Name Date

Section 4.2 Summary

Properties of Visible Light

Textbook pages 144–151

Before You Read

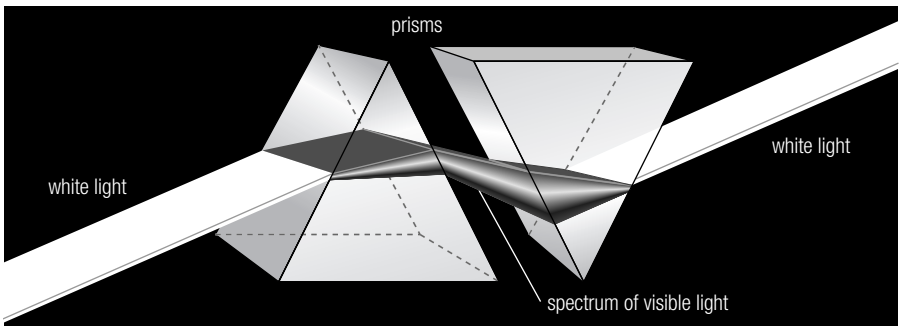
On the lines below, list five sources of light. One example is a light bulb.

_____

_____

Create a Quiz

After you have read this section, create a quiz question for each paragraph. After you have written the quiz questions, be sure to answer them.



What is visible light?

Scientists explain light using several models. One of these models is the **wave model of light**. In this model, **light** is a wave that travels through empty space. Like the waves that you learned about in section 4.1, light waves move energy from one place to another. **Visible light** is light that you can see. Visible light includes all the colours of the rainbow.

How do prisms affect light?

In the 17th century, English scientist Sir Isaac Newton found that white light, such as sunlight, is made up of light of different colours. The different colours are caused by light waves of different wavelengths.

How did Newton split the white light? He shone it through a prism. A prism is made of a clear solid, such as glass. You can see its shape in the diagram above. The light was split because a wave bends when it moves from one medium to another. This bending of a wave at the border between one medium and another is called **refraction**. When light enters a prism, the medium changes from air to glass.

Light waves of different wavelengths refract at different angles. That is why the waves separate when they exit the prism. As the diagram shows, when you place a second prism near the first, you can cause the separated light to combine, forming white light again.

Reading Check

1. What is refraction?

_____

_____

_____

What are the colours of visible light?

Visible light is made up of a range of colours. People often put these colours into seven categories. The categories are: red, orange, yellow, green, blue, indigo, and violet. Different colours are light waves of different wavelengths. Red has the longest wavelength: around 700 nm (nanometres). Violet has the shortest wavelength: around 400 nm. The other colours have wavelengths between these two.

The seven colour categories of visible light are together known as the **visible spectrum**. The seven colour categories are sometimes abbreviated in the form of a person's name: ROY G BIV (**R**ed, **O**range, **Y**ellow, **G**reen, **B**lue, **I**ndigo, and **V**iolet).

Why do objects appear coloured?

Reflection occurs when a light wave strikes an object and bounces off. Different materials absorb and reflect different wavelengths of light. You see only the reflected wavelengths. A red ball looks red because it absorbs all wavelengths of visible light except for those around 700 nm. A black shirt looks black because it absorbs all the colours.

Objects appear black in the dark because they do not produce their own light. The colours you see come from other sources of light, such as the Sun or a light bulb.

Reading Check

2. Why does a red ball look black in the dark?

_____

_____

_____

How do colours of light combine?

You only need three colours of light, such as red, green, and blue, to produce all the colours of the rainbow. These three colours are called the **additive primary colours** of light.

If you shine red, green, and blue light together, they produce white light. Adding two of these colours of light will produce a secondary colour of light as shown below.

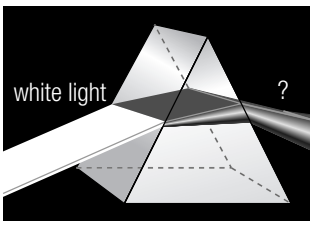
primary colours of light		**secondary colours of light**
• blue light + green light	=	cyan light
• green light + red light	=	yellow light
• blue light + red light	=	magenta light

Use with textbook pages 144–149.

Colour your world

Look at the diagrams below. State the colour(s) of light indicated by "?".

1.



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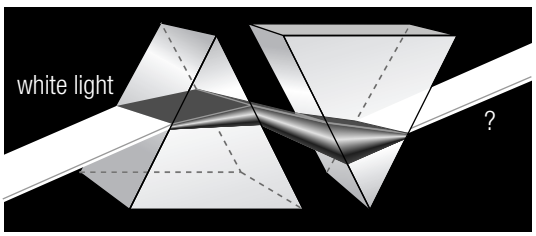

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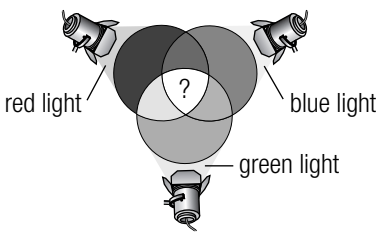

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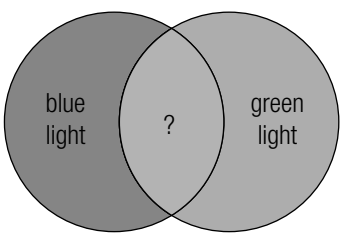

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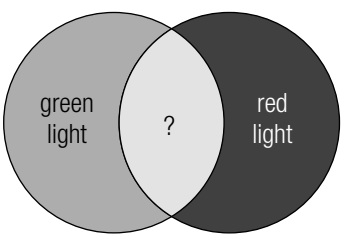

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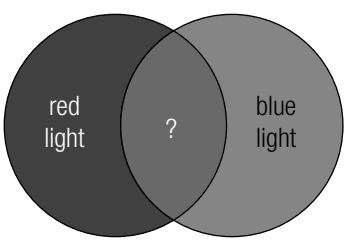

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Use with textbook pages 144–149.

Facts about visible light

Answer the questions below.

1. When white light is refracted through a prism, different colours emerge. Where do the different colours come from?

_____

_____

_____

2. Explain why all colours refract at different angles.

_____

_____

_____

3. When does light refract or bend?

_____

_____

4. Which colour in the visible spectrum has the longest wavelength?

_____

5. Which colour in the visible spectrum has the shortest wavelength?

_____

6. Explain how you can cause light separated by a prism to combine.

_____

_____

_____

7. Which has a higher frequency, yellow light or blue light?

_____

8. Why does a violet dress appear to be violet in sunlight?

_____

_____

9. List three colours that can combine to produce all the colours of the rainbow.

_____

Name Date

Cloze Activity

Section 4.2

Use with textbook pages 144–149.

Visible light

Vocabulary	
absorbed	refraction
amplitude	ROY G BIV
colour	spectrum
frequencies	visible light
prism	wave model of light
reflected	wavelengths
reflection	white light
refracted	

Use the terms in the vocabulary box to fill in the blanks. Use each term only once. You will not need to use every term.

1. The _____ describes light travelling as a wave.

2. _____ is light that you can see.

3. The bending or changing direction of a wave as it passes from one material to another is called _____.

4. White light is made up of waves having different _____ and _____.

5. Sir Isaac Newton demonstrated that _____ is a property of visible light.

6. A _____ refracts light into different colours.

7. When passed through a second prism, the _____ light is combined to form white light once again.

8. The seven colour categories of visible light are together known as the visible _____.

9. You can remember the order of the seven colours of the rainbow by using this abbreviation: _____.

10. A fire engine appears to be red because the colour red is _____.

11. A black shirt appears black because all colours are _____.

Use with textbook pages 144-149.

Properties of visible light

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

Term	Descriptor
1. _____ light	**A.** explains how light behaves like a wave
2. _____ spectrum	**B.** light we can see
3. _____ reflection	**C.** a range of colours or frequencies of visible light
4. _____ refraction	**D.** occurs when a light wave is absorbed by an object
5. _____ visible light	**E.** occurs when a light wave bounces off an object
6. _____ wave model of light	**F.** bending of light wave as it passes from one material to another
	G. wave that travels through space

Circle the letter of the best answer.

7. Which of the following statements is true?

A. White light has no colours in it.

B. Sunlight emits only yellow light.

C. There are six colours in the rainbow.

D. You can see the colours of the rainbow when sunlight is refracted.

8. Which of the following statements is **incorrect**?

A. Light travels like a wave.

B. Colour is a property of visible light.

C. A prism splits light into a spectrum.

D. Each colour in the visible spectrum refracts at the same angle.

9. Which of the following correctly places the colours in order of shortest wavelength to longest wavelength?

Shortest wavelength ⟶ Longest wavelength			
A.	red	green	violet
B.	violet	green	red
C.	green	red	violet
D.	violet	red	green

10. Which of the following colours has the lowest frequency?

A. blue

B. indigo

C. orange

D. yellow

11. Why does a blue car appear to be blue in the sunlight?

A. The car reflects all the colours of the visible spectrum.

B. The car absorbs the colour blue and reflects colours other than blue.

C. The car refracts the colour blue and reflects colours other than blue.

D. The car reflects the colour blue and absorbs colours other than blue.

12. Why does the print on this page appear to be black?

A. The print reflects all the colours.

B. The print absorbs all the colours.

C. The print is made up of all the primary colours.

D. The print is made up of all the secondary colours.