

Section 5.3 Summary

Name _____

Date _____

Using Lenses to Form Images

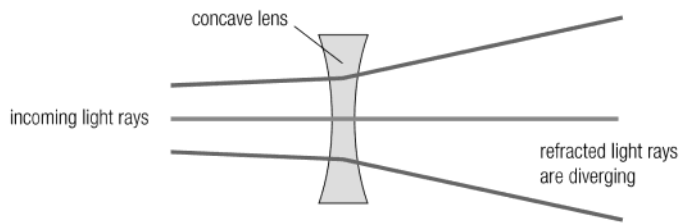
Textbook pages 190–199

Before You Read

Many common devices, such as eyeglasses and magnifying glasses, have lenses. What are lenses used for? Record your ideas in the lines below.

State the Main Ideas

As you read this section, stop after each paragraph. Put what you have just read into your own words.



What is a lens?

A **lens** is a piece of transparent material that is curved so that light rays will refract as they pass through it. The more curved the sides of a lens are, the more a ray of light will refract as it passes through the lens. There are two types of lenses: concave and convex.

What is a concave lens?

A **concave lens**

- ◆ is thinner in the middle and thicker at the edges
- ◆ refracts light rays that pass through it away from the normal. The light rays diverge and do not meet at a focal point.
- ◆ forms images that are upright
- ◆ forms images that are smaller than the object ✓

✓ Reading Check

1. What happens to light rays that pass through a concave lens?

What is a convex lens?

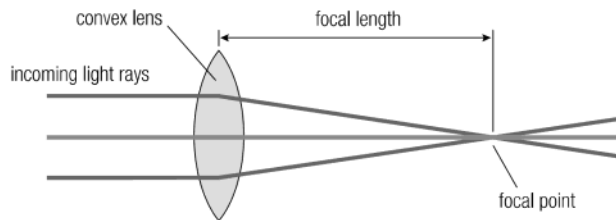
A convex lens

- ◆ is thicker in the middle and thinner at the edges.
- ◆ refracts light rays that pass through it toward the normal.
The light rays converge at a focal point.

The image formed by a convex lens depends on how far the object is from the focal point. The distance from the centre of the lens to the focal point is called the **focal length**.

- ◆ If an object is between the lens and the focal point (less than one focal length), the image is upright and larger than the object.
- ◆ If an object is more than one focal length away from the lens, the image is upside down and smaller than the object ✓

Distance of an object from the convex lens	How the image compares with the object
more than two focal lengths	upside down and smaller
between one and two focal lengths	upside down and larger
directly at the focal point	no image forms
less than one focal length	upright and larger



✓ Reading Check

2. What is the focal length of a lens?

Use with textbook pages 190–193.

Light rays and lenses

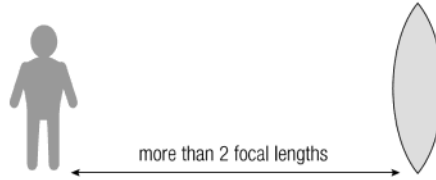
1. Will the image be

(a) larger, smaller, or the same size as the object?

smaller

(b) upright or upside down?

upside down



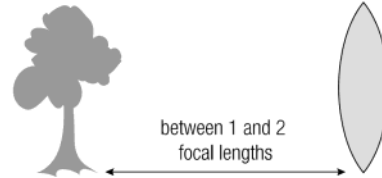
2. Will the image be

(a) larger, smaller, or the same size as the object?

larger

(b) upright or upside down?

upside down



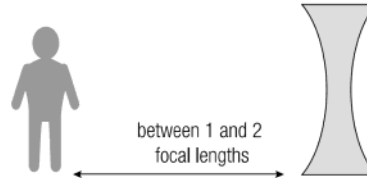
3. Will the image be

(a) larger, smaller, or the same size as the object?

smaller

(b) upright or upside down?

upright



4. Will the image be

(a) larger, smaller, or the same size as the object?

smaller

(b) upright or upside down?

upright



always the same distance doesn't matter

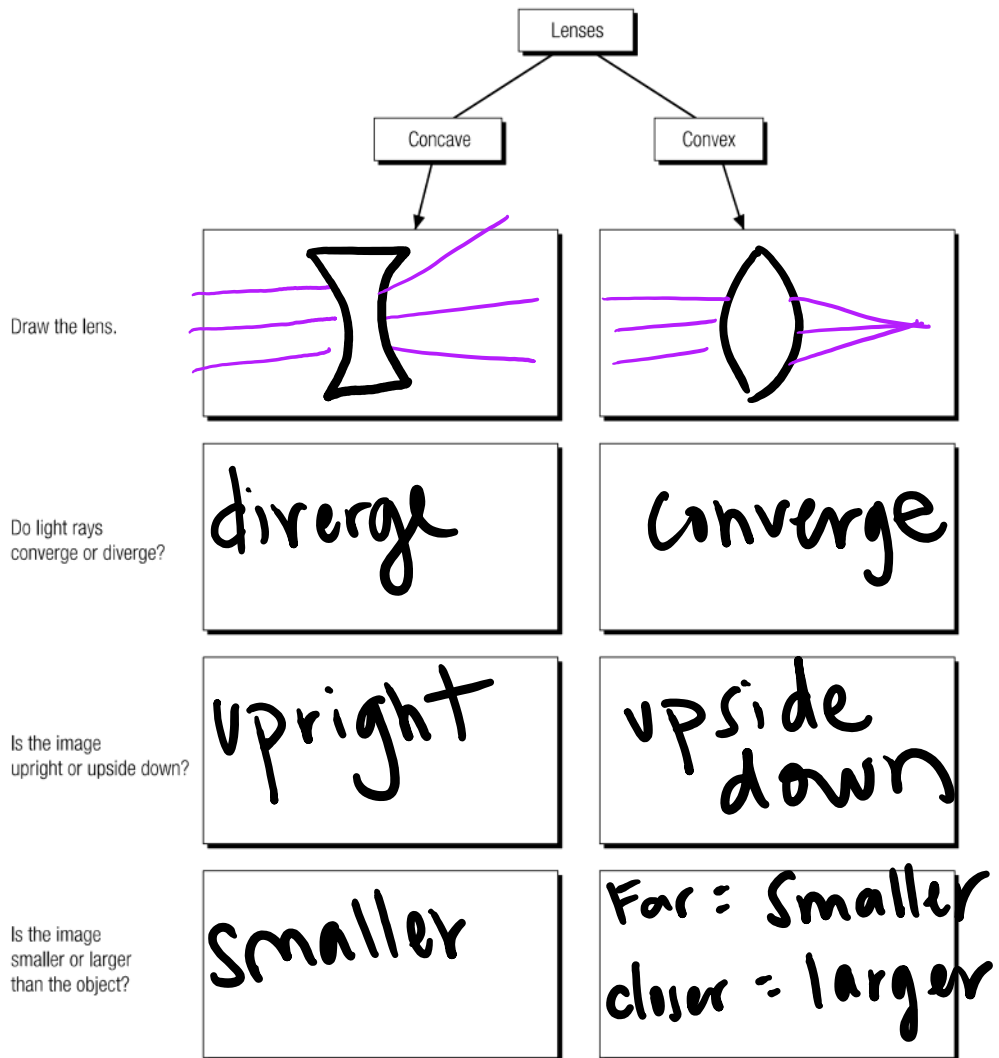
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Use with textbook pages 190–193.

Concave lenses and convex lenses

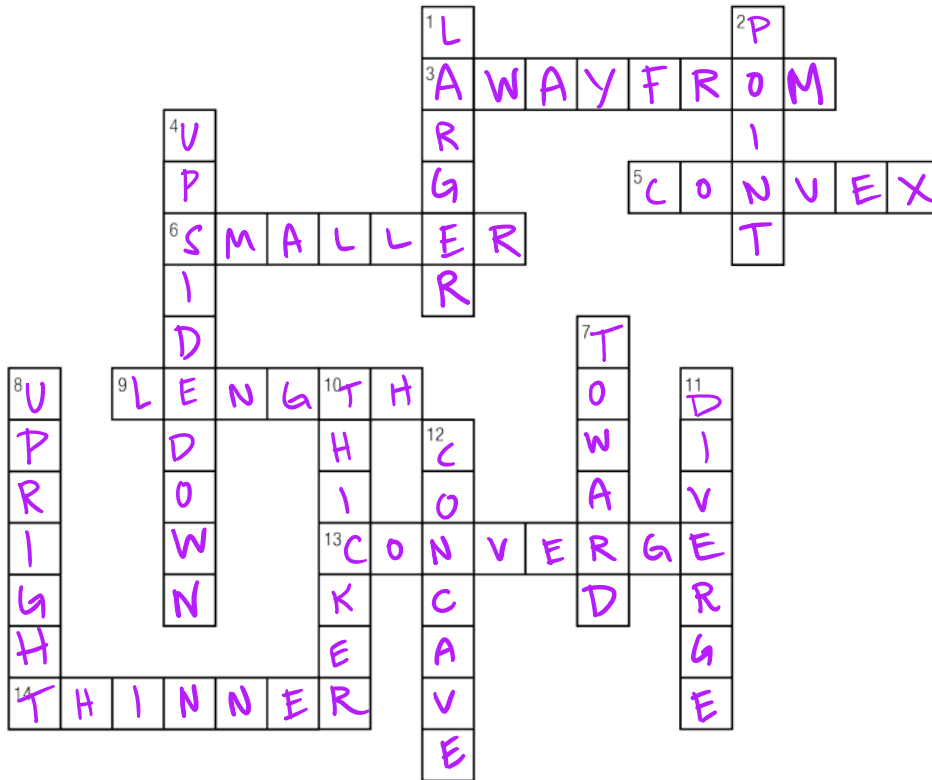
Compare and contrast concave lenses and convex lenses.



Use with textbook pages 167–193.

Lenses puzzle

Use the clues to help you solve the crossword puzzle.



Across	Down
3. a concave lens refracts light rays _____ the normal <i>away from</i>	1. if the object is less than one focal length from a convex lens, it will appear to be upright and <i>larger</i>
5. mirror that curves outwards <i>convex</i>	2. light rays meet at the focal <i>point</i>
6. if the object is more than two focal lengths from a convex lens, it will appear to be <i>smaller</i>	4. if the object is one or more focal lengths from a convex lens, it will appear to be <i>upside down</i>
9. the focal <i>length</i> is the distance from the centre of the lens to where light rays converge	7. a convex lens refracts light rays <i>toward</i> the normal
13. light rays coming together <i>Converge</i>	8. images formed by concave lenses are always smaller and <i>upright</i>
14. a concave lens is <i>thinner</i> in the middle	10. a concave lens is <i>thicker</i> at the edges
	11. light rays spreading apart <i>diverge</i>
	12. mirror that curves inward <i>concave</i>

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Use with textbook pages 190–193.

Using lenses to form images

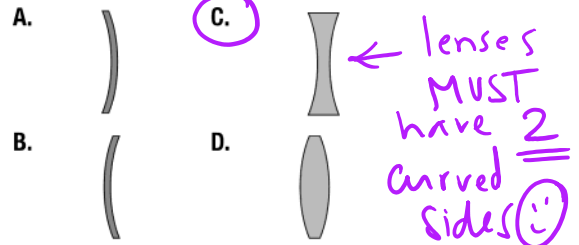
Match the Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.

Term	Descriptor
1. <u>B</u> lens	A. point where the converging light rays meet
2. <u>E</u> focal length	B. a piece of transparent material that bends light
3. <u>D</u> convex lens	C. lens that is thinner in the middle than at the edge
4. <u>C</u> concave lens	D. lens that is thicker in the middle than at the edge
	E. distance from the centre of the lens to the focal point

Circle the letter of the best answer.

5. What happens to the light rays that pass through a convex lens?
- B A. all the light rays diverge
B B. all the light rays converge
B C. all the light rays are absorbed by the lens
 D. some light rays diverge and some light rays converge
6. Describe the image that is produced by a concave lens.
- B A. it is upright and larger than the object
B B. it is upright and smaller than the object
B C. it is upside down and larger than the object
 D. it is upside down and smaller than the object

7. Which of the following is a concave lens?



8. A concave lens reflects light rays
- A. towards the normal
D B. away from the normal
 C. along the normal
D D. none of the above
9. A convex lens reflects light rays
- A. towards the normal
D B. away from the normal
 C. along the normal
D D. none of the above
10. Light rays converge
- A. at the focal length
B B. at the focal point
B C. inside the lens
 D. on the edge of the lens
11. If the object is more than two focal lengths from a convex lens, the image will be
- A A. upside down and smaller
 B. upside down and larger
A C. upright and larger
 D. no image forms