Guided Reading Chapter 1 Sections 1 and 2

1. A _____ is a determination of an amount of something.
2. If you were given a number, say the number “22”, how would you know what it meant? You would have to give it a _____, or people might think you were talking about bowling balls or flowers!
3. Two common systems of measurements are the _____ system and the _____ system.
4. The width of your pinky is about the length of a

   a) Meter b) centimeter c) millimeter d) kilometer
5. Two meanings of identifying _____ are one particular moment, and a quantity or interval.
6. In our science class, we measure and record time in

   a) hours b) light years c) seconds
7. What is your age in seconds? (show your work!) Is this an appropriate way to discuss your age?

8. To convert a time into seconds, 1) separate the total time into amount of time in each unit, 2) convert each separate quantity of time into seconds, and 3) _____ all the seconds.
9. _____ describes how far it is from one place to another.

   a) Weigh b) distance c) time
10. The basic unit of measurement for length in the metric system is the _____.

    a) Centimeter b) kilometer c) meter d) millimeter

Guided Reading Chapter 1 Sections 3 and 4

1. Why should we convert units within the metric system?

2. The metric system is based on units of

   a) twenty five b) fives c) sixteen d) tens

3. Work the "SI Estimation Challenge" in the box on page 13.

4. Copy the "study skills" figure on page 14.

5. Convert 52,000 kilometers to centimeters. 52,000 km = _____ cm

6. Convert 25 millimeters meters. 25 mm = _____ m

7. A conversion factor is a ratio with a value of

   a) one b) two c) five d)ten

8. Copy the "study skills" figure on page 16.

9. What are significant digits?

10. Copy the “study skills” figure on page 19.

11. Accuracy is how close a measurement is to its _____ value.

    a) closest b) true c) unknown

12. Precision describes how close together _____ measurements are to one another.

13. Resolution refers to the _____ interval that can be measured.

14. Explain significant differences.

15. Explain the problem discussed on page 22 which describes a lab scenario with candy mints. Make sure to describe steps 1-4 in the problem.

Guided Reading Chapter 2 Section 1

1. _____ is the amount of matter in an object.
2. The SI unit for mass is the kilogram, however we will use the _____ in our science class to make measurements, because it is more appropriate for measuring the mass of small objects.

   a) centimeter b) gram c) milligram d) liter
3. A paper clip is about the mass of _____ grams(s).

   a) one b) two c) ten d) five
4. The difference between mass and weight is that mass represents the *amount* of matter in an object, and weight represents the amount of _____ on a given mass.
5. Copy the venn diagram on page 32 in your book.
6. _____ is the amount of space an object takes up.
7. Describe two important ideas when reading a graduated cylinder full of some liquid.
8. How do you find the volume of an irregular object?

9. Name an object that has a great mass but has a small volume.

10. Name an object with a large volume but a small mass.

Guided Reading Chapter 2 Section 2

1. Density is a property of matter that relates _____ and _____.

2. Name the densities (including the unit) of several common materials from Figure 2.9 in your text.

3. Work the "Solve it!" problem on page 37 in the text and compare the density of the Brazilian wood to other materials in Figure 2.9.

4. What is the density of liquid water?

5. Two units that are actually the same in value are g/cm³ (solids) and _____ (liquids).

   a) g/mL b) kg/mL c) g/cm d) kg/cm³

6. Density of a material is the same, no matter the _____ or the _____ of the material.

7. _____ is an exception to the rule that liquids are less dense than solids.

8. What is the equation for calculating density of matter?

9. Density gives us information about how the atoms in a material are

   a) arranged b) packed c) made d) none of these

10. Why are an aluminum brick, aluminum wire, and a piece of aluminum foil the same density?

Guided Reading Chapter 2 Sections 3 & 4

1. A _____ is a visual way to show data.
2. Sketch the 4 different graphs on page 42. Don't forget labels!
3. How is a scatterplot different from a line graph?
4. How are the independent and dependent variables different?
5. Copy the equation on page 43 that helps you understand how to scale your axes on a graph.
6. Copy the "Study Skills" figure on page 44 in the text.

7. Even if you don't think it is an independent variable, _____ is usually always plotted on the "x" axis.

8. A direct relationship between variables on a graph occurs when a change in one variable makes _____ in another.

   a) a change b) no change

9. In _____ relationship, a change in one variable makes a decrease in the other variable.

   a) a strong b) a weak c) an inverse d) a graph

10. T or F? You get the best predictions when your graph is large enough to show precise measurements.

11. List the four step method (Figure 2.17) to problem solving:

12. Use the four step method of problem solving (Figure 2.17) to help you solve the following problem:

    You walk into your room and flip the light switch to turn on the light. The light, however, doesn't turn on.

13. Why can people float effortlessly on the Dead Sea?

14. Review some of the solutions to the “egg drop” problem on page 50 in your book. How would you solve this problem? Design a solution different from the ones in the book and explain your idea using the “design method” of solving problems.

Guided Reading Chapter 3 Section 3

1. _____ reporting is very important in scientific research.

   a) Partial b) Truthful c) Biased

2. What is a scientific journal?

3. Good science is always repeatable, durable, based on evidence, and _____.

4. A cell phone is an example of _____.

5. Name several types of engineers.

6. Name some technologies that engineers create.

7. Engineers with ideas begin their planning using a _____.

8. It is important for engineers to _____ their prototypes to evaluate the model under certain situations.

9. Sometimes engineers have trouble with their models and need to revise the design a few times to make sure the design holds up in a wide range of _____.

10. What is the engineering cycle and why is it important?

Guided Reading Chapter 4 Section 2

1. Constant speed means the speed _____.

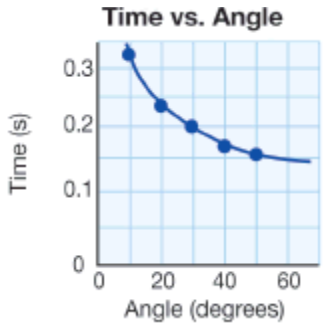
   a) changes b) stays the same c) is variable

2. What is the difference between a data table and a graph?

3. A good way to show the relationship between variables is to make a _____.

4. Draw a graph that shows a weak relationship between variables.

5. What kind of a relationship does this graph represent?



6. How is the blue line different from the red line on Figure 4.13?

7. What type of relationship on a graph shows points scattered all over the place?

8. “Slope” is the ratio of the “rise” (vertical change) to the _____ (horizontal change) of a line.

9. _____ is the slope of the position time graph.

10. How are the two graphs in Figure 4.14 related?

Guided Reading Chapter 5 Section 1

1. What is force?

2. Name and *describe* the four elementary forces.

3. What is weight?

4. The _____ is the unit of weight used in the English system of measurement.

   a) newton b) pound c) meter d) kilogram

5. One pound is equal to _____ newtons.

6. The _____ is the metric unit of force, and is a smaller unit than the _____.

7. One kilogram of mass has a weight of about _____ newtons.

   a) 5 b) 20 c) 10 d) 4.48

8. Force can be represented as a vector, with size and direction. The direction can be _____ or negative.

9. Copy Figure 5.1 on page 111 which compares the different types of forces.

10. Sketch a picture showing the difference between tensional, extensional, and compression forces.

11. _____ is a force that depends on mass and gravity.

    a) Weight b) Mass c) Friction d) Normal force

12. Copy Table 5.2 on page 114 in your text.

Guided Reading Chapter 5 Section 2

1. Friction is a force that _____ motion.
2. Sketch figure 5.8 on page 117. Remember to label!

3. Friction depends on _____ surfaces in contact.
4. You can represent the direction of force by using a _____.

   a) signal b) vector c) diagram

5. Sliding friction increases with _____.

   a) weight b) mass c) density

6. It is impossible to totally eliminate _____.
7. Name several ways to reduce the effect of friction.

8. How do tires help to increase the friction between the tire and the road?

9. Friction changes energy of motion into _____ energy.

   a) light b) electric c) heat

10. Why and how is oil used to reduce the effects of friction in large machines?

Guided Reading Chapter 5 Section 3

1. The sum of all the forces acting upon an object is called the _____ force.

2. Balanced forces result in a net force of _____.

   a) ten b) zero c) one d) five

3. When calculating the net force on an object, you must _____ the forces individually and make sure to apply _____ or negative direction to each.

4. When the net force on an object is zero, we say it is in _____.

5. Sketch Figure 5.16 on page 125. Don't forget labels!

6. Unbalanced forces cause _____.

   a) problems b) equilibrium c) acceleration d)weight

7. Explain the "normal" force in your own words.

8. Draw the free-body diagram in figure 5.19 on page 127. Include all arrows and force amounts.

9. A free-body diagram is meant to help people understand _____ force acting on the object represented in the diagram.

10. It is important to represent _____ and positive forces in a free-body diagram.

Guided Reading Chapter 6 Section 3

1. Newton's Third Law applies to _____ of objects.

2. These pairs of forces are known as _____-reaction pairs because one pushes against the other with an equal but opposite force.

3. Restate Newton's Third Law of Motion.

4. The forces don't cancel each other out because they work on _____ objects.

   a) the same b) similar c) different

5. Complete the "Solve it!" on page 150.

6. If the forces are equal and opposite, why is it that when a collision between two objects occurs, the objects don't react in the same manner?

7. What is momentum?

8. When referring to the “Law of Conservation of Momentum,” remember it applies when no outside_____ exists.

   a) force b) irregularity c) velocity

9. It is important to use _____ when discussing momentum.

   a) speed b) mass c) direction

10. More mass results in _____ acceleration.

    a) more b) less c) the same

Guided Reading Chapter 6 Sections 1 and 2

1. Only _____ has the ability to change motion.

2. Restate Newton's First Law of Motion.

3. _____ forces are those that act on an object causing the net force to be something other than zero.

4. Objects with more _____ are harder to move and have more _____.

   a) mass, inertia b) weight, inertia c) mass, acceleration

5. List the three main ideas of Newton's Second Law of Motion.

6. The second law connects force, _____, and motion.

7. _____ is defined as any change in speed or direction.

   a) Velocity b) Speed c) Acceleration

8. Sketch Figure 6.5 on page 68, which explains the metric unit called the "Newton."

9. Acceleration is proportional to force, meaning that if force _____, acceleration _____.

   a) Increases, decreases b) increases, increases c) decreases, decreases

10. The acceleration of an object is always in the _____ direction as the applied force.

    a) same b) opposite

11. Objects with greater mass have _____ acceleration.

    a) more b) less c) no

12. Write the equation used to calculate acceleration.

13. Answer the "Solve It" questions on page 144 about Newton's Second Law.

14. Summarize Newton's Second Law by drawing the three diagrams on page 145 in the text. Make sure to include the equations and make bold the correct variable when you write them.

Guided Reading Chapter 7 Section 1

1. _____ is a quantity that is related to the ability of an object to change or cause changes.

2. Name four changes that can occur in response to a change in energy.

3. A *Joule* is a unit of measurement of energy. What does this really mean?

4. The correct unit for a joule is

   a) 1 kg-m/s b) 1 kg-m^2/s^2 c) 1 g-cm/s d) 1 kg-cm^2/s^2

5. Mechanical energy includes _____ and _____ energies.

6. The type of energy that comes from electric charge is called

   a) chemical b) electrical c) mechanical d) nuclear

7. The type of energy that is carried by electromagnetic waves is called

   a) chemical b) electrical c) mechanical d) radiant

8. The flow of energy from the _____ supports all life on Earth.

9. What does “doing work” mean when it comes to physics?

10. Potential energy depends on _____.

a) height b) mass c) weight d) none of these

11. Copy the equation for calculating potential energy on page 169. Don't forget labels!

12. _____ energy is energy of motion.

13. Kinetic energy depends on _____ and _____.

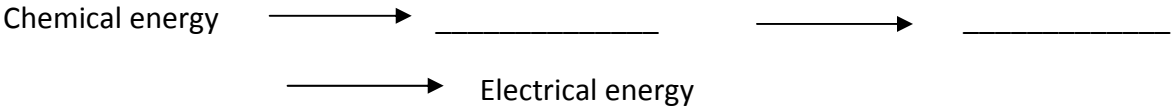
a) height, speed b) mass, speed c) height, mass

14. Copy the equation for calculating kinetic energy on page 170. Don't forget labels!

15. Complete the "Solve It!" problem on page 172.

Guided Reading Chapter 7 Sections 2 and 3

1. Follow the path of the energy that flows through the system on page 173 by completing the drawing.



2. Where does the energy that is used to ride a bicycle up a hill come from and how is it classified?

3. Energy is never _____ or _____.

4. Name some appropriate units for measuring energy.

5. A typical amount of energy used to cut the grass is _____ joules, or _____kWh.

   a) 65,000,000, 18 b) 65,000, 1.8 c) 3,600,000, 1

6. How much energy (in Joules) does it take to climb stairs? What is this value in kWh?

7. What is the "law of conservation of energy?"

8. Describe the transfer of energy that occurs when a ball is thrown up in the air and then caught when it comes down.

9. When applying the law of conservation of energy, the total energy before the change _____ the total energy after the change.

   a) is less than b) is more than c) is equal to

10. Explain why a power plant doesn't make electricity.

11. Why is it incorrect to say "We ran out of gas." when referring to your cars energy source?

12. Humans are considered the best endurance runners because of the body's ideal method of cooling called _____, which allows the body to release heat and therefore cool itself continuously.

Guided Reading Chapter 8 Sections 1 & 2

1. In science, _____ is the transfer of energy received when a force acts over a distance.
2. What is power?

3. Write the equation used to calculate work.

4. Doing work always means _____ energy.
5. Describe the three forces (in terms of work) in the picture of the block on page 190.

6. Work is done when force causes _____.

   a) motion b) time c) inactivity

7. What is the difference between work “input” and work “output?”

8. The work output of a machine is always _____ the work input.

   a) less than or equal to c) greater than or equal to c) equal to

9. The _____ of a machine is equal to the ratio of the work output to its input.

10. A perfect machine has _____ percent efficiency.

a) 25 b) 50 c) 75 d) 100

11. The reason a machine does not have perfect efficiency, is because of _____.

12. Power is the _____ at which work is done.

13. If you do more work in a shorter time, you have more _____.

a) energy b) power c) time

14. List and describe the units for *Power.*

15. Who was the inventor of the steam engine, and what is horsepower?

16. Write the equation for determining the power of something.

Guided Reading Chapter 9 Section 1

1. A _____ is a device with moving parts that works together to accomplish a task.

2. What is the difference between output force and input force?

3. A simple machine is an unpowered mechanical device that accomplishes a task in _____ movement(s).

   a) two b) three c) one

4. Name a few simple machines.

5. A _____ is a long, stiff, structure that rotates on a fixed point called the fulcrum.

   a) gear b) ramp c) lever

6. Complete the following table.

Part of a Bicycle	Simple Machine
Wheels	
	gears
	lever
Pedals	

7. A _____ is a rotating wheel with teeth that receives or transfers forces and motion to other gears or objects.

   a) gear b) ramp c) lever

8. A simple machine does work because it applies _____ over a certain _____.

9. For a perfect machine, _____ force will equal _____ force, and is considered 100% efficient.

10. In reality, _____ force is always _____ than input force, due to friction.

    a) input, less b) output, more c) output, less

Guided Reading Chapter 9 Sections 2 & 3

1. What is mechanical advantage (in words)?

2. Write the equation used to calculate the mechanical advantage of a simple machine.

3. What is the difference between the input arm and the output arm on a lever?

4. Sketch the three classes of levers (as best you can), including labels. Label each as to its mechanical advantage (>, <, or =).

5. With gears, force is multiplied when the _____ gear is smaller and has fewer teeth than the _____ gear.

   a) output, input b) input, output

6. How do you calculate the gear ratio?

7. How is mechanical advantage determined in a pulley system?

8. The mechanical advantage of a ramp is calculated by dividing the length of the ramp by the _____ of the ramp.

9. Examine the picture of the screw on page 214. Explain how to calculate the mechanical advantage of the screw.

10. The me

11. chanical advantage of a wheel and axle is the ratio of what?

12. What kind of levers are your arms and legs?

13. Name and describe two other examples of levers in your body.

Guided Reading Chapter 10 Section 1

1. _____ is anything that has mass and takes up space.

2. Who were the first philosophers to propose that atoms existed? What time period was this?

3. Who were some other scientists who contributed to the idea that atoms existed and what did they believe?

4. A(n) _____ is the smallest bit of matter that is pure and can't be broken down into any other smaller substance by physical or chemical means.

   a) atom b) element c) compound d) particle

5. A(n) _____ is the single smallest particle of an element that retains the chemical identity of that element.

   a) atom b) element c) compound d) particle

6. A compound is a substance that contains _____ or more different elements joined chemically, and has the same composition throughout.

7. What is a molecule?

8. Sketch the picture of an element, compound, and mixture at the bottom of page 230.

9. How is matter classified?

10. What is the difference between a heterogeneous and a homogeneous mixture?

Guided Reading Chapter 10 Section 2

1. Draw Figure 10.6 on page 234.

2. Write the equations to convert from Fahrenheit to Celsius temperature scales.

3. Thermal energy is caused by a(n) _____ in temperature.

   a) increase b) decrease c) change d) none of these

4. What is temperature?

5. A _____ is an instrument that measures the exact temperature.

6. In a liquid thermometer, the expansion of the liquid is related _____ to the increase in temperature.

   a) inversely b) proportionally

7. How do digital thermometers work?

8. Absolute zero is the temperature where molecules are completely _____ with no movement at all.

   a) full b) melted c) intact d) frozen

9. Absolute zero occurs at a temperature of

   a) 273° C b) -273° C c) 273° F d) -273° F

10. What is the “Kelvin” scale of measurement?

11. How do you convert from Celsius to Kelvin?

12. Describe the upper limit of temperature.

Guided Reading Chapter 10 Section 3

1. What are the “phases of matter?”

2. Draw the molecular diagram of a solid. What is a solid?

3. Draw the molecular diagram of a liquid. What is a liquid?

4. Draw the molecular diagram of a gas. What is a gas?

5. What are intermolecular forces?

6. A “competition” always exists between _____ and intermolecular forces.

7. Different substances have different melting points because the intermolecular forces _____.

   a) exist b) vary c) increase d) decrease

8. Why does the graph on page 242 show a flat line during the phase change?

9. When a solid changes directly to a gas it is called _____.

   a) condensation b) evaporation c) sublimation d) freezing

10. At what temperature does matter break apart and change into plasma?

11. Man-made plasma is created when an electrical current is passed through a _____ like _____.

12. Complete the following table to demonstrate your knowledge of the different phases of matter.

Phase	Energy	Characteristics	Temperature	Intermolecular Force
Solid		Holds shape and doesn't flow		weakest
	Molecules move around			
Gas			high	strong
	Atoms break apart		highest	

Guided Reading Chapter 11 Section 1

1. The flow of thermal energy is called _____.

2. Heat flows from _____ energy to _____ energy.

   a) higher, lower b) lower, higher

3. Why does it take more energy to heat a large pot of water compared to a small pot of water?

4. Fill in the missing information in the following table.

Unit	Definition	Equivalent to
Joule		4.186 joules = 1 calorie
	Amount of energy needed to increase the temperature of 1 g of water by 1° Celsius	
Btu		

5. What determines the manner in which an object heats up?

6. What is specific heat?

7. Copy Figure 11.4 on page 254 to compare the specific heat of several types of materials.

8. If the specific heat of an object is _____, it takes longer to heat up compared to an object with a _____ specific heat.

   a) low, higher b) high, lower c) high, high

9. Why is it that silver heats quicker than aluminum? Make sure to include information about the internal structure of each when you answer this question.

10. Write the equation for calculating energy changes from heat on page 256.

Guided Reading Chapter 11 Section 2

1. What are three ways heat transfer may occur?

2. Heat _____ is the transfer of heat through direct contact of particles of matter.

3. Give an example of heat conduction.

4. What is thermal equilibrium?

5. The state of matter that is the best conductor is

   a) liquid b) solid c) gas

6. A _____ is a material that does not hold heat well.

7. List some good thermal insulators.

8. _____ occurs when heat is transferred through matter by way of moving gas or liquid.

9. _____ _____ is the transfer of heat through electromagnetic waves such as light.

10. The amount of thermal radiation depends on the _____ of a material.

    a) mass b) volume c) surface

11. Black surfaces absorb radiation, while _____ surfaces reflect radiation.

12. Why is convection an important part of Earth's balance?

Guided Reading Chapter 12 Section 1

1. Physical properties of matter are those you can

   a) change b) observe c) touch

2. Physical properties of matter include color, texture, _____, _____, and state of matter.

3. _____properties of matter are those observed when one substance is changed into another substance.

4. Give a real life example of a physical and chemical change to matter.

5. Describe density of matter. Does the density of a piece of wood change if I chop the wood in half?

6. Why is a ring made of platinum denser than the same size ring made of silver?

7. Minerals are an example of a(n) _____ solid; having an orderly, repeated pattern.

   a) amorphous b) dense c) crystalline

8. Complete the following table that compares the mechanical properties of solid matter.

Property	Definition	Example
	A measure of how much tensional stress a material can withstand before if breaks.	Wax has a low tensile strength, steel has a high tensile strength
Hardness		Diamond
Elasticity	The ability of a solid to be stretched and return to its original size.	
	The tendency of a material to expand or contract due to temperature changes.	
Ductility		

	The ability of a material to be pounded into thin sheets.	Aluminum foil

Guided Reading Chapter 12 Section 2

1. What is a fluid?

2. Why is liquid silver less dense than solid silver?

3. _____ is the amount of force in a certain area.

4. What is the difference between pounds per square inch (psi) and pascals?

5. Pressure is caused by _____ between molecules.

   a) collisions b) density c) bonds

6. Which of Newton's three laws plays a part in creating pressure on objects, and why?

7. Bernoullis Prinicple relates the three properties height, _____, and _____.

8. What is Pascal's Principle?

9. zWrite the equation for pressure in figure 12.13.

10. Write the equation for force in figure 12.14.

11. Viscosity is the property of fluids that causes _____.

a) pressure b) velocity c) friction

12. As the temperature of a liquid is increased, the viscosity _____.

a) increases b) decreases c) remains the same

Guided Reading Chapter 12 Section 3

1. What is the difference between mass and weight?

2. Define buoyancy.

3. The strength of the buoyant force on an object depends on its _____ and is _____ to the submerged portion of the object.

4. Archimedes Principle states that the buoyant force is _____ to the weight of the fluid displaced by the object.

   a) less than b) equal to c) greater than

5. Sketch the diagram in the center of page 285, demonstrating the buoyant force on a rock. Include both pictures and the free body diagrams, as well.

6. Why do some objects float, and others sink, in terms of buoyancy?

7. What does density have to do with buoyancy?

8. Average density is the _____ divided by the _____.

   a) volume, mass b) buoyancy, volume c) mass, volume

9. How is it that a steel ship can float, when we know that steel is much denser that water?

10. What is the legend associated with Archimedes?

Guided Reading Chapter 13 Section 1

1. Create a pie chart that depicts the contents of Earth's atmosphere.

2. Why does Earth have an atmosphere?

3. An_____ is a layer of gases surrounding a planet or other body in space.

4. The major component of both Venus and Mars' atmospheres is

   a) Nitrogen b) carbon dioxide c) Oxygen

5. What is the key process that has led to Earth retaining its atmospheric composition?

6. Atmospheric pressure is a measurement of the force of air _____ in the atmosphere at a given altitude.

7. A _____ is an instrument that measures the atmospheric pressure.

8. Create a "t" chart that compares a mercury barometer to an aneroid barometer.

9. What is a typical reading on a barometer at sea level?

10. What kind of relationship does altitude have with atmospheric pressure?

Guided Reading Chapter 13 Section 2

1. A rule that states that a fixed quantity of air squeezed into a smaller container has a higher pressure is known as _____ Law.
2. Write the equation for Boyle's Law.

3. The _____ of a gas usually increases with increasing pressure.
   a) mass b) density c) volume

4. Sketch Figure 13.10 on page 303.

5. The _____ of a gas is affected by temperature.
   a) pressure b) mass c) suppression
6. Write the equation for Guy-Lussac's Law.

7. Why is it important to use Kelvin's when solving problems relating pressure and temperature?

8. To determine the temperature of a gas in Kelvin's, add _____ to the _____ temperature.
   a) 100°, Celsius b) 273°, Fahrenheit c) 273°, Celsius

9. A hot air balloon floats because the density of the air outside the balloon is _____ than the density of the air _____ the balloon.

10. Charles' Law states that at a constant pressure and mass, the _____ of a gas _____ when the temperature increases.

11. Write the equation for Charles' Law.

12. Summarize the three laws that make up the gas laws.

Guided Reading Chapter 14 Section 1

1. Atoms are made of three basic components. Name these three particles.

2. One of two forces that hold atoms together is called _____ _____.

3. A particle with a negative charge was discovered by English physicist, _____, and is called the _____.

4. Several scientists, including Ernest Rutherford, performed an experiment that helped improve the model of atom by realizing the inner core of the atom housed most of the mass. This core has a special name, the _____.

   a) electron b) nucleus c) proton

5. The two particles that make up most of the mass of the atom are called the _____ and the _____.

   a) proton, electron b) neutron, electron c) proton, neutron

6. Which particle occupies the space outside the nucleus, in a "cloud?"

7. Complete the following table, comparing forces within atoms.

Electromagnetic force		Compared to our solar system – planets don't fall into the Sun
	Attractive force between the proton and the neutron	Strongest force known to science
Weak force	A force that is significant when atoms break apart.	
	The weakest force	An unsolved mystery in science

8. The number of _____ is different for each element and is known as the _____ number.

9. The electric charge on an atom is neutral because the number of protons is the same as the number of _____, and each of their individual charges cancel out.

10. _____ are atoms of the same element with a different number of neutrons.

11. What does it mean when a nucleus is “stable?”

12. If a nucleus is unstable and breaks apart, it is called _____.

13. What is alpha decay?

14. What is beta decay?

15. What is gamma decay?

Guided Reading Chapter 14 Section 2

1. What is a spectrum?

2. A _____ spreads light into its own individual colors.

   a) meter stick b) microscope c) spectroscope

3. The smallest amount of light energy is called a _____.

   a) light bulb b) photon c) ion

4. _____ _____ were originally proposed by Niels Bohr.

5. Explain Figure 14.12 in your own words.

6. A theory that attempts to explain particles that are very small is called the _____ _____.

7. What is Heisenberg's "uncertainty principle?"

8. Electrons have _____ energy when they are farther away from the nucleus.

   a) more b) less c) the same

9. How many electrons can occupy space in the first, second, third, and fourth energy levels of the electron cloud?

10. Draw electron diagrams for the elements C, N, and O.

Guided Reading Chapter 15 Section 1

1. What is the difference between a physical and a chemical change of matter?

2. Currently, there are _____ elements that have been identified. _____ of these are naturally occurring.

   a) 117, 90 b) 90, 117 c) 50, 93

3. How is the Periodic Table arranged?

4. Rows are known as _____ and columns are called _____.

5. What are the three main categories of matter elements are classified as on the Periodic Table?

6. What is the atomic mass of an element?

7. Copy the square in the center of page 337 that represents the element Lithium. Include all the information presented.

8. What is the name of the group of elements that includes Lithium, Sodium, and Potassium?

9. Why are the noble gases called “inert”?

10. Periods represent the number of _____ _____ needed to hold the appropriate number of electrons.

Guided Reading Chapter 15 Section 2

1. Most elements are _____ at room temperature.

   a) Liquid b) solid c) gas

2. What does it mean for an element to be in a solid state?

3. _____ is the repeating pattern of chemical and physical properties of elements.

4. What type of element makes a good electrical and thermal conductor?

5. _____ make good insulators.

6. What is an alloy?

7. Name some uses of different alloys.

8. What element is important to life and what two forms of this element occur in nature?

9. _____ is the second most abundant element on Earth.

   a) Carbon b) Oxygen c) Silicon

10. _____percent of Earth's surface is made up of Oxygen.

    a) 30 b) 46 c) 62

11. Name two important uses of Nitrogen.

12. Of what important process is Phosphorus a key ingredient?

Guided Reading Chapter 16 Section 1

1. How do chemical bonds occur?

2. A _____ bond occurs when two atoms share electrons to form compounds called molecules.

3. Using the water molecule on page 354, what is the ratio of Nitrogen to Hydrogen in the chemical formula, NH_4?

4. When an atom loses or gains an electron, it is called an _____.

5. An _____ _____is formed when electrons are transferred between atoms.

6. What is chemical reactivity?

7. Why are the noble gases sometimes called the “inert” gases?

8. How many electrons does chlorine have in its highest energy level?

9. What are the highest energy level electrons of an atom called?

10. Valence _____ are important because they are the reason elements bond with each other.

    a) protons b) electrons c) neutrons

11. Draw figure 16.5 on page 357.

12. How many electrons does Oxygen need to fill its outermost energy level?

    a) 4 b) 8 c) 2

13. Draw figure 16.8 on page 359. Make sure to label!

14. When an atom receives an electron(s), it becomes more

    a) negative b) positive c) neutral

15. When ionic bonds form compounds, each atom has a stable octet and is electrically _____.

    a) positive b) negative c) neutral

Guided Reading Chapter 16 Section 2

1. All compounds have an electrical charge of _____.

   a) one b) two c) zero

2. An oxidation number is the quantity that indicates the charge on an atom when it has gained, lost or _____ electrons.

3. Copy figure 16.12 on page 361, showing oxidation numbers of some common elements.

4. Would Beryllium tend to lose two electrons or gain six when forming bonds?

5. What is the most common oxidation number for group three on the Periodic table?

6. Elements near the noble gases tend to form _____ bonds.

   a) ionic b) covalent c) metallic

7. The farther apart elements are on the Periodic Table the more likely they are to form _____ bonds.

   a) ionic b) covalent c) metallic

8. Nonmetals tend to form _____ bonds.

   a) Ionic b) covalent c) metallic

9. Using figure 16.14 on page 364, how many Chlorine atoms are needed to bond with a Copper (II) atom to form a compound?

10. What is a binary compound?

11. How many atoms of each element is in $CaCO_3$?

12. What type of ion is one that contains more than one atom?

13. What is the oxidation number for peroxide?

14. How do you write the name of a binary compound?

15. How do you name a compound with polyatomic ions?

Guided Reading Chapter 16 Section 3

1. How is it that substances can have the same chemical formulas but make different types of matter?

2. An element that is organic, unique and has a branch of chemistry which specializes in it, is called

   a) oxygen b) silicon c) carbon

3. Carbon molecules are found in three shapes, straight chains, rings, and

   a) triangles b) branched chains c) broken chains

4. A polymer is a molecule that is composed of long chains of smaller molecules. One common polymer is _____.

5. Name the four groups in which scientists classify organic molecules.

6. Carbohydrates are composed of carbon, hydrogen, and _____, and make up sugars and starches.

7. Use colored pencils to sketch the glucose molecule in figure 16.20 on page 371.

8. What is the difference between a starch polymer and a cellulose polymer since they are both made of glucose?

9. Lipids are oils, fats, and waxes that are made from carbon, _____, and oxygen.

   a) silicon b) hydrogen c)sulfur

10. Using colored pencils, sketch the lipid molecule in figure 16.21 on page 372.

11. What is the difference between a saturated and an unsaturated fat?

12. Proteins are large molecules made of carbon, oxygen, hydrogen, _____ and sometimes sulfur.

    a) nitrogen b) silicon c)phosphorous

13. Nucleic acids are long, repeating _____ called nucleotides.

14. Nucleic acids are made from _____, oxygen, hydrogen, nitrogen, and phosphorus.

    a) silicon b) sulfur c) carbon

15. A special nucleic acid called _____ contains all the information cells need to make their proteins and the genetic code for organisms.

Guided Reading Chapter 17 Sections 1 and 2

1. Physical and chemical changes involve _____.

2. A chemical reaction is the process of breaking molecular bonds and reforming them into a new _____.

   a) atom b) substance c) element

3. List a few ways that would lead you to believe a chemical reaction had occurred.

4. What are reactants and products in a chemical reaction?

5. Complete the following table:

Symbol	Meaning
(s)	
	Substance is a liquid
(g)	
	Substance is dissolved in a solution

6. The statement, “the total mass of the products must equal the total mass of the reactants” is known as the _____.

7. The _____ mass is the sum of the atomic mass units of all the atoms in a chemical formula.

   a) formula b) isotope c) molar

8. A mole of any substance is equal to

   a) 6.02×10^{22} b) 6.02×10^{-23} c) 6.02×10^{23}

9. Why is it useful to write chemical equations?

10. When balancing a chemical equation you may only change the _____, not the subscript.

11. Can you balance this equation using the rules on page 394–395?

_____Ca + _____O_2 ⟶ _____CaO

12. Can you balance this equation using the rules on page 394-395?

_____Na_2O + _____H_2O ⟶ _____NaOH

Guided Reading Chapter 17 Section 3

1. _____ reactions occur when two or more substances are combined to form a new compound.

2. A special type of addition reaction that creates polymers is called _____.

3. A _____ reaction breaks down compounds into two or more smaller compounds.

   a) addition b) single displacement c) decomposition

4. In decomposition reactions, _____ is required to begin the reaction.

5. What happens in a single displacement reaction?

6. What happens in a double displacement reaction?

7. In one type of combustion reaction, _____ is combined with oxygen to create heat and light.

   a) nitrogen b) carbon c) hydrogen

8. Complete the following table to review the different types of reactions.

Reaction	General Equation	Example
Addtion		$2H_2O + O_2 \longrightarrow 2H_2O$
	$AB \longrightarrow A + B$	
	$AX + B \longrightarrow BX + A$	
Double Displacement		$Pb(NO_3)_2 + 2KI \longrightarrow PbI_2 + 2KNO_3$
	Carbon compound + $O_2 \longrightarrow CO_2 + H_2O$	

Guided Reading Chapter 18 Section 1

1. How is energy involved in chemical reactions?

   a)

   b)

2. Describe and provide an example of an exothermic reaction.

3. Describe and give an example of an endothermic reaction.

4. Activation energy is the energy needed to begin a reaction and _____ the chemical bonds.

   a) combine b) break c) synthesize

5. Sketch and label the diagram in the center of page 411 that shows the energy flow in a chemical reaction.

6. How are photosynthesis and respiration related?

7. What kind of reaction is this (endothermic or exothermic)? How do you know?

8. A _____ reaction is a type of endothermic reaction that takes place when an ionic compound mixes in water to create an ionic solution.

9. Describe the common endothermic reaction discussed on page 413 and referred to in problem 8.

10. What is the purpose of the reaction?

Guided Reading Chapter 18 Section 2

1. A chemical equation is like a _____; for example, it tells us how many molecules of Hydrogen gas to add to Oxygen gas to produce liquid water.
2. A balanced equation shows the _____ of the molecules of the reactants to a certain number of molecules of products.
3. The ratios of molecules are defined by the number of the _____ of a balanced equation.

   a) superscripts b) subscripts c) coefficients

4. What is the difference between the limiting reactant and the excess reactant in a chemical reaction?

5. What is the difference between the predicted and actual yield in a chemical reaction?

6. How do you calculate the percent yield of your chemical reaction?

7. What are some ways to increase the rate at which a reaction will occur?

8. _____ make the reaction occur faster, and _____ make the reaction slow down.
9. A double sided arrow draw in a chemical equation means that the reaction is in a state of _____ _____.
10. Two characteristics of a reaction in chemical equilibrium include a constant _____ and a _____ system.

Guided Reading Chapter 18 Section 3

1. Nuclear reactions are caused when an alteration of the _____ of an atom occurs and the atom becomes unstable.

2. The fuel for a nuclear power plant is

   a) Carbon – 14 b) Polonium c) Uranium – 235

3. Sketch figure 18.13 on page 423 which shows the relationship between the strong nuclear force and subatomic particles.

4. Complete the following table on nuclear decay.

Type of decay	Protons	Neutrons
	-2	
		-1
Gamma Decay		No change

5. What is the difference between the two reactions that can occur during radioactive decay?

6. Sketch the two reactions in problem 5, to demonstrate their differences.

7. All life on Earth depends on energy from the _____.

   a) local power plant b) Sun c) Moon

8. Why isn't fusion a viable way to presently generate energy?

9. Nuclear reactions in power plants are caused by _____ reactions.

10. What is nuclear waste?

11. The NRC is an organization that is responsible for monitoring the use and storage of _____ _____.

    a) nuclear waste b) nuclear energy c)infectious waste

12. A half–life is the length of time it takes for _____ of a radioactive element to decay.

    a) one-fourth b) one-half c) the entire amount

13. Radioactive dating is a way to determine the date of an object by measuring the amount of radioactive material and knowing the _____of the material.

14. Complete the following table that compares nuclear and chemical reactions.

	Chemical Reactions	**Nuclear Reactions**
Part of atom involved		
Reaction started by…	High temperature, pressure, increase in concentration, catalyst introduced	High temperature
Reaction result		Change in protons and neutrons, energy released
Relative amount of energy	Small	
Examples (will vary)	Digesting food, burning fossil fuels	

Guided Reading Chapter 19 Section 1

1. Your body is made up of about _____ percent water.

   a) 40 - 50 b) 60 - 75 c) 85 - 100

2. A water molecule has the shape of a _____ because electrons (with the same charges) repel each other, and this is the arrangement that allows them to be apart from each other.

   a) "C" b) "B" c) "V"

3. Polar molecules, such as water (H_2O) and _____ have negative and positive poles.

4. An example of a nonpolar molecule is _____.

   a) water b) methane c) ammonia

5. Copy the table on page 437 to show melting and boiling points of molecules.

6. The hydrogen and oxygen atoms in a water molecule form a _____ bond, however, bonds between water molecules are called "hydrogen bonds."

7. Frozen water is arranged in an orderly honeycomb shape that has _____ sides.

   a) 6 b) 5 c) 3

8. Why does water have such a high specific heat?

9. What is meant by the phrase "water is the universal solvent?"

10. Describe the process called “dissociation.”

11. What type of bonds is broken in dissociation?

12. Why do sugar molecules stay intact when dissolved by water?

Guided Reading Chapter 19 Section 2

1. Name an example of a solution of a solid, a liquid, and a gas.

2. An example of a colloid would be _____.

3. Muddy water is considered a _____.

   a) suspension b) colloid c) solution

4. A process known as the _____ _____ distinguishes a colloid from a solution.

5. Complete the following data table which compares different properties of solutions, colloids, and suspensions.

	Size of particles	**Settling of particles?**	**Does filtering work?**	**Scatter light?**
Solution		no		
Colloid	1 -1000 nm			
			yes	Yes, if translucent

6. What is the difference between a solvent and a solute?

7. Two important influences of dissolving a solute in a solution are temperature and _____ _____.

8. _____ describes the amount of solute that can be dissolved in a solvent.

   a) Insolubility b) Solubility c) Dissociation

9. _____ solutions contain as much solute that a solvent can dissolve.

   a) Saturated b) Soluble c) Insoluble

10. Which solute, on the Temperature-Solubility Graph (page 447) seems to have the most change due to an increase in temperature?

11. Write the ratio for concentration.

12. In chemistry, it is common to express concentration using _____.

13. What is the mass percent of a solution?

14. What are some units used when referring to very small amounts of a solution?

15. _____ is when the rate of dissolving equals the rate of undissolving.

    a) Supersaturation b) Unsaturation c) Equilibrium

16. How is solubility of a gas affected when an increase in pressure occurs?

17. How is solubility of a gas affected when an increase in temperature occurs?

18. Using the "Solubility Rules" on page 452, predict whether $CaCO_3$ is soluble.

Guided Reading Chapter 19 Section 3

1. List the characteristics of an acid.

2. What is a hydronium ion?

3. List the characteristics of a base.

4. What is a hydroxide ion?

5. Name a strong and a weak acid.

6. Name a strong and a weak base.

7. What makes an acid or base weak or strong?

8. pH is the measure of _____ atoms in a solution.

   a) hydroxide b) hydronium c) sodium

9. How do you determine the concentration of hydronium ions in a solution?

10. The pH scale ranges from 0 – 14, with _____ being neutral on the scale.

    a) 7 b) 14 c) 0

11. Many household cleaners are _____.

    a) acids b) neutral c) bases

12. How is the environment affected by too low or too high pH?

13. In what way do acids affect your body?

14. What are neutralization reactions?

15. Give an example of a neutralization reaction that occurs in your body.

Guided Reading Chapter 20 Section 1

1. Atoms that make up matter are held together by _____ forces.
2. Sketch figure 20.1. Make sure you label!

3. The unit of charge is called the _____.

   a) Joule b) Newton c) Coulomb

4. Atoms with the same number of protons and electrons are neutral, and their charges add up to

   a) zero b) one c) ten

5. If an object has an unequal number of protons and electrons, the object is not neutral, it is _____.
6. _____ electricity is caused by a tiny amount of imbalance of charge.
7. Electrical forces are extremely _____!

   a) weak b) strong c) unknown

8. Sketch figure 20.4 to show the charges associated with a lightning strike.

9. How do storm clouds contribute to create a perfect situation for a lightning strike?

10. The air along a lightning strike can be as hot as

a) 10,000° F b) 20,000° F c) 20,000° C

Guided Reading Chapter 20 Section 2

1. What is electricity?

2. An electric circuit is a complete path through which _____ travels.

3. What are some examples of electric circuits in nature?

4. Electrical drawings are called _____ diagrams.

   a) flow b) electric c) circuit

5. Carefully draw the symbols used in circuit diagrams from figure 20.7. Make sure to label!

6. A _____ is any device that uses electricity in a circuit.

7. Name some resistors.

8. Where does all the energy that is used in your home come from originally?

9. Using the symbols from page 479, draw an opened and a closed circuit.

10. How does a switch work?

Guided Reading Chapter 20 Section 3

1. Electric current flows from

   a) low electrical potential energy to high electrical potential energy

   b) high electrical potential energy to low electrical potential energy

2. The unit for measuring electrical current is the

   a) coulomb b) ohm c) ampere

3. Sketch Figure 20.10, showing direction of flow of current from positive to negative charge.

4. A measure of electrical potential energy is called

   a) voltage b) amperage c) current

5. What does it mean to have a voltage difference?

6. What is a voltage difference of 1 volt?

7. A _____ is a meter that measures many different variables.

   a) voltmeter b) ammeter c) multimeter

8. A battery uses _____ energy to provide a voltage difference between its terminals.

9. Examine the picture of the waterwheel on the bottom of page 483. Answer the question "What parts are analogous to the waterwheel?"

10. A(n) _____ is a meter that measures current in an electrical system.

a) voltmeter b) ammeter c) multimeter

Guided Reading Chapter 20 Section 4

1. _____ is a measure of how strongly a wire or other object resists the flow of current.

2. Sketch Figure 20.16 to express the idea of resistance to flow.

3. Name an object with a high resistance to current flow and an object with low resistance to current flow.

4. What happens to the current flow through a circuit if you add resistors to the arrangement?

5. Resistance is measured in _____.

   a) amperes b) ohms c) volts

6. Voltage and current are _____ related.

   a) inversely b) directly c) not

7. Resistance and current are _____ related.

   a) inversely b) directly c) not

8. Copy the chart at the bottom of page 488 to understand the relationship between the variables current, voltage, and resistance.

9. Why is it that a 60 – watt light bulb will not light when connected to a 1.5 – volt battery?

10. What is the resistance of dry skin, and the amount of current that nerves in your body can feel?

11. What does water do to the resistance of current flow through your body?

12. A _____ carries current easily, while a _____ blocks the flow of current.

    a) conductor, insulator b) insulator, conductor c) insulator, semiconductor

13. Using Figure 20.21, name a good conductor, insulator, and semi-conductor.

14. Fixed resistors are found in a _____ _____ in a computer or other electrical device.

15. A variable resistor is called a _____.

Guided Reading Chapter 21 Sections 1 and 2

1. A series circuit contains only _____ path for the electric current to flow.

   a) one b) two c) three

2. If a break occurs in a series circuit, the flow of the current will stop _____ along the path of the circuit.

3. If you know the voltage and resistance of the circuit, you may use _____ Law to calculate the current in a series circuit.

4. You may _____ the individual resistances in a series circuit to obtain the total resistance.

   a) multiply b) add c) divide

5. What is a voltage drop?

6. If power is lost as a current flows through a resistor (a light bulb, for example), how does the circuit regain the power to continue to light the bulb?

7. Define Kirchhoff's voltage law.

8. Why do we use parallel instead of series circuitry in houses?

9. Define Kirchhoff's current law.

10. Sketch the picture of the parallel circuit with 2 batteries and three light bulbs on page 507. Include labels and arrows.

11. The _____ is the same across each branch of a parallel circuit.

    a) resistance b) voltage c) current

12. The total current in a parallel circuit is the sum of the _____ in each branch.

    a) resistance b) voltage c) current

13. The total resistance in a parallel circuit is _____ than in a series circuit.

14. Copy the chart on page 509 showing the differences between current, resistance, and voltage in a series and parallel circuit.

15. When a large amount of current flows through a branch with little or no resistance is called a _____ _____.

Guided Reading Chapter 21 Section 3

1. Electricity is converted into other forms of _____ such as, heat, sound, or light.
2. A Watt is equal to 1 _____ per second, and is a measurement used by utility companies to calculate how much to charge you for using energy!

   a) volt b) ohm c) joule
3. Write the equation for calculating power, and its variations as shown in Table 21.15.
4. One kilowatt (kW) = _____ watts
5. Utility companies use _____ _____ per month, to determine how much energy is being used.
6. What is the difference between direct current and alternating current?
7. Electricity comes into your house through a _____.
8. How is a wall socket designed?
9. What is a ground fault interrupter (GFI)?
10. Explain why a transformer is needed in converting electricity to a form that is proper for your home.

Guided Reading Chapter 22 Section 1

1. What is the difference between a magnet and magnetic materials?

2. All magnets have opposing poles called the _____ pole and the _____ pole.

3. Magnets will always have _____ poles, even if they are cut in half.

   a) similar b) permanent c) opposing

4. Name several materials that are transparent to magnetic force.

5. Draw a diagram of a magnetic field.

6. Using Figure 22.4 on page 530, describe the relationship between force and distance between two magnets as the magnets are separated.

7. A compass is a magnet with a needle. The _____ pole of a compass points to the _____ pole of a permanent magnet.

8. What is the difference between true north and magnetic north?

9. The source of Earth's magnetic field is believed to be due to the composition of the outer core of Earth, which is made of hot molten metals that slowly circulate about the solid inner core. Huge _____ _____ produce the magnetic field.

10. Why does Earth's magnetic field change locations?

Guided Reading Chapter 22 Section 2

1. Who discovered electromagnets?

2. Electromagnets are magnets that occur when an electric _____ is present.

   a) current b) voltage c) resistance

3. A great advantage of an electromagnet is that you can change the _____ of the magnet.

4. How does a toaster work?

5. What are two other useful ways electromagnets are used in everyday life?

6. When making your own electromagnet, what are two ways to increase the current?

7. What other property (destructive) is increased when you increase the current of an electromagnet?

8. Name the three factors that affect the strength of an electromagnet.

9. A permanent magnet is created when tiny atomic “magnets” are all lined up in _____direction, forming a stronger force than if they were free to float around in any direction.

   a) a different b) a N-N c) a N-S

10. In nonmagnetic materials, the atoms are _____free to move around and do _____ line up to create magnetic fields.

Guided Reading Chapter 22 Section 3

1. Describe how an electromagnet can make a motor run.

2. A disk that spins due to the force of an electromagnet is called a

   a) frisbee b) horseshoe magnet c) rotor

3. What are the three main parts of an electric motor?

4. A commutator is a device that _____ the direction of the current in the electromagnet.

   a) reverses b) creates c) repels

5. Motors that run on _____ power are easier to use because they automatically reverse their direction.

6. Draw Figure 22.20 on page 542, to demonstrate your knowledge of the design of an electric motor. Make sure to label the diagrams.

7. An electric _____ is a device that converts mechanical energy into electrical energy and produces the exact opposite action of an electrical motor.

8. When a moving magnet causes a current to be “induced” within a coil of wire, we call it _____ _____.

9. Ultimately, the source of electricity that provides energy to run the generator is a power plant near your home that usually contains a _____ that turns magnets inside loops of wire generating electricity.

10. Name several forms of energy that are used to create electricity for our homes.

Guided Reading Chapter 23 Section 1

1. _____ (*Linear, Harmonic*) motion goes from one place to another without repeating, while _____ (*Linear, Harmonic*) motion repeats over and over.

2. A _____ is one unit of repeating motion.

3. A _____ is a device that swings back and forth. Use the diagram at the bottom of the page to describe the cycle of a pendulum.

   The cycle starts with

   (1)

   Next, the cycle continues with

   (2)

   And

   (3)

   The cycle ends when the pendulum moves

   (4)

4. An *oscillator* is a physical system that has repeating cycles or harmonic motion. Place a check mark next to the following systems that are examples of oscillators.

   _____ A child on a swing

   _____ A wagon rolling down a hill

   _____ A vibrating guitar string

5. Systems that oscillate move back and forth around a center or _____.

6. A force that always pulls a system back toward equilibrium is referred to as _____ _____.

7. Using Figure 23.2, explain how restoring force keeps a pendulum swinging.

8. Match the following terms with the correct definition.

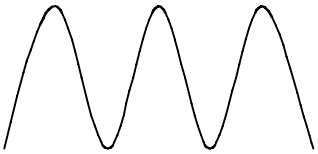
_____ Hertz	A. How often something repeats, expressed in hertz.
_____ Frequency	B. The time it takes for each complete cycle.
_____ Period	C. The unit of frequency. One hertz is one cycle per second.

9. Write the equations for period and frequency be sure to include what each variable stands for and the unit used for each.

10. Period and frequency both yield the same information, so how do you choose

which formula to use?

11. Use the picture of the wave below and label the highest and lowest points of the wave. Using this information, and Figures 23.5 & 23.6, define the amplitude of the wave.



12. _____ slows a pendulum down, just as it slows all motion.
_____ describes the gradual loss of amplitude.

13. Use Figure 23.7 to compare and contrast a linear motion graph to a harmonic motion graph.

14. Use the graphical on the center of the page to answer the following questions. The period of the motion displayed is equal to _____ seconds. The positive amplitude is _____ centimeters and the negative amplitude is _____ centimeters.

15. An oscillator will have the same period and frequency each time you set it moving, and are called _____ _____, the frequency at which a system naturally oscillates.

16. What two things can change an oscillator's natural resonance? What cannot change an oscillator's natural resonance?

17. Define periodic force and resonance.

Guided Reading Chapter 23 Section 2

1. A _____ is an oscillation that travels from place to place with properties of frequency, amplitude, and wavelength.

2. Use figure 23.11 to name several types of waves.

3. Waves carry _____ such as sound, pictures, or even numbers.

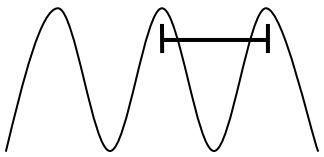
4. What is frequency?

5. What is unit is used to measure frequency?

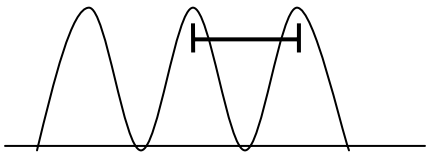
   a) seconds b) centimeters c) hertz

6. A _____ is a high point on a wave, a _____ is a low point on a wave.

7. Label:



8. Label:



9. The speed of light travels at _____ miles/sec!

   a) 100,000 b) 300,000 c) 186,000

10. How do you calculate the speed of a wave?

Guided Reading Chapter 23 Section 3

1. A _____ is the leading edge of a wave, usually considered to be the crest of the wave.
2. Draw Figure 23.15 to show the difference between a plane wave and a circular wave. Make sure to draw the direction the wave is traveling.

3. Draw the four wave interactions. Make sure to include all labels and direction of travel.

4. Match the word with the correct definition:

_____	Reflection	A. amplitude of a wave gets smaller and smaller as it passes through a material
_____	Refraction	B. happens when a wave bends across a boundary
_____	Absorption	C. the process of a wave bending around a corner
_____	Diffraction	D. when a wave bounces off an object

5. What is the difference between transverse and longitudinal waves?

6. Draw a transverse wave pulse and a longitudinal wave pulse. Make sure to include arrows to show movement of the wave direction and movement of the oscillations.

7. Constructive interference occurs when two waves, interact and make the resultant wave _____.

   a) smaller b) larger c) move

8. Destructive interference occurs when two waves interact and make the resultant wave _____.

   a) smaller b) larger c) move

Guided Reading Chapter 24 Section 1

1. The perception of high or low sounds is called _____.

2. The _____ is a measurement unit for intensity of sound.

   a) meter b) decibel c) degree

3. Complete the chart showing decibels and amplitude.

Decibel	Amplitude
0	1
20	
	100
60	
	10000
120	1,000,000

4. On the decibel scale, a "quiet whisper 1 meter away" is about _____ decibels, where a "jackhammer 3 meters away" is _____ decibels.

   a) 20, 100 b) 10, 100 c) 10-15, 90

5. _____ is the science and technology of sound.

6. The speed of sound is _____ miles/hr, which is slower than the speed of light at _____ miles/sec.

7. What does it mean when we say something is "supersonic?"

8. What is a sonic boom?

9. How fast does sound travel through different materials?

10. The Doppler effect is a shift in the _____ of an oscillation caused by the motion of the source of the oscillation, and occurs at speeds below the speed of sound.

    a) amplitude b) frequency c) speed

11. Describe how observers “A” and “C” hear the moving sound in the picture in the middle of page 581.

12. Draw a “flow chart” that shows how the process of recording sound occurs.

Guided Reading Chapter 24 Section 2

1. Sound moves through a _____ or _____material when the atoms within the material push against each other, transferring the energy from one particle to the next.

2. Sketch the picture of the atoms in a sound wave, showing areas of higher and lower pressure.

3. What frequency range can humans hear?

4. How do temperature and pressure effect sound waves?

5. Why do you sound funny after you inhale helium gas?

6. Look at Figure 24.10 and complete this phrase, “As wavelength increases, frequency _____.”

7. A long tube creates a _____ wavelength and therefore a lower sound.

   a) short b) medium c) long

8. A _____ wave is one that is confined in a space.

9. Harmonics are made when a standing wave is vibrated. The lowest natural frequency is called the _____.

10. Label the nodes and the antinodes in the picture.

11.

12. Label a full wavelength on the picture.

13. Multiple echoes in a concert hall create _____, and can make loud or softer sounds depending on their interference of each other.

Guided Reading Chapter 24 Section 3

1. The nerves in your ear hear more than _____ frequencies!

   a) 15,000 b) 20,000 c) 1500

2. How does your brain differentiate between the vocalist and the music when listening to live music with a singer?

3. Complex sound is made up of many _____.

4. When you combine and graph frequency, amplitude and time, the result is called a

   a) velocity graph b) sonogram c) frequency spectrum

5. Use the word bank to complete the paragraph explaining how we hear. You might have to do a bit of research.

channel	anvil	hairs
stirrup	spiral channel	cochlea (2)
eardrum	hammer	nerves
ear canal	lower	

   We hear when sound enters the _____ _____. The sound then moves to the _____ and causes it to vibrate. Three delicate bones, the _____, _____, and _____ transfer the vibrations to the _____. The fluid in the _____ _____ of the _____ vibrates and creates waves. _____ along the channel respond and move tiny _____. _____frequencies are heard at the wider opening of the channel, and higher frequencies are heard in the narrower part of the _____.

6. What is rhythm?

7. The musical scale is a pattern of frequencies of sound. Each frequency is called a _____.

   a) scale b) note c) octave

8. Draw two waves that are “in-phase” and two waves that are “out-of-phase.”

9. Describe the difference between consonance and dissonance.

10. How tightly are the strings on a guitar tightened (individually and collectively) to create the range of frequencies played?

11. Why is it that when a guitar and a piano play the same note they sound different?

12. What tool can play a pure note and is used to tune other instruments?

Guided Reading Chapter 25 Section 1

1. Light is a form of _____, just like heat and sound.
2. Name at least three useful properties of light.

3. Remember back to Chapter 14 when you learned about atoms. Explain how atoms are responsible for creating light.

4. Why are fluorescent bulbs more efficient than incandescent bulbs?

5. White light is an _____ mixture of all the colors.

   a) observable b) unequal c) equal

6. A _____ flame has a higher energy than a _____ flame.

   a) red, blue b) green, blue c) blue, red

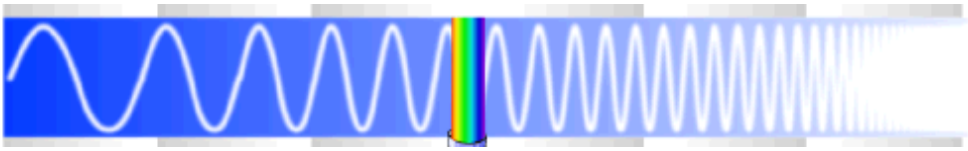
7. How do you calculate the speed of light?

8. Copy the objects, along with their relative sizes and how they appear to our eyes, in Figure 25.5.

9. Oscillations of electricity and magnetism create _____ waves, which include visible light waves.

10. Label the waves on the electromagnetic spectrum.

The electromagnetic spectrum



11. Why is it not possible to see the other waves on the electromagnetic spectrum?

12. As wavelength decreases, frequency and energy _____;

a) increase b) decreases c) remain the same

Guided Reading Chapter 25 Section 2

1. Light sensitive cells that lie on the surface of the retina called, _____ receive light and release a chemical that is sent to the brain so the brain can translate the light into color.

2. Describe the difference between a cone cell and a rod cell.

3. The three colors that cone cells detect are _____, _____, and _____.

4. Using colored pencils, draw the additive color diagram to demonstrate how cone cells can determine different colors based on the strength of the primary color signal.

5. A television has thousands of _____ each having a red, green, and blue color dot that contribute to making all the colors you see on the screen.

   a) pixies b) cells c) pixels

6. We see objects as a certain color because the objects _____ that color and _____ the other colors.

   a) refract, absorb b) reflect, absorb c) reflect, refract

7. Use colored pencils to draw the color diagram that represents the subtractive color process.

8. Compare, by naming similarities and differences, the subtractive color diagram to the additive color diagram.

9. Explain *how* to create the color red when using the CMYK color model. Make sure to include *why* the process works as it does.

10. Explain Figure 25.14 which shows absorption of light by plants.

Guided Reading Chapter 25 Section 3

1. What is the difference between a magnet and magnetic materials?

2. All magnets have opposing poles called the _____ pole and the _____ pole.

3. Magnets will always have _____ poles, even if they are cut in half.

   a) similar b) permanent c) opposing

4. What is the difference between specular reflection and diffuse reflection?

5. The index of refraction is the value given to materials based on their ability to _____ light.

   a) bend b) reflect c) absorb

6. Draw the diagram on page 623 of the light ray entering and exiting the glass. Don't forget to label all parts of the diagram!

7. Which way does light bend as it enters different materials?

8. With a converging lens, light is bent _____ the axis, and with a diverging lens, light is bent _____from the axis.

9. What is the difference between the focal point and the focal length when discussing lenses?