.
8. The return of light, heat, sound, etc., after striking a surface.
10. The transparent gelatinous substance filling the eyeball behind the lens
12. The ring of muscle forming the colored portion of the eye and containing a circular opening, the pupil, in its center..
13. Electromagnetic radiation visible to the eye.
14. The expanding and contracting opening in the iris of the eye, through which light passes to the retina
15. A small pit or depression in a bone or other structure.

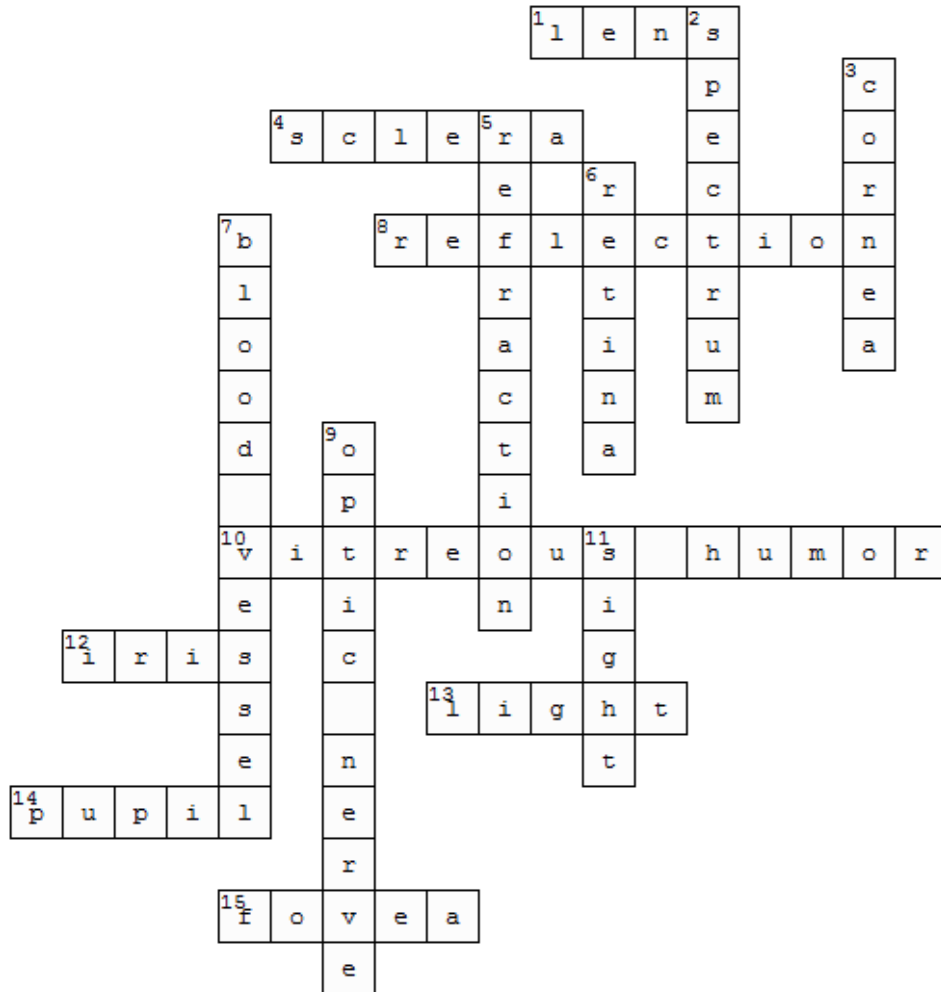
**Down**

2. The band of colors produced when sunlight is passed through a prism, comprising a rainbow
3. The transparent part of the sclera covering the iris and the pupil.
5. The change of direction of a ray, such as light, in passing from one medium into another in which its velocity is different.
6. The innermost layer of the back of the eyeball that receives the image produced by the lens.
7. Any of the vessels (arteries, veins, or capillaries) through which blood circulates.
9. Nerves consisting of sensory fibers that conduct impulses from the retina to the brain
11. Perception of objects by use of the eyes

## Answer Key

### Physics of Sight

### Language Arts Crossword Puzzle



#### Across

1. A convex, transparent part of the eye behind the iris that focuses light on the retina (**lens**).
4. A dense, white membrane that forms the external covering of the eyeball (**sclera**).
8. The return of light, heat, sound, etc., after striking a surface (**reflection**).
10. The transparent gelatinous substance filling the eyeball behind the lens (**vitreous humor**).
12. The ring of muscle forming the colored portion of the eye and containing a circular opening, the pupil, in its center (**iris**).
13. Electromagnetic radiation visible to the eye (**light**).
14. The expanding and contracting opening in the iris of the eye, through which light passes to the retina (**pupil**).
15. A small pit or depression in a bone or other structure (**fovea**).

#### Down

2. The band of colors produced when sunlight is passed through a prism, comprising a rainbow (**spectrum**).
3. The transparent part of the sclera covering the iris and the pupil (**cornea**).
5. The change of direction of a ray, such as light, in passing from one medium into another in which its velocity is different. (**refraction**).
6. The innermost layer of the back of the eyeball that receives the image produced by the lens (**retina**).
7. Any of the vessels (arteries, veins, or capillaries) through which blood circulates (**blood vessel**).
9. Nerves consisting of sensory fibers that conduct impulses from the retina to the brain (**optic nerve**).
11. Perception of objects by use of the eyes (**sight**).

## Physics of Sight Language Arts Word Search

Circle the vocabulary in the word search below. Can you find all the earth-related words?

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

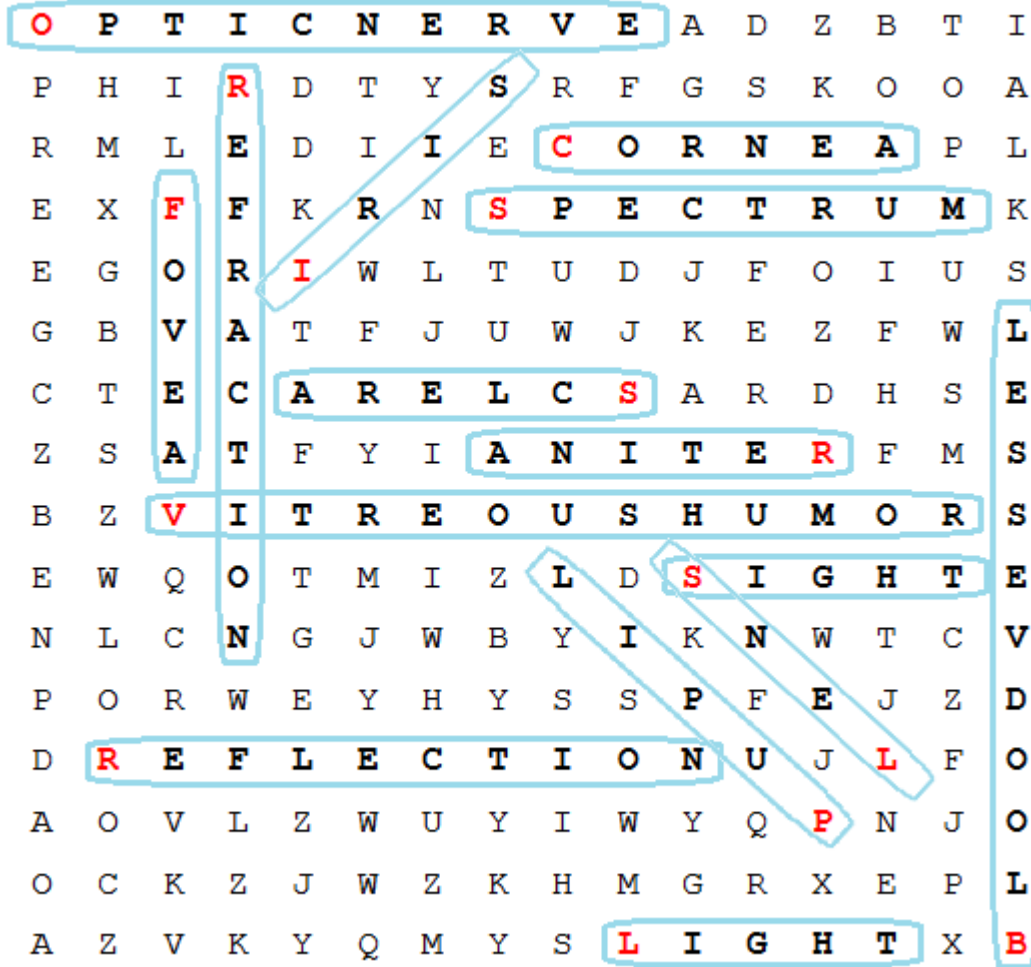
### Word Bank

BLOOD VESSEL  
CORNEA  
FOVEA  
IRIS  
LENS

LIGHT  
OPTIC NERVE  
PUPIL  
REFRACTION  
REFLECTION

RETINA  
SCLERA  
SIGHT  
SPECTRUM  
VITREOUS HUMOR

**Answer Key**  
**Physics of Sight**  
**Language Arts Word Search**



**Word Bank**

BLOOD VESSEL  
CORNEA  
FOVEA  
IRIS  
LENS

LIGHT  
OPTIC NERVE  
PUPIL  
REFRACTION  
REFLECTION

RETINA  
SCLERA  
SIGHT  
SPECTRUM  
VITREOUS HUMOR

## Physics of Sight Extension Activities

The extension activities listed below are from RAFT (Resource Area For Teaching). RAFT educational content is available online ([www.raftbayarea.org](http://www.raftbayarea.org)) at no cost and is aligned to California Science Standards and Next Generation Science Standards. Below is a selection of post-visit activities from RAFT to build on student learning about physics and sight.

### [RAFT Idea: Café Wall Illusion - Resource Area For Teaching - RAFT Bay Area](#)

**Grades Covered:** 4 through 12

**Subjects Covered:** Physical Science, Life Science

**Curriculum topics:** Vision, Function of the Eye, Illusion

**Description:** Students learn about how their eyes function with this fun illusion

<http://www.raftbayarea.org/ideas/Cafe%20Wall%20Illusion.pdf>

### [RAFT Idea: Animated Flip Books - Resource Area For Teaching - RAFT Bay Area](#)

**Grades Covered:** 2 through 8

**Subjects Covered:** Physical Science, Life Science, Art

**Curriculum topics:** Eye, Persistence of Vision, Animation

**Description:** This fun activity will give students the opportunity to create basic animations that can help them understand how motion pictures and the human eye work.

<http://www.raftbayarea.org/ideas/Animated%20Flip%20Books.pdf>

### [RAFT Idea: Eye See It - Resource Area For Teaching - RAFT Bay Area](#)

**Grades Covered:** 3 through 12

**Subjects Covered:** Physical Science, Life Science

**Curriculum topics:** Optics, Anatomy, Vision, Structure, Function of the Eye

**Description:** Use a bulk CD container to model parts of the eye and their functions.

<http://www.raftbayarea.org/ideas/Eye%20See%20It.pdf>

### [RAFT Idea: Image Viewer - Resource Area For Teaching - RAFT Bay Area](#)

**Grades Covered:** 3 through 12

**Subjects Covered:** Physical Science, Life Science

**Curriculum topics:** Light, Optics, Refraction

**Description:** Explore images formed by a pinhole and a lens. See what the eye really "sees" - an inverted image!

<http://www.raftbayarea.org/ideas/Image%20Viewer.pdf>

## Physics of Sight Education Standards

*This page references California Science Content Standards, Common Core, and Next Generation Science Standards, which students will be exposed to during the program.*

### **California Science Content Standards Second Grade:**

**Investigation and Experimentation: 4.** Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- a. Make predictions based on observed patterns and not random guessing.
- g. Follow oral instructions for a scientific investigation.

Excerpted from CA State Standards: <http://www.cde.ca.gov/>

### **Common Core Second Grade:**

**Speaking and Listening Standards:** Students will...

1. Participate in collaborative conversations with diverse partners about grade 2 topics with peers and adults in small and larger groups.
  - a. Follow agreed-upon rules for discussions.
  - b. Build on others' talk in conversations by linking their comments to the remarks of others.
  - c. Ask for clarification and further explanation as needed about the topics and texts under discussion.
2. Recount or describe key ideas or details from a text read aloud or information presented orally or through other media
  - a. Give and follow three- and four-step oral directions
3. Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.
4. Recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences.

Excerpted from Common Core Standards: <http://www.corestandards.org/>

### **Next Generation Science Standards Second Grade:**

#### **Engineering Design**

- **K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
  - **Science and Engineering Practices:**
    - **Developing and Using Models:** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
    - Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)
  - **Disciplinary core ideas:**
    - **ETS1.B: Developing Possible Solutions:** Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in



## **Animals and their Adaptations: Education Standards**

- communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)
- **Crosscutting Concepts**
  - **Structure and Function:** The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Excerpted from NGSS: <http://www.nextgenscience.org/>