Name _____ Class _____ Date _____

Chapter 22 – The nature of Light
Directed Reading A

Section: What Is Light?

1. Name two things that produce light.

_____

_____

LIGHT: AN ELECTROMAGNETIC WAVE

_____ 2. What is light?

a. a type of matter
b. a type of sound wave
c. a type of energy
d. a type of water wave

3. How is light different from other kinds of waves?

_____

_____

_____

_____

4. A wave that consists of changing electric and magnetic fields and that can travel through empty space is a(n) _____.

5. Where do fields exist and what do they do?

_____

_____

_____

6. The electric and magnetic fields of an electromagnetic wave are _____ to each other and to the direction of the wave's motion.

7. Every charged object is surrounded by a(n) _____.

8. An electric field pulls _____ objects toward it and repels _____ objects.

9. Every magnet is surrounded by a(n) _____.

10. How is an EM wave produced?

_____

_____

_____

_____

_____

_____

11. Where does the energy carried by an EM wave come from?

_____

_____

_____

12. The transfer of energy as electromagnetic waves is called

_____.

THE SPEED OF LIGHT

13. Why do you see lightning before you hear the thunder that accompanies it?

_____

_____

_____

14. What is the speed of light in the near vacuum of space?

_____

_____

LIGHT FROM THE SUN

15. How long does light take to travel from the sun to Earth?

_____

_____

16. _____ from the sun are the major source of energy on Earth.

17. Describe two ways in which the sun's energy is used on Earth.

18. Why does only a small part of the total energy given off by the sun reach Earth?

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: The Electromagnetic Spectrum

1. What kind of light can a bee see that you cannot see?

_____

2. In what way is visible light similar to ultraviolet light?

_____

_____

CHARACTERISTICS OF EM WAVES

3. How is the speed of a wave determined?

_____

_____

4. The entire range of EM waves is called the _____.

5. Name and arrange the seven kinds of EM waves in order from long wavelength to short wavelength.

_____

_____

_____

_____

_____

_____

_____

RADIO WAVES

6. Waves used for broadcasting radio signals are called

_____.

7. How are radio signals broadcast?

_____

_____

_____

_____

_____

_____

_____

8. Changing the amplitude or frequency of waves is called

_____.

9. Why can AM waves travel a longer distance than FM waves?

_____

_____

10. Why does music broadcast from FM stations sound better than music broadcast from AM stations?

_____

_____

11. Which kind of radio waves are used by television stations to carry sound?

_____

_____

12. Which kind of radio waves are used by television stations to carry pictures?

_____

_____

13. How are cable television signals sent to televisions in homes?

_____

_____

MICROWAVES

14. In what way are the wavelengths and frequencies of microwaves different from radio waves?

_____

15. Name three ways microwaves are used.

_____

_____

_____

16. In a microwave oven, the microwaves are created by a device called a(n) _____, which accelerates charged particles.

17. What do the letters in *radar* stand for?

_____

18. In addition to checking the speed of a car, what are two other ways radar is used?

_____

_____

INFRARED WAVES

19. In what way are the wavelengths and frequencies of infrared waves different from the wavelengths and frequencies of microwaves?

_____

_____

20. How are infrared waves able to make you feel warm?

_____

_____

_____

_____

21. Name three sources of infrared waves.

_____

_____

_____

22. What does the amount of infrared waves that an object gives off depend on?

_____

VISIBLE LIGHT

23. The very narrow range of wavelengths and frequencies in the electromagnetic spectrum that humans can see is _____.

24. In what ways are the wavelengths of visible light different from infrared waves?

_____

_____

25. The visible light of all wavelengths combined is _____.

26. What color are the longest wavelengths of visible light?

_____

27. What color are the shortest wavelengths of visible light?

_____

28. The range of colors of visible light is called the _____.

29. What does each letter in the imaginary name ROY G. BiV stand for?

_____

_____

_____

_____

_____

_____

30. What can cause all the colors of visible light to be seen in a rainbow?

_____

_____

ULTRAVIOLET LIGHT

31. In what way are the wavelengths and frequencies of ultraviolet light different from the wavelengths and frequencies of visible light?

_____

32. Describe four bad effects of ultraviolet light.

33. What are two ways you can protect yourself against ultraviolet light?

34. Describe two good effects of ultraviolet light.

X RAYS AND GAMMA RAYS

35. Which EM waves have some of the shortest wavelengths and highest frequencies?

36. What is one use of X rays in the medical field?

37. What can happen from too much exposure to X rays?

38. How are patients protected from exposure to X rays?

39. How are gamma rays used to treat cancer?

40. What do gamma rays kill in food?

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Interactions of Light Waves

1. How does the special layer of cells in the back of a cat's eyes help the cat see better?

_____

_____

REFLECTION

2. When light waves bounce off an object, _____ happens.
3. When you look in a mirror, how many times has the light you see been reflected and from where has it been reflected?

_____

_____

4. What does the law of reflection state?

_____

_____

_____

5. The arrival of a beam of light at a surface is called

_____.

Match the correct description with the correct term. Write the letter in the space provided.

_____ **6.** a line perpendicular to the mirror's surface

_____ **7.** the angle between the reflected beam and the normal

_____ **8.** the beam of light reflected off the mirror

_____ **9.** the beam of light traveling toward the mirror

_____ **10.** the angle between the incident beam and the normal

a. angle of incidence
b. angle of reflection
c. reflected beam
d. normal
e. incident beam

11. When light beams are reflected at the same angle,

_____ reflection occurs.

12. What type of reflection is the reflection from a mirror?

_____

_____

13. When light beams reflect at many different angles,

_____ reflection occurs.

14. Why can't a diffuse reflection be seen?

_____

_____

15. Why can a light source be seen in the dark?

_____

_____

_____

16. Objects that produce visible light are called _____.

17. An object that can be seen and that is not a light source is

_____.

ABSORPTION AND SCATTERING

18. The transfer of light energy to particles of matter is called

_____.

19. The interaction of light with matter that causes light to change energy, direction of motion, or both is called _____.

20. What two things cause a beam of light to become dimmer?

_____

_____

21. What causes the sky to appear blue?

_____

_____

REFRACTION

22. The bending of a wave as the wave passes at an angle from one substance or material to another is called _____.

23. What causes the speed of light to vary?

_____

_____

24. Is light in a vacuum traveling slower or faster than light through matter?

_____

25. What happens when light passes into a material where the speed of light is lower?

_____

_____

26. What happens when light passes into a material where the speed of light is faster?

_____

_____

27. How does the refraction of light as it passes from the air into water cause optical illusions?

_____

_____

_____

_____

_____

28. Light waves with _____ wavelengths bend more than light waves with _____ wavelengths.

29. How are rainbows created?

DIFFRACTION

30. The bending of waves around barriers and through openings is called _____.

31. How much a wave diffracts depends on what?

32. When does the greatest amount of diffraction of a light wave occur?

33. Why can't you see around corners?

INTERFERENCE

34. A wave interaction that happens when two or more waves overlap, resulting in a single wave, is called _____.

35. What kind of interference results in bright bands of light?

36. What kind of interference results in dark bands of light?

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Light and Color

1. What is white light made of?

_____

LIGHT AND MATTER

2. What are the three ways in which light can interact with matter?

_____

_____

_____

_____

3. The passing of light through matter is called _____.

4. When you look through the glass of a window, why can you see objects that are outside?

_____

_____

_____

_____

5. When you look at the glass in a window, why can you see the glass and your reflection?

_____

_____

_____

_____

6. Why might the glass in a window feel warm when you touch it?

_____

_____

_____

7. Matter that allows light to be easily transmitted is

_____.

8. Matter that transmits light but does not transmit an image is

_____.

9. Matter that does not transmit any light is _____.

Match the correct description with the correct term. Write the letter in the space provided.

_____10. aluminum foil

_____11. clear plastic wrap

_____12. wax paper

a. opaque

b. translucent

c. transparent

COLORS OF OBJECTS

13. What determines the color of an object?

_____

_____

14. What happens when white light strikes a colored opaque object?

_____

_____

15. What colors of light are reflected by an opaque white object?

_____

_____

16. What colors of light are absorbed by an opaque black object?

_____

_____

17. Why is ordinary window glass colorless in white light?

_____

_____

18. What happens when you look through colored transparent or translucent objects?

_____

_____

_____

19. What happens to the colors of light that are not transmitted through a transparent or a translucent material?

_____

_____

MIXING COLORS OF LIGHT

_____**20.** Which of the following is NOT a primary color of light?

a. red
b. green
c. yellow
d. blue

21. Combining colors of light is called _____.

22. What do you see when you add two primary colors of light together?

_____

23. Name the three secondary colors of light.

_____

_____

_____

Match the correct description with the correct term. Write the letter in the space provided.

_____**24.** cyan light

_____**25.** magenta light

_____**26.** yellow light

a. blue light plus red light
b. red light plus green light
c. blue light plus green light

27. What produces the different colors seen on a television screen?

_____

_____

_____

MIXING COLORS OF PIGMENT

28. A material that gives a substance its color by absorbing some colors of light and reflecting others is a(n) _____.

29. Give two examples of pigments.

_____

_____

30. What happens when you mix pigments together?

_____

_____

_____

31. The mixing of colors of pigment is called _____.

32. Name the three primary pigments.

_____

_____

_____

33. What is the result of the subtraction of two primary pigments?

_____

34. Name the three secondary pigments.

_____

_____

_____