Matter Part 1 Focus Notes

1. Using the information in your science notebook (lab journal), study the different scientific tools and what they measure or help you observe.

2. Volume is measured using the metric units of milliliters and liters.

3. Mass is measured using the metric units of grams and kilograms.

4. Length is measured using the metric units of millimeters, centimeters, meters, and kilometers.

5. Temperature is measured in degrees Celsius in science.

6. Conductivity is how well heat and electricity moves through a material. Metals are very good conductors. Wood and rubber are not good conductors (insulators).

7. Magnetism is an invisible force that attracts certain objects like iron and steel, and repels other objects like brass and aluminum.

8. Density is how tightly packed the particles are in a substance. For example, a brick has a higher density than a small bag of feathers.

9. Buoyancy (sinking or floating) is determined by the density of an object.

10. A property of a material that refers to how well it will dissolve in another material is called solubility.

11. Color, shape, texture, hardness, and luster are properties of matter that can be observed using the senses.

12. Length, mass, temperature, and weight are properties of matter that can be measured using science tools.
13. An atom is the smallest part of an element that has the properties of the element.

14. An element is made of only one kind of atom.

15. A molecule is the smallest particle of a compound that still has the same properties of that compound. Molecules can be made of many atoms.

16. A compound is a substance made of two or more elements.

17. When the same kinds of atoms in a molecule combine in different amounts, different molecules are formed.

18. Changing the kinds of atoms in a molecule also results in a different molecule.
Matter Part 2 Focus Notes

1. An atom is the smallest part of an element that still has the properties of the element.

2. An element is made of only one kind of atom.

3. A molecule is the smallest particle of a compound that still has the same properties of that compound. Molecules can be made of many atoms.

4. A compound is matter that is made up of two or more elements.

5. When the same kinds of atoms in a molecule combine in different amounts, different molecules are formed.

6. Changing the kinds of atoms in a molecule also results in a different molecule.

7. Mass is the amount of matter in an object. Mass is measured in grams and kilograms using a balance or scale.

8. Volume is the amount of space an object takes up. Volume may be measured in milliliters, liters, and cubic centimeters.

9. Solids and liquids have a definite volume. Gas does not have a definite volume.

10. The same matter in different amounts will have a different mass and volume. ex. Five science books have more mass and volume than two science books.

11. Length is measured using the metric units of millimeters, centimeters, meters, and kilometers.

12. Temperature measures how fast the particles of matter are moving. The higher the temperature, the faster the particles of matter are moving. It is measured in degrees Celsius or degrees Fahrenheit.

13. Adding heat to matter causes its particles to move faster.
14. Texture is a physical property of matter. It is how an object feels when you touch it.

15. Conductivity is how well heat and electricity moves through a material. Metals are very good conductors. Wood and rubber are not good conductors (insulators).

16. A property of a material that refers to how well it will dissolve in another material is called solubility.

17. Color, shape, texture, hardness, and luster are properties of matter that can be observed using the senses.

18. Length, mass, temperature, and weight are properties of matter that can be measured using science tools.

19. The particles of a solid vibrate and do not slide past each other.

20. The particles of liquid can move past each other.

21. The particles of a gas move very fast and spread out evenly to fill available space.

22. The models below show that different elements join together to form different compounds.

23. Unknown substances may be identified by their properties. Be able to use a chart of given information to identify, compare, and contrast different types of matter.
Changes in Matter Part 1 Focus Notes

1. Mass is the amount of matter in an object. Mass is measured in grams and kilograms using a balance or scale.

2. Volume is the amount of space an object takes up. Volume may be measured in milliliters, liters, and cubic centimeters.

3. The same matter in different amounts will have a different mass and volume. ex. Five science books have more mass and volume than two science books.

4. Length is measured using the metric units of millimeters, centimeters, meters, and kilometers.

5. Temperature measures how fast the particles of matter are moving. The higher the temperature, the faster the particles of matter are moving. It is measured in degrees Celsius or degrees Fahrenheit.

6. Adding heat to matter causes its particles to move faster.

7. Some properties of matter that can be observed using the senses are hardness, color, texture and odor.

8. Evaporation is when liquids change into gases. Some examples are when water boils and changes into water vapor or puddles disappear.

9. A property of a material that refers to how well it will dissolve in another material is called solubility.

10. A solution is a liquid mixture with one substance spread out so evenly in another substance so that you cannot tell the two substances apart. The solute is the substance that is dissolved and the solvent is the liquid that dissolves it.

11. Physical changes in matter do not result in a new substance. Before and after the change the same substance remains. Some physical changes are changes in shape, changes in temperature, and changes in state of matter.

12. Chemical changes result in new substances. Some evidence of chemical changes are changes in color, odor, or formation of bubbles.
13. Solids and liquids have a definite volume. Solids have a definite shape. Liquids take the shape of their containers. Gases do not have a definite volume or shape.

14. The properties of matter that can help identify the state of matter of a substance are shape and volume.

15. Water in its three states are in containers with lids. When the lids are removed, the solid remains in the container. The liquid remains in the container. The gas flows out of the container.

16. The particles of a solid vibrate and do not slide past each other. The particles of liquid can move past each other. The particles of a gas move very fast and spread out evenly to fill available space.

17. The models below show that two or more elements join together to form different compounds. Models are used to show the particles that are too small to be seen without a microscope.

18. Elements are made of only one type of atom.

19. The scientific law that in any physical or chemical change, the total mass of the matter does not change is called the conservation of matter.

20. Density is how close together the molecules of a substance are or how much mass a substance has in a given space.
Changes in Matter Part 2 Focus Notes

1. When items/substances are combined to make a mixture/solution, the mass of the mixture is equal to the sum of the objects.
2. A conductive substance is a material that can transfer temperature change or electricity.
3. Not all metals are magnetic – iron and steel are both magnetic metals, while copper and brass are not magnetic metals.
4. Things that will speed up the rate of solubility are: heat, stirring the solution, and grinding to decrease particle size. The opposite of these things will slow down solubility.
5. Upon conducting the experiment shown in the illustration below, a scientist would conclude that the properties of the substances were unchanged, as the substances could be separated from the solution into their original forms.

![Experiment Illustration](image)

6. Mass is the amount of matter in an object. Mass is measured in grams and kilograms using a balance or scale.
7. Concentration of a solution depends upon the amount of solute dissolved into the solvent. To make a solution more concentrated, you must either increase the solute or decrease the solvent. Adding more water makes the concentration more diluted (less concentrated).
8. Parts of compounds do not keep their properties – when they combine, they form a new substance.
9. The same matter in different amounts will have a different mass and volume. ex. Five science books have more mass and volume than two science books.
10. Temperature measures how fast the particles of matter are moving. The higher the temperature, the faster the particles of matter are moving. Decreasing temperatures
cause the particles to move slower, and to draw closer to each other. Temperature is measured in degrees Celsius or degrees Fahrenheit.

11. Evaporation is when liquids change into gases. Some examples are when water boils and changes into water vapor, or when puddles disappear.

12. A property of a material that refers to how well it will dissolve in another material is called solubility.

13. The components of a mixture will always keep their properties.

14. A solution is a liquid mixture with one substance spread out so evenly in another substance so that you cannot tell the two substances apart. The solute is the substance that is dissolved, and the solvent is the liquid that dissolves it.

15. Physical changes in matter do not result in a new substance. Before and after the change the same substance remains. Some physical changes are changes in shape, changes in temperature, and changes in state of matter.

16. Chemical changes result in new substances. Some evidence of chemical changes are changes in color, odor, or formation of bubbles.

17. Solids and liquids have a definite volume. Solids have a definite shape. Liquids take the shape of their containers. Gases do not have a definite volume or shape.

18. The particles of a solid vibrate and do not slide past each other. The particles of liquid can move past each other. The particles of a gas move very fast and spread out evenly to fill available space. This model shows how the particles are moving, as they are too small to be seen with the naked eye.

19. The scientific law that in any physical or chemical change, the total mass of the matter does not change is called the conservation of matter.

20. Density is how close together the molecules of a substance are or how much mass a substance has in a given space. If dropped in liquid, higher densities will drop, and lower densities will rise. Salt increases the density of water.
Forces and Motion Part 1 Focus Notes

**Study your vocabulary words and Newton’s laws! This is necessary in order to be able to answer application based questions!**

force - a push or pull that acts on an object; measured in units called Newtons (N).

contact force - a force that requires two pieces of matter to touch (ex: when you push or pull something).

non-contact force – a force that acts at a distance (ex: gravity, magnetism, electricity – these also push and pull, but without direct contact).

friction – the force that results when two materials rub against each other or when their contact prevents sliding. Certain textures (ex: carpet) exert more friction than other textures (ex: tile floor).

gravity – the force that tries to pull two objects together. Objects that have more mass have a stronger gravitational pull. Gravity’s pull is stronger if objects are closer together, and weaker if objects are farther apart.

support - to back up.

acceleration – the rate at which the speed or the direction of motion changes over time (speeding up, slowing down, or changing direction).

inertia – the tendency of an object to resist any change in motion; objects with more mass have more inertia than objects with less mass.

balanced forces – forces that cancel each other out when acting together on a single object (no change in motion).

unbalanced forces – forces that do not cancel each other out when acting together on a single object (a change in motion).
speed – the distance traveled in an amount of time

**potential energy** – the stored energy an object has because of its position or state. A bicycle on top of a hill, a book held over your head, and a stretched spring all have potential energy.

**kinetic energy** – energy of motion.

motion – a change in position over time.

inclined plane/ slope – a flat surface tilted at an angle, with one end higher than the other.

velocity – how fast something is moving in a certain direction.

**Newton’s First Law:** An object in motion will stay in motion, and an object at rest will stay at rest unless acted upon by an unbalanced force. (law of inertia)

**Newton’s Second Law:** Acceleration, mass, and force are related. The force action on an object can cause the object to speed up, slow down, or change direction. Objects with more mass require more force to accelerate. Objects with less mass require less force to accelerate. If objects are acted upon by the same force, the object that has the least mass will move farther and faster than the object with more mass. (force = mass x acceleration)

**Newton’s Third Law:** When one object exerts a force on a second object, the second object exerts a force on the first. These forces are equal in strength and opposite in direction. (law of action and reaction)
Our sun and solar system are part of the Milky Way Galaxy. A galaxy is a group of between 1 million and 1 trillion stars.

The Sun is a medium-sized yellow star. It is the only star and the center of our solar system. It makes up 99% of the mass of our solar system. The Sun is the largest object in our solar system.

The Sun’s apparent magnitude (size and brightness) is due to its closeness to Earth.

Apparent means the way something looks. A star’s actual brightness is determined by its temperature.

The Sun’s gravitational force keeps the planets, their moons, and other space objects in fixed orbits. Planets orbit around the Sun, and moons orbit around planets. Planets exert a gravitational force on their moons to keep them in orbit.

The Sun has 3 atmospheric layers – the photosphere, the chromosphere, and the corona. The photosphere is the layer that is most visible.

There are 8 planets that orbit the Sun. Orbit means to move around another object in a curved path. A planet’s orbit around the Sun determines the length of its year.

There are 4 inner planets that are closest to the sun and are rocky. They are Mercury, Venus, Earth, and Mars. All the inner planets have atmospheres.

Mercury is the smallest planet and is closest to the sun. It has no moons.

Venus is the hottest planet and is covered with volcanoes and canyons. It has no moons.

Earth is the third planet from the Sun and is the only planet known to support life. It has one moon.

Mars is known as the “Red Planet” because of its surface color. It has 2 moons.

There are 4 outer planets that are larger in size than the inner planets and are the farthest away from the Sun. They are Jupiter, Saturn, Uranus, and Neptune.

They are separated from the inner planets by the asteroid belt.
• The outer planets are called “Gas Giants” because they are made up of gases such as hydrogen, helium, and methane.
• Jupiter is the fifth planet. It is the largest planet. It has a giant storm like a hurricane known as the Great Red Spot. It also has a large number of moons.
• Saturn is the sixth planet and is known for its many rings. These rings are made of ice, dust, and rocks. It also has many moons.
• Uranus is the seventh planet. It appears to rotate on its side. It too has many moons.
• Neptune is the eighth planet. It is the coldest and most distant from the sun.
• Uranus and Neptune appear to be a bluish color due to the methane gas in their atmospheres.
• Beyond the planets is outer space.
• Asteroids are chunks of rock that orbit the sun.
• Comets are chunks of ice, rock, and dust that have stretched out orbits around the sun. As they heat up, gas and dust are expelled and trail behind them.
• Telescopes are used to view objects in space. Satellites also help gather information about space.
• A revolution is one complete trip of a planet around the Sun. One revolution of Earth is about one year (365 1/4 days). Earth’s revolution and tilt on its axis are the reasons for the seasons.
• Rotation is the spinning of a planet or moon on its axis. One rotation of Earth is about one day (24 hours). Rotation is the reason for day and night.
• The moon reflects light from the sun. The shape appears to change, but the moon does not actually change shape. Half the moon always faces the Sun. The part that we see changes with its revolution. The changing pattern of the moon is known as the phases of the moon.
• A constellation is a group of stars that ancient people thought formed a picture in the night sky. Different constellations seem to appear during different times of the year due to Earth’s revolution.
1. Gravity always pulls objects toward Earth’s center. It is a constant force.
2. Everything that has mass exerts a gravitational force on other objects.
3. Gravity exists in space. That is why stars stay in their galaxies and planets in their orbits.
4. Rockets can leave Earth because the engines exert more force than the pull of gravity. They fall back to Earth when the force of gravity becomes stronger than the force of the engine.
5. Night and day are caused by the rotation of Earth on its axis. As the earth rotates, different areas face the sun. The side facing the sun experiences day, and the side away from the sun experiences night.
6. The length of a day depends on Earth’s rotation on its axis.
7. Earth rotates on its axis once every 24 hours.
8. During the day the sun appears to move from east to west because Earth rotates from west to east.
9. As Earth rotates on its axis, it also revolves around the sun. This orbit is completed in 365 ¼ days or one year.
10. As Earth revolves around the sun, places on Earth receive different amounts of sunlight.
11. Earth’s revolution around the sun affects the amount of daylight a location gets. This also affects the times of sunrise and sunset. A location gets more sunlight in the summer than it does in the winter depending on how close it is to the North and South Poles.
12. The tilt of Earth’s axis and Earth’s revolution around the sun cause Earth’s seasons. Earth’s tilt is always the same direction at the same angle affecting the amount of direct sunlight a location receives. The view of the models may be from different perspectives making the tilt appear to change.
13. Earth’s tilt on its axis causes the Northern Hemisphere to be closer or farther from the sun at different points in Earth’s revolution. The result is that seasons change in a predictable pattern.

14. The Northern Hemisphere and Southern Hemisphere have opposite seasons.

15. The moon revolves around Earth and also rotates. One complete rotation is the about the same as one complete revolution (about 29 days).

16. The moon does not have its own light but reflects the sun’s light. The moon appears to change shape, but actually does not. The different appearances or phases of the moon are due to its revolution around Earth. We see different parts of the lit portion during the moon’s revolution creating a pattern.

17. The Moon’s gravitational pull on Earth affects the surface levels of the ocean known as tides.

18. A constellation is a group of stars that form a picture or shape in the sky. These constellations appear to move but do not actually move. Their appearance in different parts of the sky or lack of appearance during different seasons is due to Earth’s revolution.

19. A shadow is a dark area or shape that is made when an object blocks a source of light. As the sun appears to move across the sky in an arc, sunlight shines on objects at different angles. As a result, shadows change their size and shape during the day. The lower the sun is in the sky, the longer the shadow. As the sun rises in the sky, shadows get shorter.
Our Earth and Earth's Resources Focus Notes

• **Renewable resources** are made by nature as quickly as people use them. Examples include plants and animals, solar energy, wind energy, and the air we breathe.

• **Nonrenewable natural resources** are not made fast enough to replace what is used. Examples include coal, petroleum, aluminum, and natural gas.

• Below is an estimated breakdown of the world’s **freshwater** resources:
  - Ice and snow: 69%
  - Fresh groundwater: 30%
  - Permafrost, lakes, soil moisture, wetlands, and lakes: 1%

• **Geothermal energy** is a renewable resource that can be extracted (removed) from the earth by pumping the heat directly to building or used to turn turbines that produce electricity. Though this energy source does not cause pollution, drilling through miles of rock can be difficult and expensive.

• **Solar energy** for homes can be obtained using **solar panels**. To collect the maximum amount of energy, these panels should be placed at a tilt on the rooftops of houses without objects blocking sunlight from reaching the panels.

• **Hydroelectric energy (hydroelectricity)** is a nonfuel source of energy that comes from the movement of water. Water dams are used to obtain hydroelectric energy and can impact the environment in both positive and negative ways. **Positive**: energy is generated without the pollution of burning fossil fuels. **Negative**: dams block (control) the natural flow of water and alter (change) the environment for living things.

• Increasing the use of renewable energy sources would help extend the time before fossil fuels run out.

• Farmland and forests are renewable natural resources that provide us with food (farmland) and wood (forests).

• Examples of humans using natural resources **efficiently** (well):
  - unplugging electronic devices and appliances when not in use
  - turning off water when brushing teeth
  - recycling plastic bottles and newspapers
  - carpooling to activities, such as baseball tournaments
Examples of humans wastefully using natural resources:
- leaving a phone charger plugged in when not in use
- throwing away cans and bottles in the trash (not recycling bin)
- leaving on air conditioner when on vacation
- keeping lights on when leaving room

Fuel energy sources (fossil fuels): coal, natural gas, petroleum
The burning of fossil fuels releases toxins into the air, increasing air pollution, and decreases the availability of fossil fuels.

Nonfuel energy sources: geothermal, hydroelectric, solar
Natural ecosystems, such as ponds, can be harmed by the human impact of using fertilizers to improve crop growth. This is because the fertilizer can increase plant growth and throw off the ecosystem’s balance.

Conservation - the preservation, management, and care of natural and cultural resources.
Activities such as using solar water heaters in homes, using solar panels in schools, increasing energy generation by wind, and forming oil from natural resources like kelp (seaweed) could reduce the dependence of nonrenewable resources like fossil fuels.

Industrial wastewater cannot be recycled for drinking water. This would not be considered a safe way to conserve freshwater resources.
As the population of an area increases, its need for water also increases.

**Study Earth’s Systems Chart (geosphere, biosphere, hydrosphere, atmosphere) in addition to these notes.**
<table>
<thead>
<tr>
<th><strong>Geosphere</strong></th>
<th><strong>Biosphere</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth’s crust, mantle, and core</td>
<td>all living things, including humans</td>
</tr>
<tr>
<td>rocks, soil, minerals, and sediment</td>
<td>only Earth has one</td>
</tr>
<tr>
<td>important part – lithosphere – the outer rocky part of Earth - the crust and rigid part of mantle</td>
<td>living things on land, in air, and in sea</td>
</tr>
<tr>
<td>80% of Earth</td>
<td>interacts with other systems</td>
</tr>
<tr>
<td>only non-living things</td>
<td>about 3.5 billion years old</td>
</tr>
<tr>
<td>CEO- means “relating to Earth”</td>
<td>biomes – regions of the world with similar climate, plants, and animals</td>
</tr>
<tr>
<td></td>
<td>BIO- means “life”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Hydrosphere</strong></th>
<th><strong>Atmosphere</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>all the water, above and below Earth’s surface</td>
<td>layer of gases that surround the planet</td>
</tr>
<tr>
<td>solid, liquid, and gaseous water</td>
<td>nitrogen, oxygen, carbon dioxide, argon, water vapor and other gases</td>
</tr>
<tr>
<td>70% of Earth</td>
<td>constantly interacts with the hydrosphere (water cycle)</td>
</tr>
<tr>
<td>most is saltwater (90%)</td>
<td>traps heat from the sun to keep Earth warm</td>
</tr>
<tr>
<td>freshwater includes groundwater</td>
<td>5 layers – troposphere – air we breathe</td>
</tr>
<tr>
<td></td>
<td>stratosphere – gases protect us from sun’s harmful rays</td>
</tr>
<tr>
<td></td>
<td>mesosphere – coldest layer</td>
</tr>
<tr>
<td></td>
<td>thermosphere – satellites</td>
</tr>
<tr>
<td></td>
<td>exosphere – top layer</td>
</tr>
<tr>
<td></td>
<td>ATMOS – means “air”</td>
</tr>
</tbody>
</table>

|                       |                       |
|                       |                       |
Conservation Focus Study Notes

• When planning to build a sanitary (clean) land fill, the most important environmental consideration is the location of the groundwater in the area.
• Conservation can be simply described as using Earth’s resources wisely.
• National Wildlife Reserves are created so that land can be preserved for plant and animal habitat.
• Population growth is a major concern to ecosystems because the development of land for settlement reduces the natural habitat in an ecosystem. In order to develop land for settlement, trees are often clearcut, which can result in an increase of soil erosion (movement) and decrease the population of species that live in and around these trees. The clearcutting of trees in rainforests negatively impacts these ecosystems.
• When an area is clear-cut for development, such as to build a playground, house, or business, soil erosion can be an issue. To minimize erosion, shrubs and trees can be planted around the development.
• Carpooling, driving electric cars, and using public transportation help to decrease air pollution.
• While adding nutrients to the soil can have a positive impact for farming, these nutrients can end up in water ways, an ecosystem in which they are harmful rather than helpful.
• The building of oil platforms in order to obtain (get) oil from underground, increases the likelihood of an oil spill in our oceans and wetlands.
• Planting tree saplings (young trees) has a positive impact on the environment by improving the air quality; this happens because the trees absorb carbon dioxide and release needed oxygen into the air. Planting trees also reduces the erosion of soil.
• Recycled paper is made from paper that was one used for another purpose. If plastic and paper products are thrown away rather than recycled, conservation has not taken place. Failing to recycle and conserve our natural resources can cause some renewable resources to become nonrenewable.
• Compost piles contain items such as fruit, vegetables, and leaves.
and bones cannot be composted.

- Pollution, such as dumping waste in a lake, can decrease the number of fish species that live in the lake.

- Planting a garden can provide a new habitat for organisms who live in the area.

- Reusing resources can lower the environmental impact of humans. An example of reusing resources would be using leftover household water to water plants.

- The emission of fossil fuels (the fumes that are given off when we burn fossil fuels) causes air, water, and soil pollution.

- Studies have shown that forest ecosystems on Earth have decreased since the year 1990. Some possible reasons for this decrease are clearcutting for development and the growing of crops, population increase, and pollution.

- Examples of positive impacts on Earth's resources:
  - turning off lights when not needed
  - using recycled materials
  - taking shorter showers
  - using solar power
  - using reusable grocery bags

- Examples of negative impacts on Earth's resources:
  - air pollution
  - water pollution
  - allowing water to run when not needed
  - using natural gas (fossil fuels) to heat building
  - littering
  - sewage runoff into a freshwater source
Energy exists in many forms, including light and heat energy from the sun, or chemical energy as a result of bodies breaking down food particles. Each organism uses energy in a specific way and depends on energy for survival.

All living things need energy from food. A calorie is a unit of energy. The amount of energy needed depends on body size and activity level. All living things use and store chemical energy.

**Plants and Energy**
- Plants get their energy by making it inside their bodies.
- All plants use energy to grow, reproduce, and maintain life. Plants can look different, but all have structures to support production and distribution of food molecules.
- The amount of energy that the plant produces is less than the energy that the plant received from the sun.

**Animals and energy**
- Animals need energy to grow, reproduce, move, and maintain life systems (heart, lungs, liver, etc.).
- Animals (and humans) cannot make their own food inside their bodies, so they must eat plants and/or other animals to get energy. Their bodies break down the molecules of the eaten bodies in order to obtain energy and nutrients.
- All animals are either herbivores, carnivores, or omnivores. These animals have special digestive systems and specific teeth to help break down their food.
  - **Herbivores** eat only plants. Examples are deer, giraffes, and bees.
  - **Carnivores** eat only animals or animal products, like eggs/milk. Examples are tigers, wolves, and snakes.
  - **Omnivores** eat only plants and animals. Examples are pigs and some birds.

**Trophic Level**
A trophic level sorts animals and plants according to how they obtain energy. Energy flows through each level, from bottom to top. Some energy is used along the way, which is why the pyramid gets narrower toward the top – less and less energy is left. Some animals eat organisms from different lower levels of the model. For example, a secondary consumer may only eat from the level directly below.
(prim © 2011 Encyclopædia Britannica, Inc.)

primary consumers), OR they may eat from both primary consumers and producers.

**Energy paths to the sun**

All the energy in the food that humans and animals eat can be traced back to the sun whether directly (plants) or indirectly (animals).

**Photosynthesis**

Plants use water and carbon dioxide from the air to make a sugar called glucose. In this process, they give off oxygen into the air. Plants use glucose as food or store it in long, chain-like molecules called starch.
• Water travels from the ground into the plant through the roots, and then up to the leaves through tubes in the stem.
• Carbon dioxide in the air enters the plant through the stomata – small openings on the surface of the plant (mostly the leaves). Oxygen is released through the stomata as well.
• Plants trap sunlight energy in structures called chloroplasts. Chloroplasts contain chlorophyll, which is the substance that absorbs sunlight energy, and gives plants their green color.

PLANTS
• Seeds are able to grow to earth’s surface by using stored sugars and starches contained in the seed. When the sprout reaches the surface, it is able to start using the sun’s energy. Water + carbon dioxide (carbon + oxygen) = plant growth. Plants also receive nutrients from the soil.
• Transpiration: When plants open their stomata to take in carbon dioxide or release oxygen, water can exit plants and travel into the air. This happens more when it is hot. To reduce transpiration, desert plants often open their stomata only at night when it is cooler.
• As plants absorb water from the ground with their roots, they also absorb nutrients and minerals. These are used to build proteins, to open and close stomata, etc. Plants make these nutrients available to animals and humans that consume them.

Metabolism and Body Heat
• Animals eat food and take in the chemical energy that is stored in the plant or animal it eats. Some of this energy is used to help animals grow, perform daily tasks, heal, and reproduce. Sometimes, more food is eaten than is needed for these necessary life processes. The unused food is either stored in the body as fat tissue, or will be expelled as waste.
• The collection of chemical processes that break down and build molecules in a living organism is called metabolism. Metabolisms can be fast or slow.
• Animals use energy for everything they do. One way that some animals use energy is to maintain body heat, or keep it near a certain level, no matter if your environment is hot or cold.
  Endotherm – an animal that uses energy stored in its body to keep its body within a normal range. We often call these “warm blooded”. All mammals and birds are endotherms. *remember: humans are mammals, too! Very small and active endotherms often have very fast metabolisms. They also become cold faster than large animals. To stay warm, small animals break down more food to release heat, which causes a faster metabolism.
  Ectotherm – an animal that depends on its environment to warm its body. Most fish, all reptiles, and all insects are ectotherms. They often get their warmth from lying in the sun. If they aren’t able to obtain enough warmth from the environment, they often become inactive or go into hibernation. The speed of an ectotherm’s metabolism depends on temperature. When the body of the ectotherm is warm, it’s metabolism speeds up – when the body is cold, the metabolism slows down.

Energy and movement:
Chanic energy in an animal’s food can be transformed into the kinetic energy of movement.
• Locomotor movements: movement from one place to another (run, crawl, jump)
• Non-locomotor movements: movement while staying in one place (twist, shake, wiggle)
Topic 9 Matter and Energy in Ecosystems Focus Notes

- An ecosystem is all the living (biotic factors) and nonliving (abiotic factors) components in a particular area. These components interact with each other.
- Abiotic factors include air, water, rocks, soil, sunlight, and temperature.
- Biotic factors include all the living things.
- All the organisms living together in an ecosystem form a community. A community is ONLY the living things.
- Water, temperature, and sunlight determine the number and types of organisms that live in an ecosystem.
- Fewer organisms live in an arctic or desert ecosystem than in a tropical rainforest ecosystem. Tropical rainforests are warmer than temperate rainforests.
- Ecosystems may be any size – as small as a water droplet or as large as Earth.
- Every kind of organism must get energy and matter from its environment to carry on life processes. Different organisms get their food in different ways.
- Producers make their own food using nonfood matter and energy from the sun. Plants are producers for land food chains.
- Consumers cannot produce their own food and must eat other organisms. There are primary consumers, secondary consumers, and tertiary consumers.
- Phytoplankton are small producers, and zooplankton are tiny animals that feed off of phytoplankton.
- Decomposers are organisms that break down other organisms’ bodies. Some decomposers are earthworms, flies, mushrooms, and microbes.
- Some decomposers are too small to be seen, such as microbes. Microbes include bacteria and fungi.
- Without decomposers, dead organisms would not decay. All the minerals in the soil would be used up.
- A food chain shows how matter and energy flow from one organism to another, otherwise known as energy transfer.
- Producers are always the first link in a food chain.
- A food web is a set of overlapping food chains.
  *Be able to describe how the energy flows in a food web.

**REVIEW** Focus Notes – There will be questions from the following Focus Notes. If you have misplaced any of these notes, they can be reprinted from your teacher’s web page.

Matter Part 1
Matter Part 2
Changes in Matter Part 1
Changes in Matter Part 2
Earth’s Systems Chart
Our Earth and Earth’s Resources
Conservation
Energy in Food