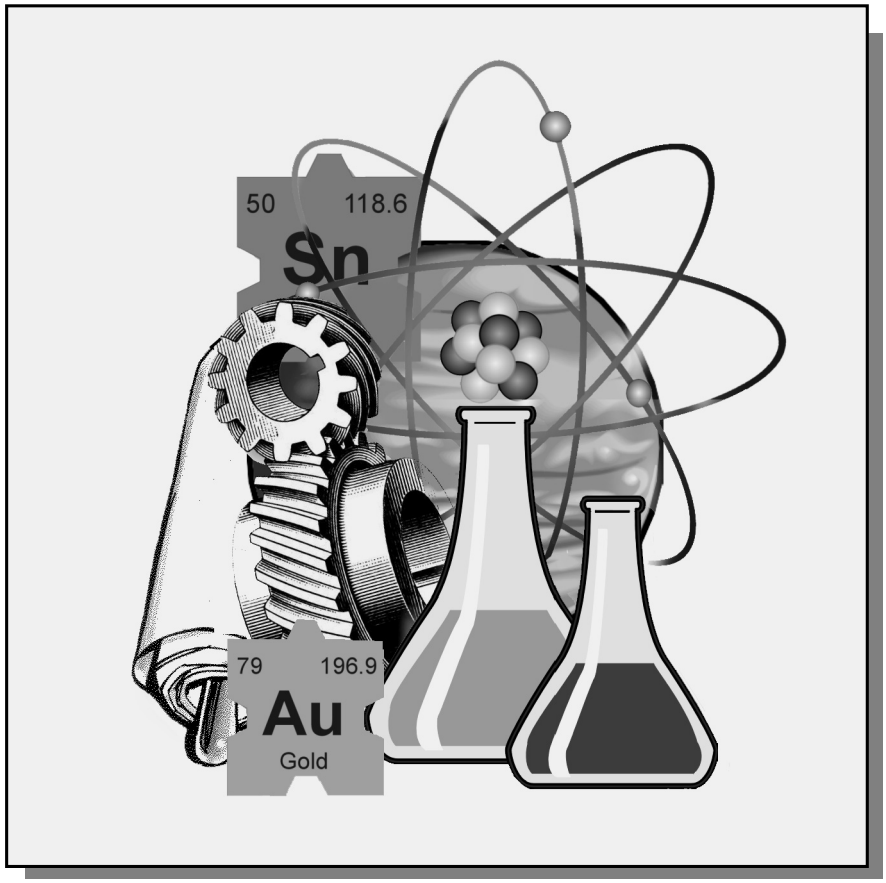
Integrated Physics & Chemistry

ACTIVITIES



Chapter 9

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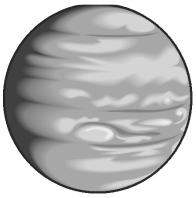
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ACTIVITIES
Lesson 1:
Planets

Keeping Time—Years and Days

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. Ancient farmers needed an accurate: _____.
   (a) calendar (b) clock (c) sundial (d) diary

*2. A year is the total time for the Earth to: _____.
   (a) orbit the Moon
   (b) orbit once around the Sun
   (c) turn once on its axis
   (d) orbit around the world

*3. The first day of summer is usually _____. (Give month and day.)

4. On the first day of summer, the daytime is longest at: _____.
   (a) London, England
   (b) the ***equator***
   (c) North Pole
   (d) St. Louis, Missouri

*5. The first day of winter is usually _____. (Give month and day.)

*6. From the longest day to the next longest day is one: _____ .
   (a) century (b) day (c) ***equinox*** (d) year

7. During the year, the stars visible right after sunset are always the same.
   (a) True or (b) False

8. The brightest star in the nighttime sky is: _____.
   (a) the North Star (b) Saturn (c) Sirius (d) Alpha Centauri

9. A year of 360 days is too _____.

10. The Sun always comes up at exactly the same place in the east.
    (a) True or (b) False

11. The shadow of a tall building is the same length at noon every day of the year.
    (a) True or (b) False

*12. A building has its shortest shadow on the first day of: _____.
   (a) winter (b) fall (c) spring (d) summer

*13. Seasons are caused by: _____.
   (a) the speed at which the Earth orbits the Sun
   (b) the Moon
   (c) the tilt of the Earth on its axis
   (d) global warming

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14. Fall and winter in the ***Northern Hemisphere*** occur when the Sun is _____ of the equator.

15. The United States and Australia have the _____ seasons.
(a) same (b) opposite (c) shortest (d) longest

*16. During the summer, the Earth has the Northern Hemisphere tilted _____ the Sun.

*17. The first day of spring is the ***vernal*** _____.

*18. The first day of spring usually starts on _____. (Give month and day.)

*19. The first day of fall usually starts on _____. (Give month and day.)

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

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Name: _____

Date: _____ Grade: _____



ACTIVITIES
Lesson 2:
Inventions & Discoveries

Keeping Time—The Calendar

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. Due to simpler lifestyles, ancient peoples had no use for *calendars*.
   (a) True or (b) False

*2. The one that contains the most information is a(n): _____.
   (a) *almanac* (b) calendar (c) ***tide table*** (d) diary

3. The North American Indians left no record that they studied the stars.
   (a) True or (b) False

*4. The Mayan Indians of Central America and Mexico built an _____.

5. The purpose of the ring of poles set in the ground by the mound builders was: _____.
   (a) to direct spirits
   (b) a place to play ball
   (c) to mark various astronomical events
   (d) to predict the tides

*6. *Stonehenge* is located in: _____.
   (a) Chichén Itzá, Mexico
   (b) Peru
   (c) England
   (d) St. Louis, Missouri

7. Stonehenge was built about 1130 ***A.D.***
   (a) True or (b) False

*8. Stonehenge can predict the first day of summer and winter, the first day of spring and autumn and ***eclipses***.
   (a) True or (b) False

*9. The 56 Aubrey holes were probably used to mark the cycle of: _____.
   (a) eclipses (b) Moon phases (c) meteors (d) sunspots

*10. One advantage of having 360 days in a year is that the number 360: _____.
   (a) has mystical powers
   (b) has many other numbers that can divide it
   (c) was easier to remember
   (d) is divisible by ten

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*11. For a calendar to match the seasons, the number of days in a year must equal: _____.
(a) 360 days (c) 12 complete trips of the Moon around the Earth
(b) 52 weeks (d) the time the Earth goes around the Sun once

12. The *Julian calendar* has an average year of: _____.
(a) 360 days (c) 365 ¼ days
(b) 51 weeks (d) 365 days, 11 minutes, 14 second

13. The month of July is named after _____ Caesar.

14. The month named after Caesar Augustus is _____.

15. The Julian calendar had a year that correctly matched the time the Earth goes around the Sun.
(a) True or (b) False

16. The calendar with 97 leap years in 400 years is the: _____.
(a) Gregorian (b) Julian (c) Georgian (d) Augustian

17. The *Gregorian calendar* has a year that exactly matches the time it takes the Earth to orbit the Sun once.
(a) True or (b) False

*18. The expression *100* ***B.C.*** means *100 years* _____.

*19. George Washington was born in 1732 A.D., about 1,732 years _____ the birth of Christ.

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

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ACTIVITIES
Lesson 3:
Inventions & Discoveries

Keeping Time—Sundials and Hourglassses

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 _____ is measured by one complete cycle of the Earth traveling in its orbit around the Sun.

*2. The time required for the Earth to _____ around the Sun is called a ***period***.

3. The person who has an average life expectancy will travel around the Sun _____ times in his or her lifetime.

*4. A _____ is a complete cycle of the Earth spinning on its axis once.

*5. Today, a *day* is measured from the time the Sun passes across any given _____ until it again crosses the _____ ***meridian***.

*6. _____ means having to do with *the Sun*.

7. Scientists use the word *mean* to show that they are: _____.
(a) changing the definition of a term (c) taking an average
(b) solving a difficult problem (d) aggravating or unkind

*8. The original definition of a month was the time it took for the _____ to go around the Earth once.

9. The monthly event in the heavens known as the ***lunar*** cycle is when: _____ _____.
(a) the Sun completes one full orbit
(b) Earth completes one orbit around the Sun
(c) the Moon rotates once on its axis
(d) the Moon completes one orbit around the Earth

10. Days, months and years are ***periodic*** events marked by events in the heavens.
(a) True or (b) False

11. The current use of 24 *hours* did not begin until the _____.

*12. A *sundial* points: _____.
(a) west southwest (c) toward the celestial North Pole
(b) toward the sunrise point in the east (d) straight up and down

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*13. In early ***water clocks***, as the container was emptied the water flowed more: _____.
(a) slowly (c) quickly
(b) easily (d) erratically

14. Galileo used the water clock to time his experiments because: _____ _____.
(a) he had not learned how to tell time using a clock
(b) clocks and watches were costly
(c) water was plentiful
(d) it was the most accurate way to measure time

15. The ancient Romans timed senators' speeches with: _____.
(a) a mechanical clock (c) a sundial
(b) an ***hourglass*** (d) a ***water clock***

16. The first _____ were very _____ devices.

17. The first clocks had only _____ hands.

*18. The purpose of an ***escapement*** is to: _____.
(a) let out the cuckoo bird
(b) catch and release gears
(c) change the hours of a clock to match the hours of a sundial
(d) to release a hammer to strike a bell on the hour

*19. Although the first clocks had _____, they were not regulated.

*20. The first accurate clocks were regulated with _____.

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

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Name: _____

Date: _____ Grade: _____



ACTIVITIES
Lesson 4:
Inventions & Discoveries

Keeping Time—Clocks

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 Principle of the Pendulum states that the time for a pendulum to make a complete arc changes as the arc grows smaller.
(a) True or (b) False

2. To measure *period*, one uses: _____.
(a) time (b) pressure (c) speed (d) weight

3. The first astronomer to understand that Saturn is circled by rings was: _____.
(a) Thomas Jefferson
(b) Christiaan Huygens
(c) Johannes Kepler
(d) Isaac Newton

4. Most clocks in Christiaan Huygens' day: _____.
(a) could keep time to the second
(b) were sundials
(c) had only hour hands
(d) marked time with light emitting diodes

5. Christiaan Huygen built a clock capable of keeping time to the minute by using the regular back and forth motion of a swinging _____ to control the gears.

6. Clocks of Huygen's design: _____.
(a) became known as grandfather clocks
(b) were small enough to carry in a person's pocket
(c) never worked well
(d) were so large they could be found only in clock towers

7. Christiaan Huygens moved to Paris, France: _____.
(a) to be closer to Galileo
(b) at the invitation of King Louis XIV
(c) to serve as president of the Royal Society
(d) because of religious persecution

8. The ***pendulum clock*** reduced the size of a timekeeper from one that required an entire bell tower to one that: _____.
(a) was microscopic
(b) fit in a cabinet
(c) was the size of a plate
(d) hung on a wall

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*9. The _____ and ***balance wheel*** regulated a watch.

10. Ways to improve the reliability of watches were to put them in cases, use smooth, hardened steel gears and mount the axles in small jewels.
(a) True or (b) False

*11. The ***fundamental unit*** for mass in the metric system is the: _____.
(a) gram (b) liter (c) kilogram (d) ounce

12. When the metric system was first begun, the ***kilogram*** was defined as the unit of 1,000 cubic centimeters of pure water at a temperature of _____.

*13. The fundamental unit of length in the metric system is the: _____.
(a) ***derived unit*** (b) hertz (c) kilogram (d) ***meter***

*14. The _____ units for length include the millimeter (1/1,000 meter) and the kilometer (1,000 meters).

*15. The ***second*** is the fundamental unit for: _____.
(a) mass (b) length (c) time (d) energy

16. The calculation 24 hours/day * 60 minutes/hour * 60 seconds/minute = 86,400 gives the number of: _____.
(a) minutes in a week (c) hours in a day
(b) days in a year (d) seconds in a day

17. The Earth rotates uniformly on its axis.
(a) True or (b) False

18. The Moon and Sun pull up tides of _____ on the Earth which slows the Earth.

*19. The day may be irregular in length because of: _____.
(a) braking effects of tides (c) both a and b
(b) melting of polar ice caps (d) neither of these

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

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ACTIVITIES
Lesson 5:
Inventions & Discoveries

Keeping Time — Navigation

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 person who made a clock that could keep time aboard a ship was: _____ _____.
   (a) Christiaan Huygens (c) John Harrison
   (b) Galileo (d) Neil Armstrong

2. John Harrison built scientific _____, such as those used by surveyors.

*3. _____ is the distance north or south of the equator.

*4. ***Longitude*** is found by comparing local time with the time: _____.
   (a) at St. Louis, Missouri (c) at the north pole
   (b) at Greenwich, England (d) on the equator

5. The British used the _____ _____ as their reference line.

*6. Every hour that local time differs from Greenwich time is _____ degrees longitude from Greenwich.

7. Isaac Newton was one of the first to realize that a trustworthy clock would win the longitude prize.
   (a) True or (b) False

8. Harrison's first three clocks were big and heavy.
   (a) True or (b) False

9. Harrison's clock Number Four was only five inches across and an inch thick.
   (a) True or (b) False

10. The reason Government officials delayed giving John Harrison the prize was because they: _____.
   (a) hoped some of their scientist friends would win the prize
   (b) did not like John Harrison
   (c) believed the clock looked ugly
   (d) believed the clock was too large and heavy

11. John Harrison's Number Five clock averaged an error of only _____ second per day.

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12. The person who helped John Harrison receive the full prize was: _____.
    (a) Captain James Cook (c) Greenwich
    (b) King George III (d) the Royal Society

13. _____, the first person to put foot on the Moon, said that John Harrison's invention of the clock enabled people to explore the Earth with precision.

*14. The prefix *chrono-* means *time* and the suffix *-meter* means *measure*, therefore, a _____ is a device to measure time.

*15. In the United States, the power companies put out alternating current with a frequency of _____ cycles per second.

*16. An electric clock has a _____ electric motor that runs in step with the frequency of the electricity in the power line.

*17. A modern watch is regulated by a: _____.
    (a) pendulum (b) ***quartz crystal*** (c) ***chronometer*** (d) regulator

*18. A watch with a quartz timer is not very accurate.
    (a) True or (b) False

19. Electric power from batteries eliminates the need for a _____ _____ that has to be wound.

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

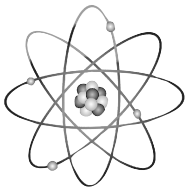
Note: Ask your teacher for the quiz over topics 1-5 before proceeding to the next section. Reminder: If you score 85% or higher on the three section quizzes, you may be exempt from the chapter test!



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Name: _____

Date: _____ Grade: _____



ACTIVITIES
Lesson 6:
Energy

Sound—Period and Frequency

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 small tuning fork has a ***period*** that is small and _____.

2. The one with the faster vibration and greater accuracy is a: _____.
   (a) tuning fork (b) quartz crystal (c) guitar string (d) reed

*3. A ***cycle*** is: _____.
   (a) something to ride on
   (b) a complete repetition
   (c) a one time event
   (d) a square wheel

4. The 11 years from sunspot maximum to minimum back to maximum is one half of a cycle.
   (a) True or (b) False

5. The period is the time for a complete cycle. (a) True or (b) False

*6. To calculate the period, divide the time by the number of _____.

*7. To calculate the ***frequency***, divide the cycles by the _____.

8. An example of the units of frequency is: _____.
   (a) cycles/sec (b) kilometers/sec (c) meters (d) miles/hour

*9. The frequency of ***alternating current*** in the United States would be written as _____.

10. The frequency of the ***sunspot*** cycle is _____.

*11. ***Acoustics*** is the scientific study of _____.
   (a) sound (b) Sun spots (c) frequency (d) cycles

12. The first person to study sound was the Greek scientist, _____, who was born about 580 B.C.

*13. Pythagoras believed that the natural world is _____ in nature and applied mathematics to music.

14. The drum is an example of a(n) _____ musical instrument.
   (a) electronic (b) percussion (c) stringed (d) wind

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15. An example of an instrument that uses a vibrating column of air to make music is the: _____.
(a) piano (b) cymbal (c) guitar (d) organ

16. To make music, a violin uses: _____.
(a) a stretched membrane like that on a drum
(b) resin
(c) an air column
(d) vibrating strings

17. The ***theremin*** is an example of a(n) _____ musical instrument.
(a) electronic (b) percussion (c) woodwind (d) stringed

18. The Russian dictator, Stalin, had Leon Theremin kidnapped and returned to Russia to: _____.
(a) work in a secret scientific research labor camp in Siberia
(b) force him to teach electronics to soviet students
(c) give him a hero's welcome
(d) accuse him of treason

19. The ***music synthesizer*** was developed by: _____.
(a) Leon Theremin
(b) Robert Moog
(c) Walter Carlos
(d) Joseph Stalin

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

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ACTIVITIES
Lesson 7:
Light and Sound

Sound—Pitch and Quality

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. ***Pitch*** of sound is its: _____.
(a) frequency (b) period (c) wavelength (d) tone

2. High C on the musical scale is equal to _____ vibrations per second.

*3. An ***octave*** is a change in pitch by a multiple of _____.

4. The range in pitch from 64 vibrations per second to 1,024 vibrations per second: _____.
(a) can only be heard by dogs and bats
(b) is the range of a bassoon
(c) is the range of singers from bass to soprano
(d) is the total range of sound

5. The one with the greater range is the: _____.
(a) clarinet (b) piano (c) human voice (d) guitar

6. Pitch alone determines all of the properties of a sound.
(a) True or (b) False

*7. ***Loudness*** can be represented by the energy of a sound wave and is measured by: _____.
(a) amplitude (b) tone (c) frequency (d) pitch

*8. _____ measure the loudness of a sound.

*9. The loudest sound that the human ear can tolerate is about 100 times louder than the softest sound barely detectable to the human ear.
(a) True or (b) False

10. The frequency range of 15 cycles/sec to 20,000 cycles/sec: _____.
(a) can only be heard by dogs and bats
(b) is the range of human hearing
(c) is the range of a piano
(d) is the range of singers from bass to soprano

11. A person is more likely to hear a whisper at normal pitch than one that is of the same loudness but at a higher or lower pitch.
(a) True or (b) False

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12. ***Noise pollution*** is any sound that is annoying, physically damaging or: _____.
    (a) distracting (c) louder than 110 decibels
    (b) higher than 20,000 cycles per second (d) a necessity

*13. Most airports have noise _____ plans to reduce the sound as jet aircraft are taking off.

*14. The Environmental Protection Agency is responsible for protecting the environment for future generations through reducing and controlling _____ pollution.

*15. The _____ of a sound helps the human ear to tell one instrument from another.

16. An entire body vibrating produces the: _____.
    (a) harmonics (c) last ***overtone***
    (b) first octave (d) ***fundamental frequency***

*17. ***Quality*** is caused by the number and loudness of overtones.
    (a) True or (b) False

18. Of the following objects, the one with the fewest overtones is a: _____.
    (a) tuning fork (b) human voice (c) violin (d) piano

*19. The *three properties of a sound* are _____, _____ and _____.

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

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ACTIVITIES
Lesson 8:
Light and Sound

Recording Sound

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. Thomas Alva Edison patented close to _____ inventions.

2. Edison received an education: _____.
   (a) at a private school
   (b) in a public school
   (c) primarily at home
   (d) at Menlo Park school.

3. Edison earned money at age twelve: _____.
   (a) by mowing lawns
   (b) as a telegraph operator
   (c) by selling his invention of a stock ticker
   (d) by selling newspapers on a train

4. Edison sold his stock ticker for: _____.
   (a) $40,000 (b) $5,000 (c) $500 (d) $1

5. Edison used the money he earned from the stock ticker to: _____.
   (a) build a research laboratory
   (b) buy a supply of vinyl records
   (c) invent the light bulb
   (d) pay his mother's medical bills

*6. In 1877, Thomas Edison demonstrated the first _____.

*7. The word *phonograph* comes from the Greek words *phono-*, meaning sound or speech, and *-graph*, meaning to write. A phonograph is a _____ _____.

8. Edison recorded the rhyme *Mary Had a Little Lamb* on (in): _____
   (a) a cylinder wrapped with tin foil
   (b) a vinyl record in the shape of a flat disc
   (c) a CD player
   (d) his diary

*9. On the first phonograph, the grooves caused the needle to vibrate, the needle caused the diaphragm to vibrate, and the vibrating diaphragm produced _____ waves that were amplified by the megaphone.

*10. The filament of the first light bulb was: _____.
   (a) thread (b) carbon (c) tungsten (d) neon

11. The first light bulbs that Edison manufactured for sale would last for: _____.
   (a) 1,500 hours (b) 2 years (c) 16 hours (d) 40 hours

*12. For the *persistence of vision* to cause most people to see continuous motion the number of pictures must be at least _____ pictures per second.
   (a) 8 (b) 16 (c) 100 (d) 30

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13. The ***kinetograph*** was a device invented by Thomas Edison to write motion.
    (a) True or (b) False

14. Thomas Edison invented the _____, a device to view motion pictures.

15. The first movie that was viewed on the ***kinetoscope*** and that told a story was: _____.
    (a) the *Great Train Robbery* (c) *Cinderella*
    (b) *Mary had a Little Lamb* (d) *The Keystone Kops*

16. For 25 years, movies were silent because: _____.
    (a) the actors refused to talk and act
    (b) Edison refused to release his patent for the phonograph to the movie business
    (c) people preferred to hear organ or orchestra music than listen to actors talk
    (d) sound could not be made to synchronize with the picture

*17. One of the advantages of a compact disk (CD) over a record is that it holds more information.
    (a) Tru or (b) False

*18. The invention that records and retains quality sound information in ***digital*** format is a: _____.
    (a) ***CD*** (b) tape recorder (c) vinyl record (d) ***DVD***

*19. The digital device that records and plays back motion pictures in place of film and videos is a: _____.
    (a) CD (c) DVD
    (b) movie projector (d) tape recorder

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

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ACTIVITIES
Lesson 9:
Light and Sound

Sound—Doppler Shift

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 pitch of the horn of an approaching car becomes _____ because of its motion.
   (a) higher (b) lower (c) remains the same (d) a nuisance

*2. The apparent change in the pitch of sound because of motion is the _____ effect.

3. The pitch of the whistle of a train as it goes away from a station is _____ because of the train's motion.
   (a) higher (b) louder (c) lower (d) remains the same

4. The speed of sound in air is different for each instrument that causes the sound.
   (a) True or (b) False

5. If a train doubled its speed, the speed of the sound coming from its whistle will double.
   (a) True or (b) False

*6. Sound waves in front of a moving source of sound have_____ pitch.
   (a) higher (b) lower (c) louder (d) more piercing

*7. Those waves behind the moving source have a _____ pitch.

8. The ***Doppler effect*** applies only to sound waves.
   (a) True or (b) False

*9. The color of a star that is approaching the Earth is shifted toward the: _____
   (a) red (b) blue (c) yellow (d) green

10. The color of a star that is receding from the Earth: _____.
   (a) is white (c) is shifted only if the star exceeds the speed of light
   (b) does not change (d) is shifted toward the red

*11. The Doppler effect is also known as the Doppler _____.

12. Regular radar was used in World War II to detect enemy aircraft and show their distance and direction. (a) True or (b) False

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*13. The radar that is designed to measure speed of a target is _____ radar.
(a) regular (b) tracking (c) Doppler (d) police

14. Shift in frequency does not occur if the source of the sound is stopped and the listener is in motion. (a) True or (b) False

*15. As a horn sounding at 256 cycles/sec is approaching, the listener will hear a frequency that is _____ 256 cycles/sec.
(a) greater than (b) less than (c) pitched to (d) equal to

16. The fraction that is greater than one is: _____.
(a) 334/370.8 (b) 334/307.2 (c) 307/334.45 (d) 307.2/370.8

17. When a horn is _____ the listener, the pitch increases from 256 cycles/sec to 278 cycles/sec.

*18. The Doppler effect applies to _____ wave motion.

*19. When measuring the speed of a star by the ***Doppler shift***, astronomers must take into account: _____.
(a) circumrotation (c) the speed (motion) of the Earth
(b) the speed of police cars (d) the time it takes for light to reach the Sun

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

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ACTIVITIES
Lesson 10:
Geology

Earthquake Waves

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. An ***earthquake*** is felt on the surface of the Earth as a shaking of the ground.
   (a) True or (b) False

*2. An earthquake ***pressure wave*** (*P wave*) causes rocks in the Earth to: _____ _____.
   (a) bobble like a cork on water
   (b) compress and expand
   (c) move at right angles to the direction of the wave
   (d) explode

3. A ***shear wave*** is similar to waves in a spring that is compressed and released.
   (a) True or (b) False

*4. The purpose of a ***seismograph*** is to record information about: _____.
   (a) ocean waves (c) motion of double stars and satellites
   (b) earthquake waves (d) sound waves and ***triangulation***

*5. The ones that arrives first are _____waves.
   (a) P (b) shock (c) A (d) S

*6. The farther *P* and *S waves* travel, the _____ the two types of waves become.
   (a) closer together (c) more threatening
   (b) farther apart (d) less threatening

*7. An earthquake scientist is better known as a _____.

*8. To locate the origin of an earthquake, a ***seismologist*** must know the distance from three separate locations.
   (a) True or (b) False

*9. The source of the earthquake that is on the surface directly above the source of earthquake waves is the _____.

10. Rocks can be bent and deformed under pressure.
   (a) True or (b) False

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11. _____ _____ or earthquake waves are produced when strain in layers of rock are suddenly released, usually by the rocks breaking.

*12. Earthquakes usually occur in those areas that have _____.

13. Some earthquakes produce waves with a frequency high enough to be heard by humans
(a) True or (b) False

14. The _____ of an earthquake can cause some soils to change into mud.

15. The most powerful U.S. earthquake was probably the: _____.
(a) Los Angeles earthquake (c) New Madrid earthquake of 1811
(b) San Francisco earthquake of 1906 (d) Mexico City earthquake

16. The most deadly, destructive earthquake was the: _____.
(a) Mexico City earthquake (c) New Madrid earthquake of 1811
(b) San Francisco earthquake of 1906 (d) Los Angeles earthquake

17. Most news media report the strength of earthquakes on the *Richter scale*.
(a) True or (b) False

*18. The most powerful earthquake is one that has a value of _____or more on the Richter scale.
(a) 3.0 (b) 2.0 (c) 8.0 (d) 5.0

19. The _____ earthquake of 1964 was the strongest quake recorded up to that time in the United States.

*20. A ***tsunami*** is a wave caused by: _____.
(a) an earthquake (b) tides (c) ocean storms (d) water

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

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ACTIVITIES
Lesson 11:
Invention & Discoveries

Radio

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 first record player that was invented by Thomas A. Edison did not use _____.
2. Music from Edison's record player could only be heard by one person at a time.
   (a) True or (b) False
3. Greater volume for the first record player was made possible with ***vacuum tubes*** that _____ the sound.

*4. ***Diode*** means two electrodes. (a) True or (b) False

*5. In the diode, the electrode that is hot and acts as source of electrons is the _____.

*6. In the diode, the electrode that is cold and acts as a collector of electrons is the _____.

*7. A _____ is a one-way path for electricity.

8. A diode is especially effective in allowing electricity to pass in both directions.
   (a) True or (b) False

*9. An *alternating current* that has been made to flow in only one direction has been: _____.
   (a) amplified (b) *hertzed* (c) *rectified* (d) dioded

10. The diodes in electronic circuits today are _____ diodes.
11. Diodes that glow when electricity flows are known as light suppressing diodes.
    (a) True or (b) False

12. The abbreviation for a ***light emitting diode*** is _____.

13. Heinrich Rudolf Hertz was a German physicist who studied wavelength.
    (a) True or (b) False

*14. Radio waves have a _____ frequency than visible light.
    (a) longer (b) higher (c) lower (d) more dense

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*15. Radio waves have a _____ wavelength than visible light.
(a) longer (b) safer (c) shorter (d) higher

*16. The unit for cycles per second in the metric system is: _____.
(a) Edison (b) Fleming (c) ohm (d) Hertz

17. The first person to send radio messages across the Atlantic Ocean was: _____.
(a) Christian Doppler (c) Heinrich Rudolf Hertz
(b) Guglielmo Marconi (d) Alexander Bell

18. To send a message by Marconi's radio, the operator spoke into a microphone.
(a) True or (b) False

*19. _____ is the process of changing some part of an electric signal so it carries information.

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

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ACTIVITIES
Lesson 12:
Inventions & Discoveries

Amplifying Electric Signals

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 first radios sent messages by: _____.
   (a) Morse code (c) telephone
   (b) voice activated circuits (d) air pockets

2. A *microphone* changes _____ into electrical energy.

3. The microphone was first invented for use with: _____.
   (a) computers (c) the telegraph
   (b) live stage productions (d) the telephone

4. In a *carbon microphone*, less electricity flows when the carbon particles are pressed together. (a) True or (b) False

*5. When a quartz crystal is squeezed it produces: _____.
   (a) a cold wave (c) a high pitched sound
   (b) crystal juice (d) a small electric current

6. One way to transmit voice or other sound signals is to _____ the amplitude of the waves.

*7. _____ modulation changes the strength of radio waves to carry sound.
   (a) *Amplitude* (b) *Frequency* (c) Decreased (d) Increased

8. The AM broadcast band goes from 535 to 1605: _____.
   (a) kiloHertz (b) million Hertz (c) megakilos (d) kilocycles

9. The first radio stations began broadcasting in the _____ and used ***amplitude modulation***.

10. The letters FM stand for ***frequency modulation***.
    (a) True or (b) False

*11. The broadcast method that requires more ***bandwidth*** is _____ modulation.
    (a) amplitude (b) frequency (c) decreased (d) diametric

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*12. The radio band that experiences less interference is the _____ band.
(a) CD (b) AM (c) FM (d) CB

13. Radio waves that are reflected by the ionosphere are those from _____ stations.
(a) AM (b) CD (c) FM (d) CB

14. AM broadcasts carry shorter distances than FM stations.
(a) True or (b) False

15. Lee De Forest's most important invention regarding radio waves, was the _____.

*16. The _____ amplifies weak radio signals.
(a) diode (b) triode (c) range (d) biode

*17. The purpose of the ***grid*** in Lee De Forest's ***triode*** was to: _____.
(a) amplify electric currents (c) detect earthquakes
(b) coat metals with silver (d) sift out bad signals

18. Lee De Forest proved to have greater skills as an _____, not as a businessman.

19. In 1910, Lee De Forest sold the triode to American Telephone and Telegraph (AT & T) for $390,000.
(a) True or (b) False

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

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ACTIVITIES
Lesson 13:
Inventions & Discoveries

Semiconductors

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. If one *vacuum tube* will amplify a signal 10 times, then six of them in ***series*** will amplify the signal _____ times.
   (a) 600 (b) 100,000 (c) 10,000 (d) 1,000,000

2. Lee De Forest developed a way to have the sound synchronize with the action on a motion picture screen.
   (a) True or (b) False

3. One of the first computers, *ENIAC*, used 18,000: _____.
   (a) diodes (b) transistors (c) vacuum tubes (d) volts

4. Vacuum tubes are still used in microwave ovens.
   (a) True or (b) False

*5. All electromagnetic waves travel at the speed of: _____.
   (a) Doppler waves (b) mach 2 (c) light (d) sound

*6. Hertz is a metric unit for: _____.
   (a) amplitude (b) distance (c) rentals (d) frequency

7. The expression 1.0 cycle/sec can also be written as 1.0 *Hz*.
   (a) True or (b) False

8. Wavelength is represented by the Greek letter:_____.
   (a) lambda, λ (b) omega, Ω (c) sigma, Σ (d) alpha, α

*9. One formula for ***velocity*** is distance divided by time or *d/t*.
   (a) True or (b) False

*10. Velocity of a wave can be found by _____ the ***frequency*** and wavelength.
   (a) subtracting (b) adding (c) dividing (d) multiplying

11. Vacuum tubes could be easily miniaturized.
   (a) True or (b) False

12. If the elements of a triode were made too small, the _____ would jump from the electrodes to the glass or other nearby components.

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*13. _____is the process of changing high frequency radio waves back into the lower frequency of sound waves.

14. Natural crystals acted as radio receivers and *demodulated* the radio signals.
(a) True or (b) False

*15. A *semiconductor* is a very good electrical conductor.
(a) True or (b) False

*16. *Silicon* is an example of a semiconductor.
(a) True or (b) False

17. The chemical formula for silicon dioxide is _____.

18. The name silicon is from *silex*, a Latin word meaning _____.

*19. Silicon and carbon are in the same chemical family in the periodic table.
(a) True or (b) False

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

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ACTIVITIES
Lesson 14:
Inventions & Discoveries

Transistors

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 number of electrons in silicon's outer shell is _____.
2. In a crystal of pure silicon, the silicon _____ share electrons with each other.
3. Arsenic is above nitrogen and phosphorus in the periodic table.
   (a) True or (b) False
4. The number of electrons in arsenic's outer shell is _____.

*5. A *n-type* ***semiconductor*** has _____ electrons.
   (a) too few (b) extra (c) insufficient (d) enough

6. The number of electrons in gallium's outer shell is _____.

*7. A *p-type* semiconductor has _____ electrons.
   (a) enough (b) too few (c) extra (d) the same number of

8. A triode consists of three parts: the *filament*, the *grid* and the _____.
9. In 1947, three physicists working at Bell Telephone Laboratories in Murray Hill, New Jersey invented the _____.
10. John Bardeen studied electrical conductivity at very low temperatures and became one of the few people to win two _____ prizes.

*11. The _____ is a semiconductor that is a source of electrons and corresponds to the filament of a vacuum tube.

*12. The _____ is a semiconductor that receives the electrons released by the ***emitter***.

13. The ***base*** controls how well electricity flows between emitter and ***collector***.
   (a) True or (b) False
14. *Transistors* were not used in hearing aids.
   (a) True or (b) False
15. Several devices were manufactured from a single silicon waver and then cut into individual _____.

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16. In the 1970s, ***microchips*** were replaced with *integrated circuits*.
(a) True or (b) False

17. An integrated circuit is a thin semiconductor wafer that has a multitude of _____ and other components.

18. Today, integrated circuits may contain _____ devices.
(a) 12 (b) 2 (c) 50,000 (d) 100 million

19. As computers became faster, the speed of light became a ***limiting factor***.
(a) True or (b) False

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

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Name: _____

Date: _____ Grade: _____



Series and Parallel Circuits

ACTIVITIES
Lesson 15:
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. Many devices use AA or AAA batteries, with _____ being the smallest.

2. The slightly raised end (the nubbin) is the _____ end of the battery.

*3. A _____ _____ has all devices connected in a single path.

*4. The number of possible paths in a ***series circuit*** is: _____.
(a) one (b) two (c) 10 or more (d) unlimited

5. The cross-section of the flashlight to the right shows a circuit that fails to produce light. The circuit would work if: _____
(a) the bulb was changed
(b) the switch was on
(c) new, stronger batteries were used
(d) the batteries were lined up so the positive end of one touches the negative end of another



*6. According to Ohm's Law, "_____ _____."

7. Putting two or more batteries in series increases the: _____.
(a) resistance (b)amps (c) voltage (d) the electrons

8. Putting two or more flashlight bulbs in series increases the: _____.
(a) resistance (b) voltage (c) amperage (d) the protons

*9. Doubling the ***resistance*** of a series circuit _____ the ***current*** that flows.

10. The total ***voltage*** in a series circuit equals the _____ of the individual voltages.
(a) difference (b) sum (c) total (d) product

*11. In a _____ circuit, the current that passes at any point will be the same as the current that passes at any other point.

12. The *total resistance* of a series circuit is the _____ of the individual resistances.
(a) product (b) difference (c) sum (d) reversal

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13. A ***parallel circuit*** offers more than one path to the electrons to complete the circuit. (a) True or (b) False

14. When two sources of voltage are connected in parallel, the *total voltage* is: _____.
    (a) found by adding the individual voltages
    (b) 24 volts
    (c) the same along either path
    (d) found by dividing the individual voltages

*15. In a _____ circuit, the total current is found by adding the individual currents in each path.

16. In a parallel circuit, _____ follows paths that are proportional to the resistance.

17. Replacing one battery with two batteries in parallel: _____.
    (a) changes the voltage
    (b) does not change the voltage
    (c) decreases the voltage
    (d) has a definite increase in the voltage

18. A parallel circuit has _____ or more devices that provide a resistance.
    (a) one (b) two (c) three (d) series

19. Electricity flow is proportional to the _____.

20. If a bulb has more resistance than the other, then the bulb with the least resistance will receive the greater current.
    (a) True or (b) False

21. 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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