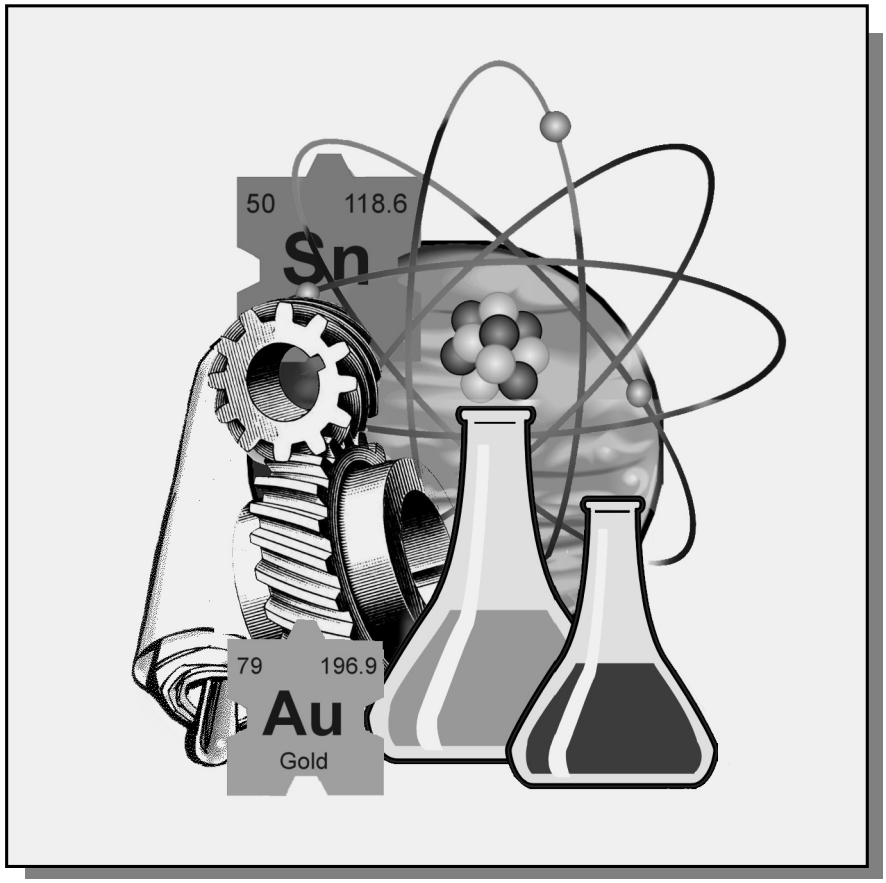
# *Integrated Physics & Chemistry*

## ACTIVITIES




# *Chapter 6*

IPC 76178 Revision: 030208



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*ACTIVITIES*
***Lesson 1:***
*Compounds*

# *Making It Shine*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. ***Electrolysis*** makes chrome by coating a metal such as iron with: _____.
(a) carbon (b) ***chromium*** (c) silver (d) paint

2. The first scientist to study how electrolysis works was _____ _____.

3. Because Michael Faraday was too small to follow his father's trade as a blacksmith, Michael's first job was: _____.
(a) a barber (c) an apprentice for a bookbinder
(b) cleaning chimneys (d) a laboratory assistant

4. Michael Faraday attended the science lectures of _____ with tickets from Mr. Dance.

5. For a time, Humphry Davy could not read or write because he had _____ his eyes in an explosion.

6. Michael Faraday was dismissed as Davy's assistant because Michael became involved in a brawl.
(a) True or (b) False

*7. Faraday invented the terms _____, _____, cathode and anode.

*8. One of Faraday's important discoveries showed the relationship of _____ and electricity.

*9. State the First Law of Electrolysis. "_____ _____ _____."

*10. Faraday's first lesson of electrolysis states a predictable relationship between the amount of _____ and chemical activity.

*11. Equivalent weight is the weight of a particular element that is needed to complete a _____ reaction.



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**Use the Periodic Table of Elements to answer #12-14.**

*12. From the Periodic Table of the Elements, sodium would be found in the _____ family.
(a) III (b) I (c) II (d) VI

*13. From the Periodic Table of the Elements, an element with a valence of $^{-}3$ would be found in the _____ family.
(a) IV (b) VIII (c) II (d) V

*14. From the Periodic Table of the Elements, oxygen has a valence of $^{-}2$ and is found in the _____ family.
(a) VII (b) I (c) VI (d) III

*15. State the Second Law of Electrolysis. "_____ _____."

*16. Equivalent weight is atomic weight divided by _____.

*17. The atomic weight of oxygen is 16 and its valence is $^{-}2$, so its equivalent weight is _____.

*18. Aluminum has a valence of: _____.
(a) $^{+}3$ (b) $^{-}3$ (c) 0 (d) 14

*19. Aluminum has an atomic weight of 27 and a valence of $^{+}3$, so its equivalent weight is _____.

20. Chemists cannot be assured of having the right amount of both elements by using the equivalent weight.
(a) True or (b) False

*21. Compared to sodium, _____ times as many electrons are needed to free the same number of aluminum ions from the electrolyte.

*22. Equivalent weight is used in the law of _____ because both electrolysis and valence depend on the number of electrons an element is willing to release or accept.

23. In the process of electrolysis, sodium gives up one electron so its equivalent weight is equal to its _____ weight.

24. Write the **Life Principle:** *"*_____ _____.*"*



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*ACTIVITIES*
***Lesson 2:***
*Inventions & Discoveries*

# *An Attractive Subject*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. ***Permanent magnets*** have no particular use except as playthings.
   (a) True or (b) False

2. The scientist who first wrote about magnetic effects was _____ of Miletus.

*3. The first known magnetic substance was: _____.
   (a) copper (b) gold (c) magnetite (d) iron

*4. Another name for a natural magnet is _____.

5. The magnetic effect of a bar magnet is greatest at the _____.

*6. The one that is strongly ferromagnetic is: _____.
   (a) aluminum (b) gold (c) iron (d) copper

*7. Stroking iron to make it magnetic is an example of _____ magnetism.
   (a) reduced (b) enhanced (c) induced (d) stroked

8. If magnetic lines of force avoid a metal, then the metal is slightly _____ by the magnet.
   (a) attracted (b) repelled (c) distracted (d) disliked

*9. Like magnetic poles _____ one another, while unlike poles _____ each other.
   (a) repel; attract (b) distract; dislike (c) attract; repel (d) dislike; distract

10. When the needle of a dip compass is released, it will point: _____.
   (a) only upward (c) up to the heavens
   (b) down to the earth (d) toward the person holding the compass

*11. Geographic North Pole and magnetic north pole are at _____ locations.

*12. The difference between geographic north and magnetic north is magnetic _____.

13. Compass needles can be taken off course if they are near a: _____.
   (a) magnet (b) strong static charge (c) reflector (d) lake

14. Compass needles can be taken off course by flares on the sun.
   (a) True or (b) False



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*15. State the Law of Magnetic Force: " _____
_____
_____
_____."

*16. The force of magnetism, static electricity and gravity all follow the _____
_____ Law.

17. Gravity can both attract and repel.
(a) True or (b) False

18. Static charges always come in pairs. If a positive charge is present, a negative charge will be associated with the positive charge.
(a) True or (b) False

*19. Magnetic charges always come in pairs. If a north pole is present, _____
_____ will be associated with the north pole.

20. Write the **Life Principle:** *"*_____
_____*."*



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*ACTIVITIES*
***Lesson 3:***
*Inventions & Discoveries*

# *Picking Up Paperclips*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Farmers feed magnets to cows to attract dangerous iron that might get into the cows digestive tracts.
   (a) True or (b) False

2. When a nail becomes magnetized by _____, the nail picks up iron fillings.

3. A ***domain*** is: _____.
   (a) a small elementary magnet in a ferromagnetic substance
   (b) a series of electrons spinning in opposite directions
   (c) an area over which a magnet rules
   (d) the length of the magnet

4. Domains are too small to be seen in a microscope.
   (a) True or (b) False

*5. Domains in permanent magnets: _____.
   (a) act together (c) are not organized
   (b) are constantly changing direction (d) do not exist

*6. A nonmagnetic iron nail has its domains all organized in the same direction.
   (a) True or (b) False

*7. Heat can cause a metal to lose its _____.

*8. Liquids and gases cannot be _____.

9. The metal that is harder to make into a magnet is: _____.
   (a) aluminum (b) iron (c) steel (d) lead

10. The metal that retains its magnetism longest is: _____.
   (a) iron (b) steel (c) aluminum (d) copper

11. A needle can be made magnetic by: _____.
   (a) stroking the needle in the same direction with a magnet
   (b) heating the needle
   (c) moving a magnet back and forth along the needle
   (d) putting the needle in liquid magnetism



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*12. When bar magnets are stored, if placed north pole to north pole, the magnetism is likely to be: _____.
(a) strengthened (b) weakened (c) unaffected (d) multiplied

*13. Striking a magnet sharply with a hammer _____ its magnetism.
(a) unaffects (b) weakens (c) strengthens (d) multiplies

*14. Electrons traveling along wires produce a _____ field around the wire.

15. Electrons are motionless around the nucleus of an atom.
(a) True or (b) False

16. Most _____ in atoms occur in pairs with motions that cancel the magnetic fields that they produce.

*17. _____ substances have unpaired electrons that produce tiny magnetic fields.

*18. Magnetism is due to the _____ charge in motion.

*19. Magnetic poles _____ occur in pairs.

20. Write the **Life Principle:** *"*_____
_____
_____*."*



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Name: _____

Date: _____ Grade: _____





## *From Magnets to Mars*

*ACTIVITIES*
***Lesson 4:***
*Inventions & Discoveries*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. The magnetic field of an _____ can be turned off and on.

*2. The recording heads in audio and videocassette recorders use _____.

*3. A magnetic field can be created by a wire that carries an _____ current.

4. In Oersted's experiment, the compass needle moved when wire carrying a current ran _____ to the compass needle.
(a) at right angles (b) parallel (c) diagonally (d) quickly

*5. A magnetic field is _____ when the current changes direction.

*6. Which of the following produces a magnetic field? _____
(a) current electricity (b) static electricity (c) modern electricity (d) stored electricity

*7. The lines of force around a wire form _____ circles.

8. A spiral of wire wrapped in the form of a cylinder is a _____.

9. William Sturgeon, an English scientist, made the first _____.

10. Joseph Henry's early childhood was similar to that of: _____.
(a) Benjamin Franklin (c) Thomas Edison
(b) Michael Faraday (d) John Henry

11. Joseph Henry and Michael Faraday both succeeded in getting an _____ by a self-directed program of reading books.

12. Joseph Henry and Michael Faraday became great _____ while retaining their humility and religious beliefs.

13. Joseph Henry completed an entire high school course of study in _____ months at Albany College.



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*14. An ***electromagnet*** can be made stronger by sending more current through it or by: _____.
(a) increasing the number of turns of wire
(b) removing the insulation
(c) removing the iron from the core of the solenoid
(d) applying heat

15. Electromagnets designed by Joseph Henry could lift only 100 pounds.
(a) True or (b) False

16. Joseph Henry built the first commercial electromagnet.
(a) True or (b) False

*17. Joseph Henry's electric _____ became an essential part of Samuel F. B. Morse's telegraph.

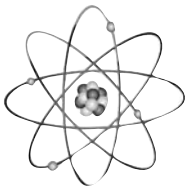
*18. Joseph Henry helped Samuel F. B. Morse improve the design of the first electric _____.

*19. Cooling the core of an electromagnet causes the magnet to be _____ powerful.

20. Write the **Life Principle:** *"*_____ _____.*"*



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ACTIVITIES
**Lesson 5:**
*Energy*

# *Force Fields*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Joseph Henry's rivals in England did not welcome him when he visited that country.
   (a) True or (b) False

2. Joseph Henry was convicted as a Southern spy during the Civil War.
   (a) True or (b) False

3. Joseph Henry's advice to Alexander Graham Bell was to: _____.
   (a) give up
   (b) sell the idea to the telegraph company
   (c) work until you succeed
   (d) invest more money

4. The Bell family worked with: _____.
   (a) bag pipe manufacturers
   (b) cotton merchants
   (c) deaf children
   (d) aircraft

*5. In February 1876, Bell patented the _____.

6. The 1876 Centennial Exposition would not let Bell show his invention because he came too late.
   (a) True or (b) False

7. Scientists were surprised at the _____ of Bell's telephone.

*8. When carbon particles are _____ they conduct electricity better.

9. Alexander Graham Bell's _____ was the first mechanical method to keep a person alive who had stopped breathing.

*10. A magnetic field is: _____.
   (a) a series of magnets that act together
   (b) the region in which a magnet exerts its influence
   (c) the region in space that has no magnetic lines of force
   (d) a place where magnets grow

*11. A magnetic field is _____ where the ***lines of force*** bunch together the most.



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*12. When a paperclip jumps to a magnet before being touched, it is responding to: _____.
(a) action at a distance
(b) static electricity
(c) the lines of force of the magnetic field
(d) antigravitational attraction

*13. Magnetism can be produced by: _____.
(a) current electricity (c) electricity
(b) static (d) striking stones together

*14. A magnetic field can be created by using a wire provided: _____.
(a) it carries an electric current (c) it is made of aluminum
(b) it is in a strong static electric field (d) the field coordinates are the same

15. Hans Christian Oersted showed that electricity would produce a _____ field.

16. As Michael Faraday sought to do the reverse of Oersted's experiment, Faraday wanted to: _____.
(a) generate magnetism (c) generate electricity using magnetism
(b) generate static electricity (d) become more magnetic

17. A _____ is a device used to detect weak electrical currents.

*18. A moving electric field produces magnetism. A moving magnetic field produces electricity. The production of either electricity or magnetism by the other is electromagnetic _____.

*19. The key to electromagnetic induction is _____.

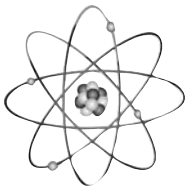
20. Write the **Life Principle:** *"*_____
_____
_____
_____.*"*

***Note: Ask your teacher for the quiz over topics 1-5 before proceeding to the next section. Reminder: If you score 85% or higher on the three section quizzes, you may be exempt from the chapter test!***





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ACTIVITIES
**Lesson 6:**
*Energy*

# *Electric Transformers*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. One of the ways that a magnetic field can induce electricity is by causing the magnetic field to expand and _____ either by moving the magnet around the wire or moving the wire around the magnet.

2. The ***electric motor*** was invented by _____.

*3. An electric motor converts electricity into _____ motion.

*4. An electric _____ converts mechanical motion into electricity.

5. ***Electric generators*** and electric motors work on vastly different principles.
(a) True or (b) False

*6. A hydroelectric plant converts the gravitational potential energy of water into: _____.
(a) electricity
(b) gravitational lines of force
(c) magnetic resonance
(d) steam

7. One small-scale application of an electric generator is a flashlight without _____.

*8. The three key devices that make electricity useful in everyday activities are the electric generator, the _____ and the electric motor.

9. Faraday realized that the changing _____ field caused electricity.

10. ***Transformers*** can only reduce voltage.
(a) True or (b) False

*11. A _____ changes a higher voltage to a lower one.

*12. High voltage causes an increase in the risk of shock and _____.

13. Electric power lines on the street carry _____ volts, but the voltage is stepped down to 110 volts before it enters the home.

14. Signs on the electrical towers that carry the wires warn of very high voltage. It can be as much as _____ volts.

*15. *Power* is equal to the product of voltage and _____.



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16. An efficient means of transmitting electrical power is by a combination of _____ voltage and _____ current.

17. Voltage has no effect on the loss of heat.
(a) True or (b) False

18. A ***step up transformer*** has an output voltage that is _____ than the input voltage.

19. Wiring in the home is more likely to have a voltage of: _____.
(a) 110 volts (b) 2,400 volts (c) 750,000 volts (d) 500 volts

20. Write the **Life Principle:** *"*_____
_____
_____
_____*."*



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Name: _____

Date: _____ Grade: _____





*ACTIVITIES*
***Lesson 7:***
*Energy*

## *From Electromagnetism to Light*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Michael Faraday believed his achievements resulted because he had great _____.
2. Michael Faraday was able to retire before age 40 and live on the income from his many inventions.
   (a) True or (b) False
3. The person who offered a home to Michael Faraday was: _____.
   (a) Abraham Lincoln (c) Queen Victoria
   (b) Humphry Davy (d) King George
4. Michael Faraday was buried in Westminster Abby next to Isaac Newton.
   (a) True or (b) False
5. Great scientists, such as James Clerk Maxwell and Albert Einstein, dismissed Michael Faraday's ideas as worthless, especially because he had only limited mathematical ability.
   (a) True or (b) False

*6. Electric and magnetic fields give rise to _____ waves.

*7. Light is a form of _____ waves.

*8. Visible light is the _____ part of the ***electromagnetic spectrum***.

*9. A tanning bed radiates the body with: _____.
   (a) ***infrared light*** (b) microwaves (c) ***ultraviolet light*** (d) x-rays

*10. X-rays, gamma rays and cosmic rays have high frequencies and carry more _____ than ultraviolet rays.

*11. All electromagnetic waves travel at the same _____ in a vacuum.

*12. Changes in the conditions of trees and crops can be detected by the _____ _____ they reflect.

*13. A person's body heat is detected as _____ light.

14. Icebergs give off _____ radiation.



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*15. Visible light from the sun contains _____ of the colors of the rainbow.

*16. _____ light is a combination of all the colors.

17. A source of light that contains all of the colors found in sunlight is said to be _____ for daylight.

18. Which of the following lights can filters correct so the light is more nearly like daylight?

(a) fluorescent tubes
(b) incandescent light bulbs
(c) mercury vapor lamps
(d) gas light

19. One way to filter out the red color in a photograph is to use a filter with a _____ over the lens of a camera.

20. Write the **Life Principle:** *"*_____
_____*."*



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ACTIVITIES
**Lesson 8:**
*Inventions & Discoveries*

# *Color Vision*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. _____ was invented in the 1840s and remained a black and white process for many years.

*2. When red, green and blue are combined in equal amounts, the eye sees the resulting color as: _____.
(a) black (b) ultraviolet (c) white (d) ***cyan***

3. A person who mixes colors using spotlights is more likely to understand and use _____ color.
(a) ***additive*** (b) ***subtractive*** (c) abstract (d) green

4. Color vision is well understood.
(a) True or (b) False

*5. _____ is a combination of the light that enters the eye, the ***rods*** and ***cones*** that receives the light and the brain that processes the signal.

*6. The color receptors that see in black and white in dim light are: _____.
(a) cones (b) rods (c) cuticles (d) retina

*7. Human eyes have _____ types of color receptors.
(a) three (b) six (c) an endless number of (d) fourteen

*8. The three primary colors that the receptors of the eyes responds to are _____, _____ and _____.

9. A wavelength of green light is _____ long.
(a) 20,000 leagues (c) about one foot
(b) about 50 millionths of a centimeter (d) about 40 miles

*10. If the brain receives signals from both red and _____ cones, the color is interpreted to be yellow.

11. Physical color and ***physiological color*** are essentially the same.
(a) True or (b) False

12. Light exists in _____ wavelengths.
(a) three (b) four (c) an endless number of (d) nine



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*13. Two colors that can produce white are _____ colors.
(a) ***complementary*** (b) ***physical*** (c) supplemental (d) responsive

14. To remove a yellow tinge from a white dress, it is washed with a _____ agent.

*15. Paints and pigments _____ color.

16. Which of the following is more likely to be talking about subtractive color? _____
(a) artist (b) scientist (c) student of the arts (d) math teacher

17. When light strikes a canvas that has been painted red, all colors but red is reflected.
(a) True or (b) False

*18. If a sheet of paper absorbs all of the colors the paper will appear: _____.
(a) black (b) white (c) red (d) green

19. The color green as seen by our eyes can be made by mixing two pigments, neither of which is green.
(a) True or (b) False

20. Write the **Life Principle:** *"*_____
_____*."*



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Name: _____

Date: _____ Grade: _____





*ACTIVITIES*
***Lesson 9:***
*Energy*

## *Light Traveling in Straight Lines*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. The five sensory organs of the human body are _____, _____, _____, _____ and _____.

2. Inventors have found ways to extend vision with the use of telescopes, microscopes, cameras and other _____ instruments.

3. All of the properties of light can be explained by assuming it travels in straight lines as rays.
   (a) True or (b) False

*4. The illusion of water over a highway is a _____.

*5. Geometric optics explains the observations of: _____.
   (a) color vision
   (b) interference and diffraction
   (c) ***reflection*** and ***refraction***
   (d) rectangles

*6. A point source of light is one in which light: _____.
   (a) can expand freely in all directions
   (b) does not follow the inverse square law
   (c) is reflected by a mirror
   (d) starts at a specific point

*7. As light leaves a point source, the light expands outward.
   (a) True or (b) False

*8. State the Inverse Square Law for the intensity of light. "_____ _____."

9. Which of the following is NOT an example of a point source of light? _____ _____.
   (a) a light source that allows light to expand freely in all directions
   (b) an automobile headlight with its built in reflector
   (c) a single light bulb hanging in the middle of a large auditorium
   (d) the sun

*10. A substance that lets light pass through unhindered is: _____.
   (a) ***opaque*** (b) ***translucent*** (c) ***transparent*** (d) transpierce

11. Diamond is clear and some crystals such as quartz are _____.



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12. Pure water is an example of a substance that may appear: _____.
(a) opaque (b) translucent (c) transparent (d) transpierce

*13. An _____ medium is one that light cannot penetrate.

14. A sidewalk is transparent, but ice is opaque.
(a) True or (b) False

*15. A _____ medium diffuses the light that enters it.

16. Translucent globes are placed around light fixtures to _____ the light and prevent glare.

17. *Diffuse reflection* means that parallel rays reflect only in one direction.
(a) True or (b) False

18. *Regular reflection* is when rays are reflected in the same order as they arrive.
(a) True or (b) False

19. Magicians never use mirrors in performing their tricks.
(a) True or (b) False

20. Write the **Life Principle:** *"*_____
_____*."*



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*ACTIVITIES*
***Lesson 10:***
*Inventions & Discoveries*

# *Mirrors and Telescopes*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. The angle a ray makes with the normal after the ray reflects from the mirror is the angle of: _____.
(a) *incidence* (b) *reflection* (c) objectivity (d) refraction

*2. State the Law of Reflection. "_____
_____."

*3. Rays that appear to be coming from a location where the image does not exist form a _____ image.
(a) real (b) virtual (c) normal (d) refracted

*4. The outer surface of a shiny Christmas tree ornament or some shiny hubcaps is an example of a _____ mirror.

*5. A convex mirror forms: _____.
(a) an image smaller than the object (c) a reflected image
(b) a virtual image (d) all of these

6. The backside of a spoon makes a _____ surface, while the front (bowl side) of a spoon makes a _____ surface.

7. One advantage of a convex mirror is that it has a wider ***field of view***.
(a) True or (b) False

8. Exterior mirrors on automobiles are gently curved to improve the field of view helping the driver to see objects that would otherwise be hidden.
(a) True or (b) False

*9. A mirror with the curve like the inside of a sphere has a _____ shape.
(a) convex (b) concave (c) cone (d) spherical

10. Some mirrors used for putting on make-up or shaving are _____.

*11. Parallel rays of light are brought to a focus at the _____.

*12. The distance from the mirror to the ***focal point*** is the _____ of the mirror.



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13. To be at ***infinity***, an object must be as far away as the farthest star.
(a) True or (b) False

*14. Most large modern telescopes use _____ mirrors to gather light and bring it to a focus.
(a) convex (b) concave (c) re-silvered (d) square

15. A person who states that the size of a telescope is 8 inches is probably referring to the: _____.
(a) diameter of the main mirror
(b) distance from the mirror to the point an image is formed
(c) ***focal length***
(d) overall length of the telescope

16. Although most telescopes use concave mirrors, the largest telescope on Kitt Peak near Tucson, Arizona, has a _____ mirror.

*17. For more than 50 years, the largest telescope that used a mirror to gather light and form an image was the glass giant on _____ in California.

*18. Most large telescopes are put high on mountains to: _____.
(a) keep away visitors
(b) prevent the mirror surface from tarnishing
(c) reduce air and light pollution
(d) utilize reduced air pressure

*19. The Hubble Space Telescope is located: _____.
(a) in Chile
(b) in orbit, 600 miles above the earth
(c) on Mount Palomar
(d) on the space shuttle

20. Write the **Life Principle:** *"*_____
_____*."*

***Note: Ask your teacher for the quiz over topics 6-10 before proceeding to the next section. Reminder: If you score 85% or higher on the three section quizzes, you may be exempt from the chapter test!***



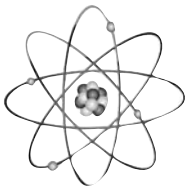


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Name: _____

Date: _____ Grade: _____





*ACTIVITIES*
***Lesson 11:***
*Energy*

# *Bending Light*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. At an amusement park, the shape of the image depends on the shape of the mirror.
   (a) True or (b) False

2. _____ mirrors form real images that can have a startling reality.

*3. Objects at the focal point of concave mirrors send out parallel rays to _____.

*4. Light from an automobile headlight goes out in a parallel bundle because the bulb is at the _____ of the reflector.
   (a) center of curvature (b) focal point (c) infinity focus (d) side

5. A concave mirror cannot form a virtual image.
   (a) True or (b) False

*6. _____ is caused by a change in speed of the light rays.

7. The speed of light can be measured in a variety of media, such as air, water, glass, clear crystals and even _____.

*8. Light has its greatest speed in: _____.
   (a) a vacuum (b) water (c) glass (d) diamond

*9. The _____ is determined by the speed of light in a vacuum divided by the speed of light in the medium.

10. The statement that nothing can go faster than the speed of light is true only in: _____.
   (a) diamond (c) a vacuum
   (b) regions around the sun (d) the imagination

11. ***Refraction*** of light causes the bottom of a pool of water to appear farther away.
   (a) True or (b) False

*12. A change in the speed of light usually causes it to change: _____.
   (a) color (b) density (c) direction (d) temperature



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*13. When light leaves air and enters a block of glass at an angle, the path of the light is bent away from the normal.
(a) True or (b) False

*14. If light enters a medium straight along the normal, only the _____ changes.

15. Refraction of light causes the time for the sun to set to be: _____.
(a) lengthened (b) shortened (c) constant (d) colored red

16. The image of a star near the horizon is higher in the sky than the star itself.
(a) True or (b) False

17. The surface of water in a ***mirage*** looks blue because it reflects the _____.

18. A mirage looks like water because air and not water presents the sky to our eyes.
(a) True or (b) False

19. The air _____ rays from the blue sky so they appear to be coming from the surface of the land.

20. Write the **Life Principle:** *"*_____
_____
_____.*"*



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*ACTIVITIES*
***Lesson 12:***
*Inventions & Discoveries*

# *Cameras and Eyeglasses*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. A magnifying glass is a _____ ***lens***.
(a) convex (b) refraction (c) reflexive (d) concave

*2. A convex lens causes parallel rays of light to: _____.
(a) converge (b) immerge (c) submerge (d) diverge

*3. A magnifying glass can form a real image.
(a) True or (b) False

4. To focus on a nearby subject, the distance between the lens and film must be: _____.
(a) increased (b) decreased (c) the same distance (d) multiplied by 2

5. On a bright day the ***diaphragm*** of a camera is set so it will admit _____ light.
(a) moist (b) more (c) the same amount of (d) less

*6. The outer bulge of the human eye is the _____.

*7. The fine focus control for the eye is done by the: _____.
(a) *cornea* (b) lens (c) zoom control (d) ***iris***

*8. The lens changes its focal length by: _____.
(a) shrinking (c) moving back and forth
(b) changing shape (d) changing focus

*9. Light enters the eye through the _____.

*10. The _____ can make the ***pupil*** larger or smaller.

11. A person who can see distant objects but not those nearby is _____.

12. If a person cannot see objects that are near, the image forms in front of the _____.

*13. To correct for ***farsightedness***, a lens that helps _____ light is used.
(a) submerge (b) diverge (c) digest (d) converge

14. A lens that is thicker in the middle than at the edge is a _____ lens.



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15. A person who can clearly see nearby objects but not those far away is _____.

16. If a person cannot see objects that are far away, the image forms in _____ of the retina.

*17. The correction for ***nearsightedness*** is a lens that _____ light.
(a) supplies (b) converges (c) diverges (d) submerges

*18. Loss of accommodation is caused when the _____ cannot change shape.
(a) retina (b) iris (c) cornea (d) lens

19. A person can overcome loss of accommodation by: _____.
(a) using a white cane (c) wearing sunglasses
(b) wearing bifocals (d) exercising the eyes

20. Write the **Life Principle:** *"*_____
_____
_____
_____.*"*



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*ACTIVITIES*
***Lesson 13:***
*Inventions & Discoveries*

# *Single Lens Microscopes*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Most people experience difficulty holding a pair of binoculars steady that has a ***magnification*** greater than: _____.
   (a) 1x (b) 100x (c) 10x (d) 2.5x

*2. Magnification is defined as _____
_____.

*3. A person carefully measures the apparent size of an image and finds that an object five cm tall appears to be 50 cm tall. The magnification is _____.

*4. The 25 cm in the magnification formula $m = (25\ cm)/f$ for a simple lens represents the:
_____.
   (a) comfortable viewing distance (c) magnification
   (b) diameter of the lens (d) maximum magnification possible

*5. A magnifying glass with a focal length of 10 cm has a magnification of: _____.
   (a) 25x (b) 1x (c) 2.5x (d) 7x

*6. As the focal length decreases, the magnification _____.

7. Anton van Leeuwenhoek was the first person to make and use a _____ for scientific purposes.
   (a) barometer (b) thermometer (c) microscope (d) telescope

8. Anton van Leeuwenhoek was: _____.
   (a) mayor of Delft, Holland
   (b) janitor for the city hall
   (c) chief experimenter for the French Academy of Science
   (d) a Swedish inventor

9. The only living things Leeuwenhoek observed through his microscope were insects.
   (a) True or (b) False

10. Leeuwenhoek wrote his reports to the Royal Society in: _____.
   (a) Dutch (b) German (c) English (d) French



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11. Anton van Leeuwenhoek found living organisms so small they could only be seen in a microscope.
(a) True or (b) False

*12. _____ means *small life*.

13. Because he did not have a college degree, the Royal Society refused to grant membership to Leeuwenhoek.
(a) True or (b) False

14. Leeuwenhoek's simple lens microscope has never been improved upon.
(a) True or (b) False

*15. The ***eye lens*** acts as a magnifying glass to enlarge the image formed by the _____ lens.

*16. _____ is the size of the image divided by the size of the object; $m = Si/So$.

*17. The formula for the magnification of a lens using the lens to object and the lens to image distances is _____.

18. The distance from the lens to the object is 3 inches, while the distance from the lens to the image of the object is 36 inches. The magnification is _____.

19. An overhead transparency is 10 inches across and located 18 inches from the projector lens. The 10 inch transparency is enlarged by a factor of 6.67x: 10 inches * 6.67 inches, or between five and six feet.
(a) True or (b) False

20. Write the **Life Principle:** *"*_____
_____*."*



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ACTIVITIES
**Lesson 14:**
*Inventions & Discoveries*

# *Microscopes and Telescopes*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. The formula for the magnification of a microscope objective is _____.

2. The _____ enlarges the real image formed by the objective lens.

*3. The _____ of the eye lens is given by the formula $m = (25cm)/f$ with $m$ being the magnification, *25 cm* the comfortable viewing distance, and $f$ the focal length of the eye lens.

4. An ***optical microscope*** with a magnification of 1,250x is far greater than would normally be used.
(a) True or (b) False

*5. The best optical microscope in the hands of a skilled observer can achieve a maximum useful magnification of _____.

*6. _____ use electrons, magnetic and electric fields to form an image.

*7. ***Electron microscopes*** can achieve a magnification of _____.

*8. The magnification of a _____ depends on focal length of the main objective and the focal length of the eyepiece.

9. In using the ***telescope***, the size of an image has no direct relation to the proportion of the objective.
(a) True or (b) False

10. A telescope objective forms a real image of the _____.

*11. The total magnification of a telescope is given by the ratio of the focal length of the objective to the focal length of the eye lens. The formula is _____.

*12. _____ is the ability to separate two objects that are close together.

13. The ***resolution*** of two objects that are close together includes the size and _____ of the telescope.



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*14. The resolution of a telescope _____ as the diameter of its main lens or mirror increases.
(a) realigns (b) increases (c) decreases (d) remains the same

15. If the magnification of a telescope exceeds the resolution, the image becomes larger, blurred and _____.

16. Magnification that exceeds the resolution is _____ magnification.

17. Because of the nature of light, _____ of the lens is limited.

18. A telescope objective of 50 mm (2 inches) can provide a maximum magnification. of about: _____.
(a) 800x (b) 80x (c) 20x (d) 8,000x

19. For most student grade microscopes, the highest useful magnification is about: _____.
(a) 400x (b) 100x (c) 200x (d) 300x

20. Write the **Life Principle:** *"*_____
_____
_____.*"*

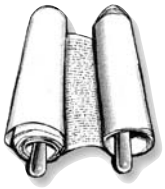


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Name: _____

Date: _____ Grade: _____





## *Rainbows*

*ACTIVITIES*
***Lesson 15:***
*Scientific Laws*

*You are making progress!* ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

*1. The amount light bends depends upon whether it enters air, water, glass or diamond.
(a) True or (b) False

*2. In going from air into water, a ray of light is bent _____ from the normal.
(a) downward (b) toward (c) away (d) upward only

3. A beam of light entering at 90 degrees from the normal will be bent most by: _____.
(a) air (b) diamond (c) glass (d) steel

*4. The index of refraction is the ratio of the _____ of light in a substance compared to its _____ in a vacuum (same word).

*5. Separating light into the colors is: _____.
(a) declination (b) refraction (c) reflection (d) dispersion

6. When red and violet light enter glass, the one that slows least is: _____.
(a) red (b) violet (c) blue (d) purple

*7. The index of refraction is the same for all colors.
(a) True or (b) False

8. When red and violet light enter glass at the same angle, the one that refracts more is: _____.
(a) blue (b) red (c) violet (d) purple

*9. The greatest ***dispersion*** is caused by a: _____.
(a) magnet (b) diamond (c) glass ***prism*** (d) vacuum

10. The two properties that cause a diamond to sparkle are: _____.
(a) density and specific gravity (c) dispersion and total internal reflection
(b) density and reflection (d) reflection and refraction

11. Diamond is the only substance that has the property of *total internal reflection*.
(a) True or (b) False

*12. Total internal reflection has found a practical application in _____.



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13. Either reflection or refraction can produce a rainbow.
(a) True or (b) False

*14. A _____ reflects each color by the same amount.

*15. A reflecting telescope has a convex mirror as its primary surface for forming an image.
(a) True or (b) False

*16. The primary objective of a refracting telescope is a _____ lens.

*17. The _____ of light is not the same for all types of glass.

18. _____ separates red and blue by a different amount than the denser flint glass.

19. A solution to the color problem caused by a glass lenses has yet to be found.
(a) True or (b) False

20. Write the **Life Principle:** *"*_____
_____*."*

***Note: Ask your teacher for the quiz over topics 11-15 before proceeding to the next section. Reminder: If you score 85% or higher on the three section quizzes, you may be exempt from the chapter test!***





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