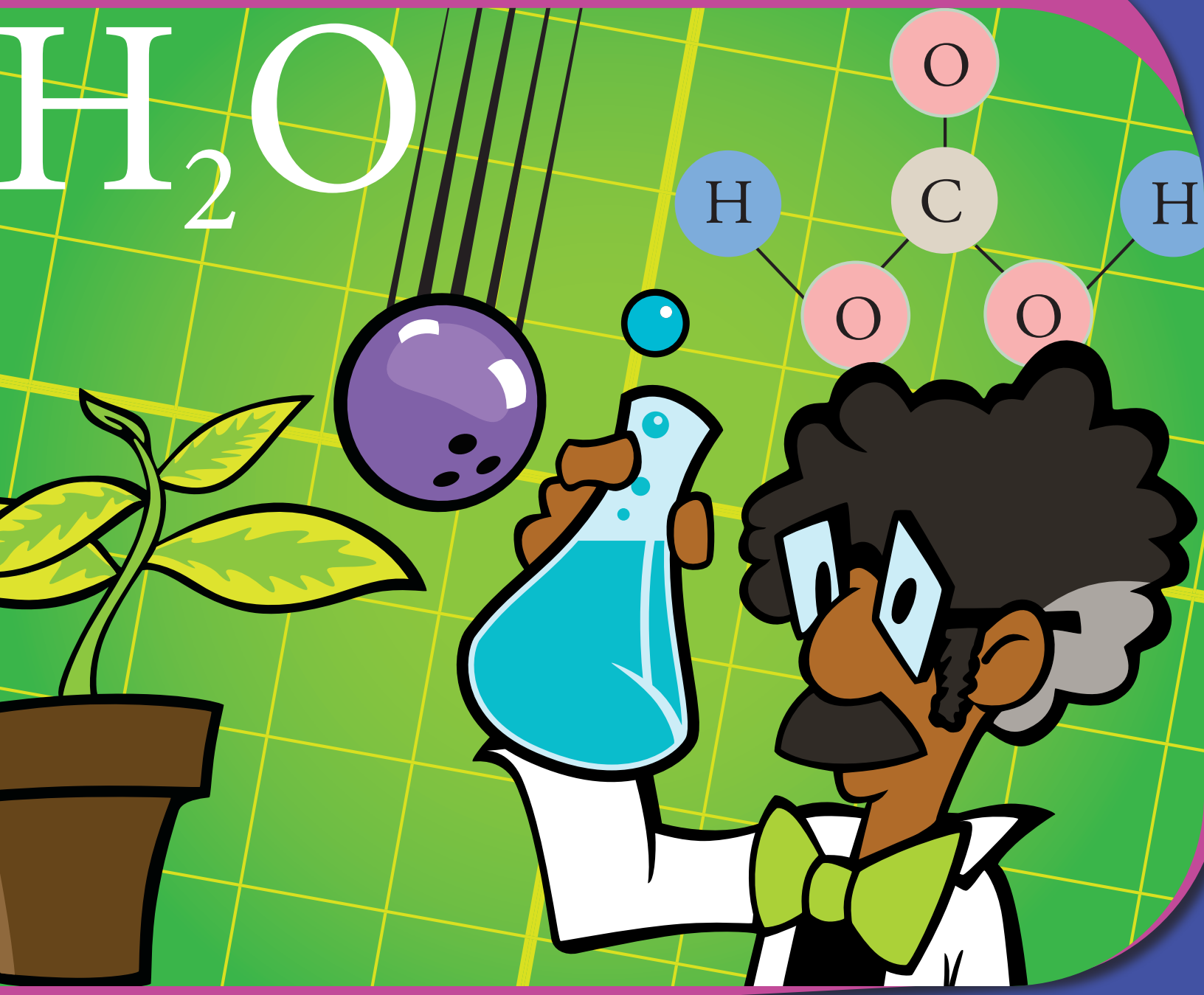
Fascinating Facts About

Earth Science

5th Grade



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Certificate of Completion
Answer Sheets

** Has an Answer Sheet*

Sorting out the Scientific Method #1

with Dr. E. McSquare

5TH GRADE

PHYSICAL SCIENCE

Scientist Dr. E. McSquare is compiling his scientific findings into a single volume. He forgot to give titles to the sections of his reports and now they're all mixed up! Use the definition guide to help Dr. McSquare label his reports.

Definition Guide:

Q = Question: The question is the first part of the scientific process. What question do you want to answer?

H = Hypothesis: A hypothesis is a statement that can be proven true or false. It is often written in the form "If (a) then (b)."

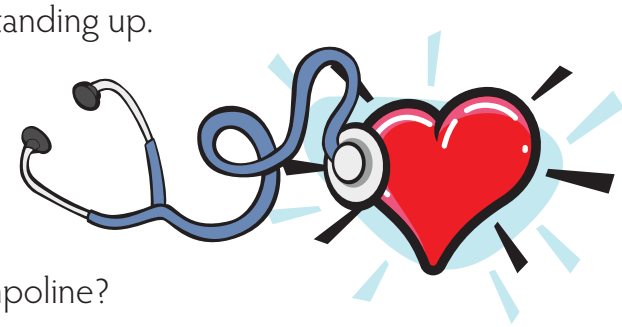
E = Experiment: The experiment is an activity that is used to test if your hypothesis is true or false.

D = Data: Data are the results of the experiment.

C = Conclusion: The conclusion is a final statement that describes what you learned from the experiment and results.

E I will test my lab partners' resting heart rates by counting their heart beats in three different positions: lying down, sitting, and standing up.

_____ **Object: Bounce count**
Golf ball: 4 bounces
Medicine Ball: 7 bounces
Baseball: 5 bounces



_____ Do heavier objects bounce higher on a trampoline?

_____ If standing up requires more physical effort than lying down, then one's pulse standing up will be faster than one's pulse lying down.

_____ From a fixed height, I will drop a variety of objects onto a trampoline several times and observe the number of bounces.

_____ If there is and equal an opposite reaction to every action, then heavier objects will bounce higher off a trampoline.

_____ **Maurice:** Lying down - 55 bpm, **Sitting** - 59 bpm, **Standing** - 65 bpm
Lucy: Lying down - 58 bpm, **Sitting** - 60 bpm, **Standing** - 70 bpm
Carlos: Lying down - 51 bpm, **Sitting** - 54 bpm, **Standing** - 56 bpm

_____ How does your resting heart rate change depending on your position?

_____ The experiment and data show that heavier objects bounce higher on trampolines.

_____ A person's position affects his or her resting heart rate. The heart rate is higher if the body is upright.

Sorting out the Scientific Method #2

with Dr. E. McSquare

5TH GRADE

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C = Conclusion: The conclusion is a final statement that describes what you learned from the experiment and results.

C The results of this experiment show that the boiling point of water does rise as the amount of salt in the water increases.

_____ I will drop a variety of objects from a height of 10 feet and use a stopwatch to record the time it takes for them to hit the ground.

_____ Ignoring wind resistance, if two objects are dropped at the same time, they will both hit the ground at the same time because gravity is the same for both of them.

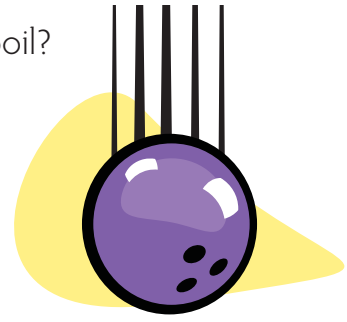
_____ The results of this experiment showed that objects fall at the same rate despite weight differences.

_____ **Object (weight) (drop time)**
Shoe: (15 oz) (.82 seconds)
Bowling ball: (12 pounds) (.82 seconds)
Pencil: (2 oz) (.84 seconds)

_____ I will put a thermometer in each of 3 pots of boiling water. Each pot will contain a different amount of salt. I will observe and compare the temperatures in each pot when the water begins to boil.

_____ Does adding salt change the temperature at which water begins to boil?

_____ Do heavier objects fall faster than lighter objects?



_____ **Temperature when boiling begins (salt quantity)**
Pot 1: 214.2 F (0g)
Pot 2: 216.3 F (50g)
Pot 3: 218.3 F (100g)

_____ If adding salt to water increases the density of water, then it requires more energy to make it boil, thus increasing the boiling point temperature.

Sorting out the Scientific Method #3

with Dr. E. McSquare

5TH GRADE

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H If plants reflect green light, then they must absorb red light (the opposite of green) and thus grow faster under red lights.

_____ **Plant Specimen - Light color: Growth**
Yellow Hibiscus - Green light: +9.4cm, **Red light:** +12.2cm, **Blue light:** 11.9cm
Golden Sage - Green light: +6.6cm, **Red light:** +8.1cm, **Blue light:** +7.1cm
Soybean Plant - Green light: +7.4cm, **Red light:** +10.1cm, **Blue light:** +10.0cm
Common Gardenia - Green light: +5.1cm, **Red light:** +6.9cm, **Blue light:** +6.9cm

_____ I will place 4 different plants under green lights and compare their growth over a month with identical plants under red and blue lights.

_____ Using clear containers with measurement marks, I will compare the volume of a glass of water at room temperature with a glass of frozen water.

_____ Which color lights cause plants to grow more effectively?

_____ **Container# - State of water: height**
Container 1 - Water: 14.0ml, **ice:** 14.8ml
Container 2 - Water: 20.0ml, **ice:** 20.8ml
Container 3 - Water: 24.0ml, **ice:** 24.9ml

_____ Does the volume of water change when it freezes?

_____ After consistent results, I found the that water increases in volume when it freezes.

_____ The results of this experiment showed that green light was the least effective color for growing our plants. Blue and red lights caused the greatest amount of growth.

_____ If the molecular structure of solids is more dense than liquids, then water will decrease in volume when it freezes.

Sorting out the Scientific Method #4

with Dr. E. McSquare

5TH GRADE

PHYSICAL SCIENCE

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D = Data: Data are the results of the experiment.

C = Conclusion: The conclusion is a final statement that describes what you learned from the experiment and results.

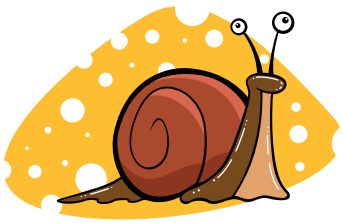
Q Do snails crawl faster on concrete or glass?

_____ **Amber: Left eye:** decreased. **Right eye:** decreased.
Julio: Left eye: decreased. **Right eye:** decreased.
Claudia: Left eye: decreased. **Right eye:** decreased.

_____ I will test my lab partners' pupils by covering one eye and shining a light directly into the other. Then, I will note the change in pupil size.

_____ If snails move faster on smoother surfaces, then a snail will move faster on glass than on concrete.

_____ The results of the experiment showed that pupil size decreases when there is more light present. In order to absorb less light, the pupils shrink.



_____ **Snail 1:** Glass - 45s, Concrete - 55s
Snail 2: Glass - 49s, Concrete - 49s
Snail 3: Glass - 55s, Concrete - 56s

_____ If a pupil how much light is visible, then it will get smaller in size when there is more light.

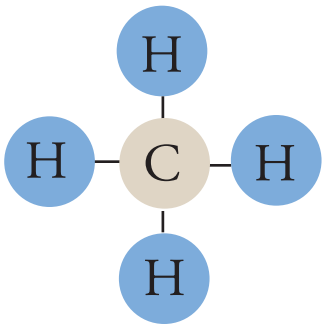
_____ Snails move faster on glass than on concrete.

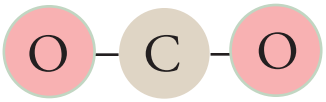
_____ What makes the pupil in the eye change size?

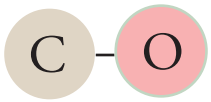
_____ I will organize snail races on glass and concrete and compare how fast snails travel on each surface.

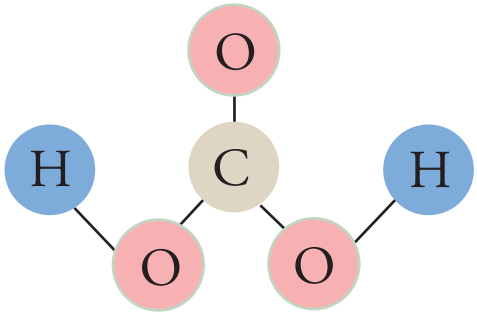
C

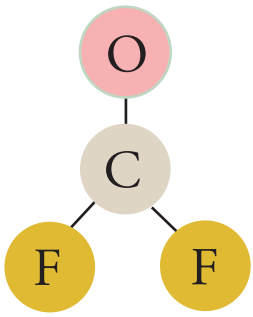
Carbon is number 6 on the periodic table of elements and its symbol is C. It is the most important element in organic material and without it life-forms cannot exist. Carbon appears in many compounds that are essential to living creatures, including carbon dioxide (CO_2) and methane (CH_4). By itself it can be a diamond, which is one of the hardest substances on Earth, and it can also be graphite, which is very soft and is used for writing. Below, interpret each diagram and match it to the correct compound.











COF_2

Carbonyl Fluoride - This is a gas made of the elements carbon, oxygen and fluorine. It is highly toxic to human beings. It is used to produce other chemicals that contain fluorine.

CH_4

Methane - This is the simplest possible organic compound. It is made of carbon and hydrogen, the two most important elements in organic material.

H_2CO_3

Carbonic Acid - This is an inorganic acid. It is most often created when carbon dioxide (CO_2) is dissolved in water (H_2O). Our bodies use it to help transport CO_2 out of our bodies.

CO

Carbon Monoxide - This is a compound made of one oxygen atom and one carbon atom. It is a gas and is slightly lighter than air. It is toxic in high quantities but animal bodies produce small amounts of it.

CO_2

Carbon Dioxide - This is a gas made of one carbon atom and two oxygen atoms. Plants use this to create sugars through photosynthesis and animals release it when they breathe out.

Hydrogen

Hydrogen is the most common element in the universe. In fact, about 75% of the mass of the universe is made of hydrogen atoms! Hydrogen is the first element on the periodic table and got its name because it is found in water (Hydro means water in Latin). Scientists use the capital letter H to represent Hydrogen.

The chemical formula for water is H_2O. This means there are two hydrogen atoms and one oxygen atom in each water molecule. Look at the chemical formulas below and write how many hydrogen atoms are in each one.

water H_2O _____

Space ships use hydrogen and oxygen as fuel, the byproduct of the explosion is water.

methane CH_4 _____

Methane is a byproduct of decomposing organic matter, it is used as a fuel at some landfills.

1
H
(1.01)

glucose $C_6H_{12}O_6$ _____

Glucose is the sugar plants use as food, and is produced through photosynthesis.

ammonia NH_3 _____

Ammonia is often used in fertilizers because of its nitrogen content, which is essential for most plants.

caffeine $C_8H_{10}N_4O_2$ _____

Caffeine is found in many plant leaves, it is a natural insecticide because it ofen kills insects when they ingest it.

vitamin C $C_6H_8O_6$ _____

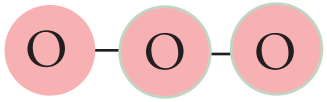
Vitamin C is important for nearly all animals. Humans are one of only a few species that do not produce it and must get it from food with large amounts of the vitamin.

baking soda $NaHCO_3$ _____

Baking soda is used in the body to neutralize some of the acids produced by the stomach.

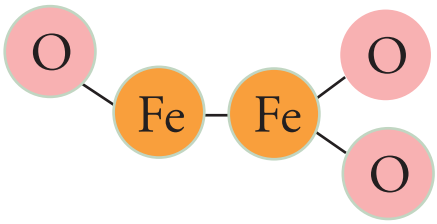
O

Oxygen is number 8 on the periodic table of elements and its symbol is O. It is one of the most important elements to life. It is a part of water and makes up more than 20% of our atmosphere. It is also the most important part of air that we breathe in. Our lungs take it out of the air and transport it into our blood stream. Oxygen is also a very important part of inorganic materials. It is found in many metallic compounds and minerals that we use everyday. Below, interpret each diagram and match it to the correct compound.



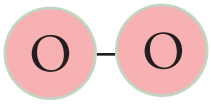
O_2

Molecular Oxygen - This is two oxygen atoms bonded together. It is the form of oxygen that makes up 20% of our atmosphere. It is also the form of oxygen that we breathe in and is absorbed into our bloodstream.



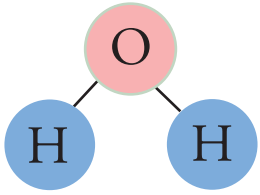
H_2O

Water - Water is everywhere and is essential to life. It covers more than 70% of the Earth's surface. It is a very simple molecule with two hydrogen atoms and one oxygen atom. A fish's gill can get oxygen out of water the way animals' lungs get it out of the air.



Fe_2O_3

Iron Oxide - This is a part of what makes rust. When iron combines with oxygen in the atmosphere the structure of the molecule changes and becomes a new substance.



O_3

Ozone- This is another form of oxygen found in the atmosphere. But our bodies cannot use it when we breathe it in. It is very important in other ways though. Large quantities of ozone exist in our upper atmosphere and block the sun's radiation.

The Water Cycle

Since the very first years of Earth's existence, there has been water present. No water is ever added or taken away from our atmosphere because it's constantly moving in a *water cycle*. Read the definitions below and put the corresponding letter in the squares marking each part of the cycle in the diagram.

A Evaporation:
Liquid water is heated by the sun until it rises as water vapor into the atmosphere.

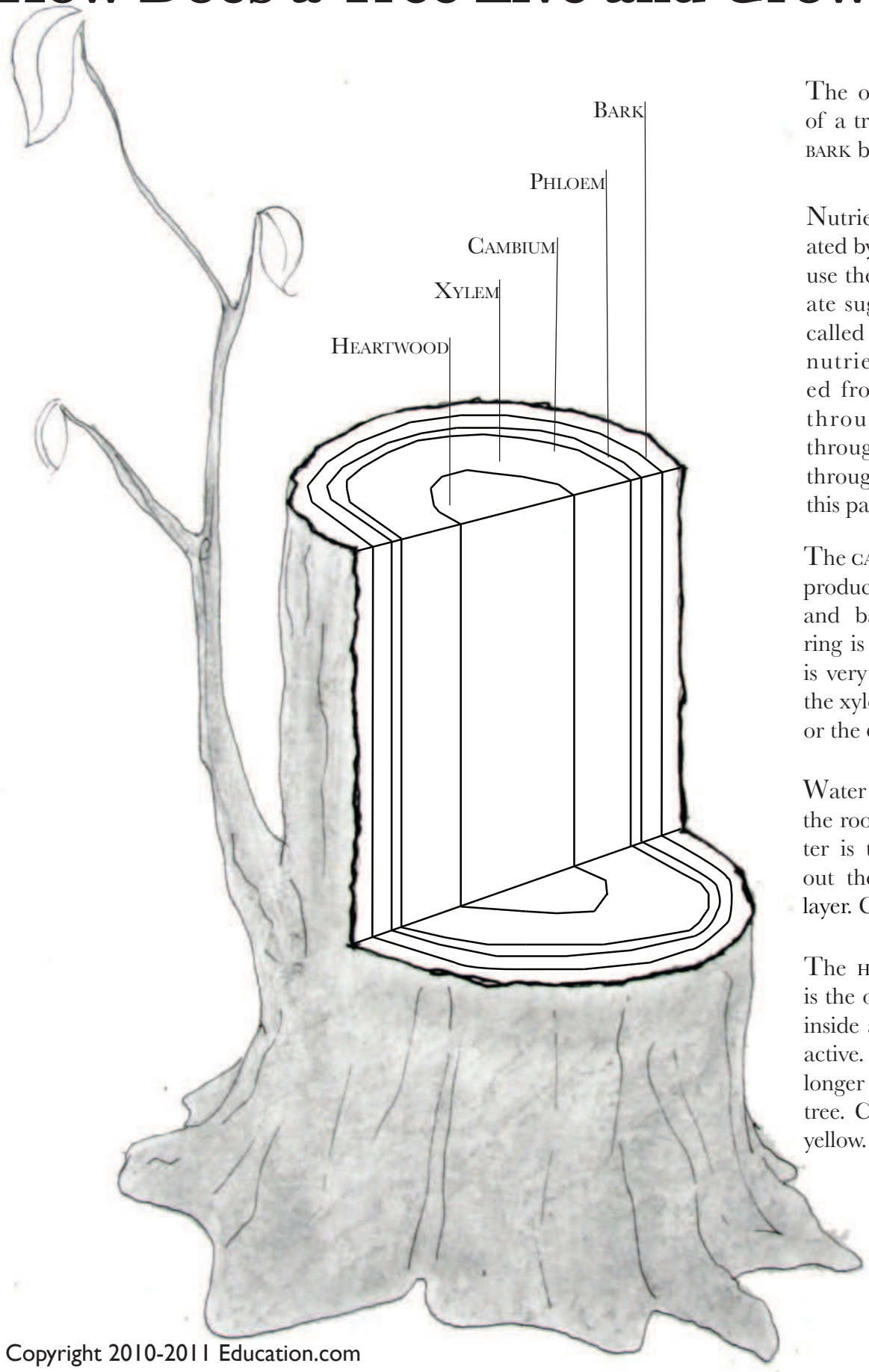
B Precipitation:
Water falling to the Earth in the form of weather - including rain, sleet, hail and snow.

C Condensation:
Water vapor molecules join together, becoming liquid, in the form of clouds.

D The Sun:
Creates all of the weather on Earth through the uneven heating of Earth's surface.

E Liquid Water:
All living things need this to survive and it is an important part of the weather system.

How Does a Tree Live and Grow?



The outer, protective layer of a tree is BARK. Color the BARK brown.

Nutrients, or food, are created by a tree's leaves. They use the sun's energy to create sugars. This process is called photosynthesis. The nutrients are transported from the leaves down through the stems and throughout the whole tree through the PHLOEM. Color this part red.

The CAMBIUM layer of a tree produces new heartwood and bark cells. One new ring is created each year. It is very thin and is between the xylem and phloem. Color the CAMBIUM layer green.

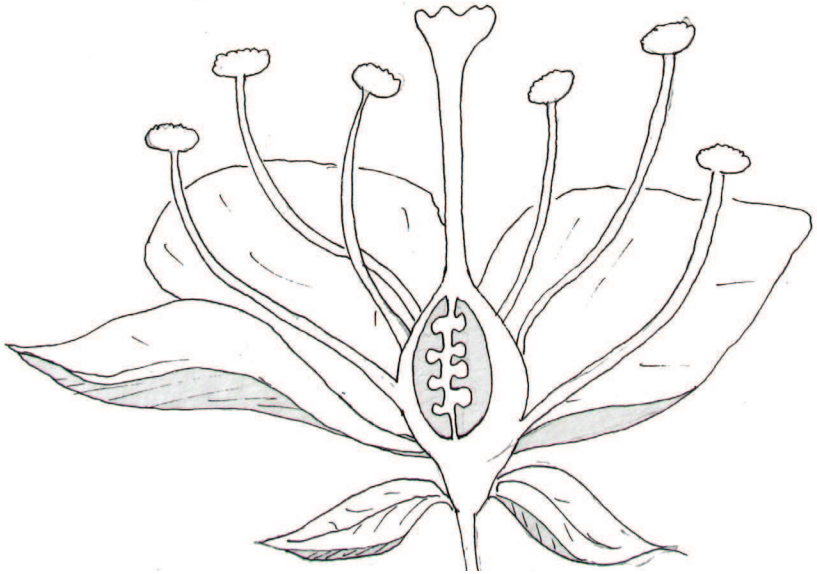
Water is absorbed through the roots of a tree. The water is transported throughout the tree in the XYLEM layer. Color this part blue.

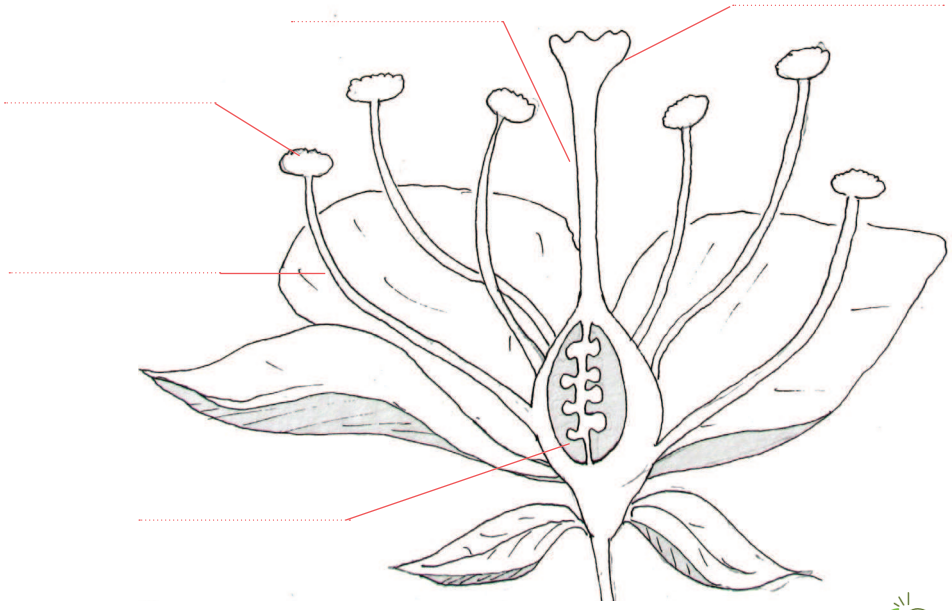
The HEARTWOOD of a tree is the older part. It is found inside and is considered inactive. This means it is no longer a living part of the tree. Color the HEARTWOOD yellow.

Pollination

is very important and neccessary to the reproduction of plants. There are several stems within a flower. These are called **stamen**. At the top of each stamen is a small pad where **pollen** sits. At the center of a flower there is a tube. The top of the tube is a sticky platform called a **stigma**. Pollen from the stamen must be transported to the stigma. This is typically done when bees and other insects feed on the nectar of the flower. The pollen sticks to the feeding bee. When the bee flies away to feed on another flower, it carries the pollen from the first flower to the stigma of the second flower. From the stigma pollen travels through a tube called the **pistil** down to the base of the flower. At the base of the flower is the **ovule**. That is where the pollen mixes with the other reproductive elements of the flower to make the seeds for new plants. It is important that the pollen of one flower reaches the stigma of the other. This creates diversity in the new plant's genes. Diversity means the new plant will not not inherit all the traits of either of its parents so it is less likely to inherit any problems they might have had.

First, find the different parts of the flower in the diagram, label and color them in. Color the stamen black, the pollen yellow, the stigma red, the pistil green and the ovule blue. Then with a blue line trace the path the bee must take to pollinate these two flowers. Using a green line trace the path the pollen takes to create new seeds with a different plant.



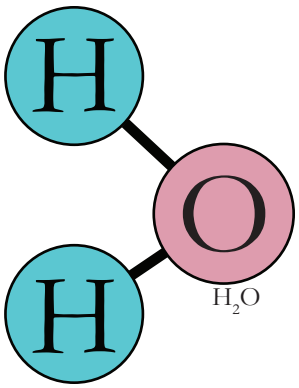


Photosynthesis

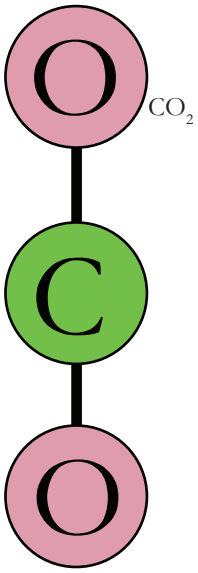
Use the word bank below to fill in the empty spaces in the paragraph to the right.

WORD BANK

CARBON DIOXIDE
CHLOROPHYLL
GLUCOSE
FOOD
LIGHT
BREATHING
WATER



H_2O



CO_2

Photosynthesis is a process where plants create their own _____ using sunlight.

Plant leaves absorb red and blue _____ into their leaves, reflecting green light. This is why most plants are green in color. A chemical called _____ is found inside most plant cells. This is the substance that absorbs sunlight.

Meanwhile, plants are absorbing _____ (H_2O) through their roots and storing it within their cells. When the sunlight hits the water molecules, the water breaks apart into hydrogen and oxygen.

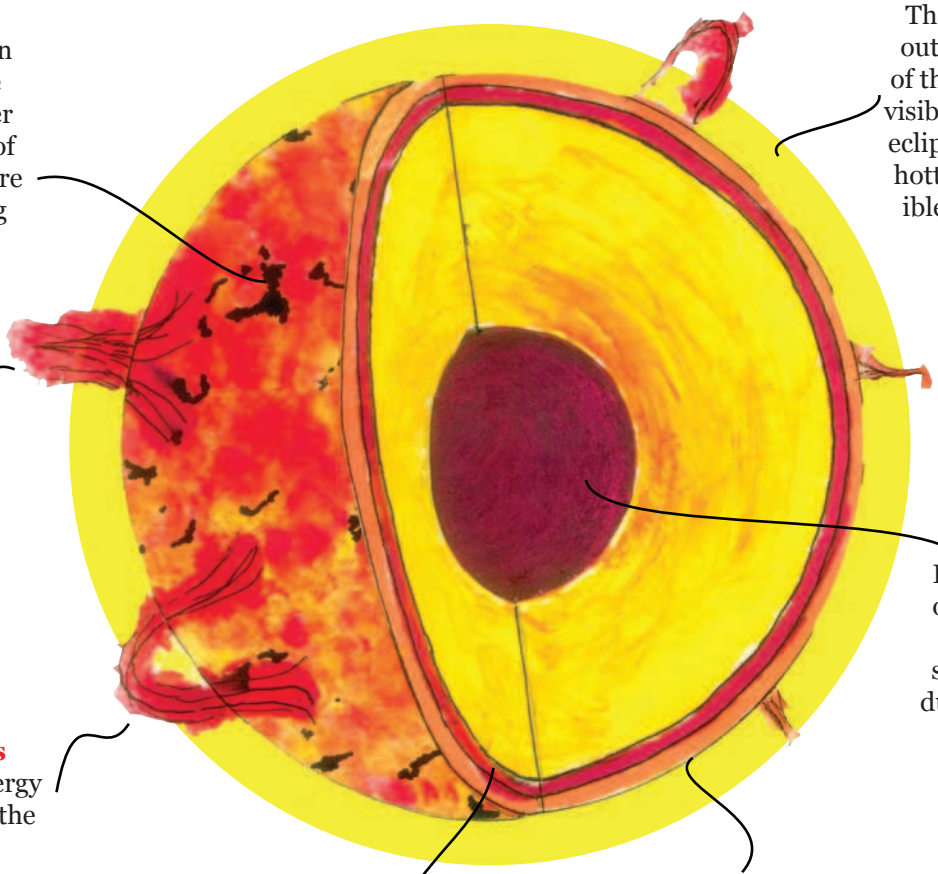
Plants also take _____ (CO_2) in through holes in their leaves, called stomata. This is a plant's way of _____. When the carbon dioxide combines with hydrogen, a type of sugar called _____ is formed. This is a plant's food, and it uses this energy to live and grow. The extra oxygen molecules are released back into the atmosphere.

The Sun

The sun is our star. All of the planets in our solar system orbit around it. It is made of very hot gases, mostly hydrogen and helium, that provide the light and heat for our solar system. Answer the questions at the bottom of the page using what you have learned.

Sunspots
These are areas on the sun's surface that appear darker because they are of a lower temperature than surrounding areas.

Corona
The corona is the outermost surface of the sun. It is only visible during a solar eclipse, and is much hotter than the visible surface of the sun.



Flares
Bursts of energy that flash off of the sun's surface.

Core
It is the hottest part of the solar system. Almost all of the sun's energy is produced here by fusion, and moves outwards.

Prominences
Large flares of energy that loop back to the sun's surface.

Photosphere
This is the visible layer of the sun, but it is cooler than the outer two layers.

Chromosphere
It is a reddish color but, is not visible to the eye.

Questions

What is the difference between a flare and a prominence?

What part of the sun produces the majority of heat and light?

What two parts of the sun's outer layer are only visible from Earth during a solar eclipse?

Why are sunspots darker than surrounding areas?

What part of the sun do we see from Earth?

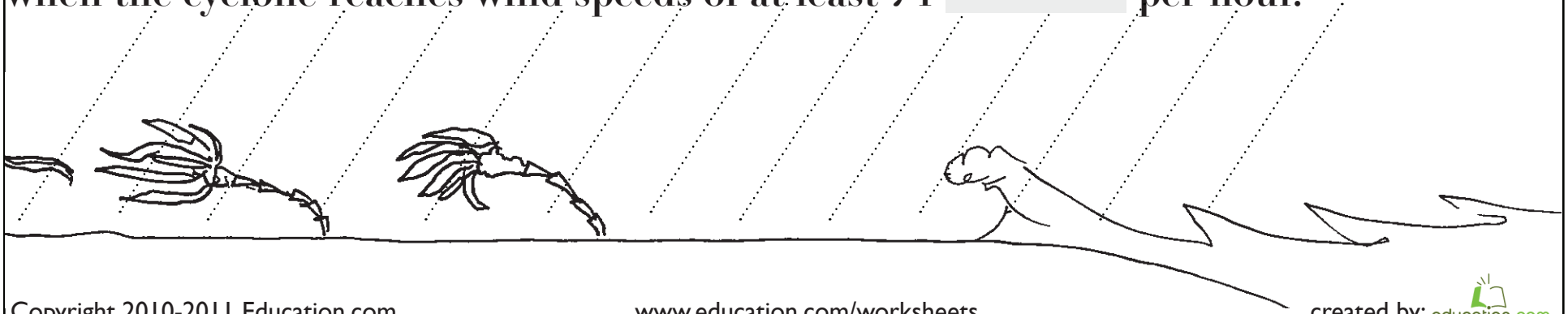
Learn About Hurricanes

Use the word bank to fill the empty spaces in the paragraph.

Word Bank

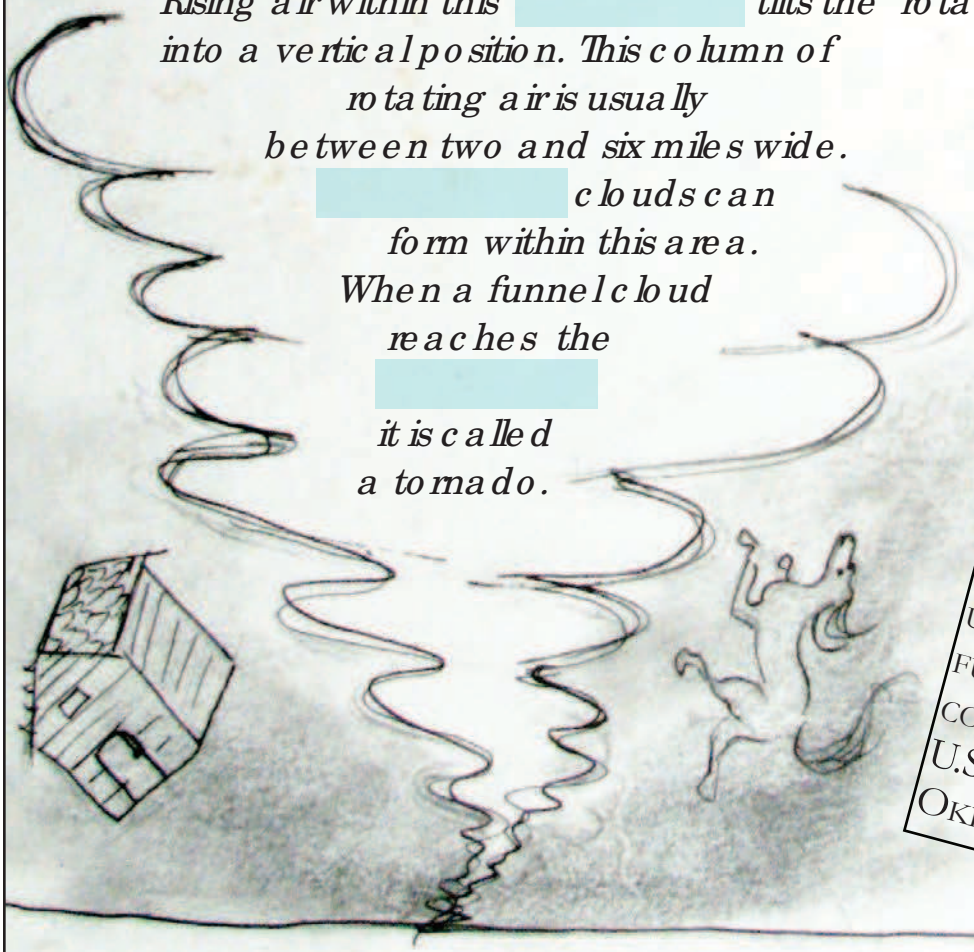
ISLANDS
HUMID
OCEAN
ENERGY
RAIN
MILES
WINDS
SPIRALS

A hurricane is a huge storm that forms over the open _____. Hurricanes are made up of strong _____ and are usually accompanied by heavy _____. They can create large waves and cause a great amount of damage. Because a hurricane only travels over open ocean waters the places most at risk are _____ and coastal towns. Hurricanes are formed over ocean water that is 80° F or warmer. The warm water provides _____ for the hurricane. Winds come together above the water and force the air upward. _____ air, which is hot and moist, rises from the water to create storm-clouds. Above the storm clouds wind flows outward and allows the air to rise. The wind _____ around and around the storm. This storm becomes a hurricane when the cyclone reaches wind speeds of at least 74 _____ per hour.



Learn *About* Tornadoes

A tornado is a spiraling _____ of air that reaches from a cloud to land. Tornadoes can reach speeds of up to _____ miles per hour and can cause significant destruction! In the _____ there are about 1,000 tornadoes each year. Most of these tornadoes occur in an area called Tornado Alley. Tornado alley is right in the middle of the country and includes the states Texas, Kansas and _____. Most tornadoes form during _____. When warm, moist air and cool, dry air mix the atmosphere becomes unstable. With a change in wind speed and direction a spinning effect begins to take place. Rising air within this _____ tilts the rotating air into a vertical position. This column of rotating air is usually between two and six miles wide. _____ clouds can form within this area. When a funnel cloud reaches the _____ it is called a tornado.



Use the word bank below to fill the empty spaces in the paragraph.

Word Bank

300
GROUND
THUNDERSTORMS
UPDRAFT
FUNNEL
COLUMN
U.S.A.
OKLAHOMA

Explore Tornadoes!

phenomenal science

A **tornado** is an amazing, awesome act of nature that can leave citizens dumbfounded. It's a huge, swirling, beast of a storm that can appear to have a mind of its own.

Tornadoes start with a massive thundercloud. The cloud sucks huge amounts of air up its center. In the largest clouds, called **super cells**, there is enough energy in that upswelling of air to spawn a **tornado**. As warm, wet air collides with cool, dry air, the storm will spin faster and faster. It finally twists down to the ground, creating a **tornado**.

If you've ever seen a whirlpool form in a drain, you have seen how a **tornado** works. A drain's whirlpool, also known as a **vortex**, forms because of the down draft that the drain creates in the body of water. The downward flow of water into the drain begins to rotate, and as the rotation speeds up the **vortex** forms.

Tornadoes move and devour the ground, following a path controlled by the thundercloud it came from. Sometimes the **tornado** will appear to hop. The hops occur when the **vortex** is disturbed. The **tornado's vortex** will hop, form, and collapse along the thundercloud's path.

Scientists measure **tornado** strength on the **Fujita Scale**, also known as the **F-Scale**. Wind speeds are estimated by the damage accumulated from a **tornado**. Once those wind speeds are established, a **tornado** can be placed on the **F-Scale**. The weakest **tornadoes** are rated **F-0** with wind speeds of up to 72MPH. **F-2 tornadoes** can tear roofs from houses and destroy mobile homes. **F-4 tornadoes** are able to toss cars up in the sky with winds of up to 260mph. **F-5 tornadoes** bring total devastation at over 300 mph, no faster winds have ever been recorded by scientists. An **F-5 tornado** can pick up a cow and launch it as a projectile.

Despite modern radar technology, experts cannot predict exactly when and where a **tornado** will touch down. It's important to pay attention to emergency broadcasts if you live in a **tornado zone**. Should a **tornado** happen where you live, the safest place to be is an underground storm shelter with a very strong door such as a basement or emergency shelter.

Historical Tornadoes

1840 — Great Natchez Tornado
The 2nd deadliest tornado in US history, this storm killed 317 people and injured 109.

1925 — Tri-State Tornado
This giant storm left the longest recorded track in the world at 219 miles in length.

1974 — Super Outbreak
Over 148 tornadoes hit 13 states, with nearly 30 of the tornadoes ranked on the Fujita Scale as F5.

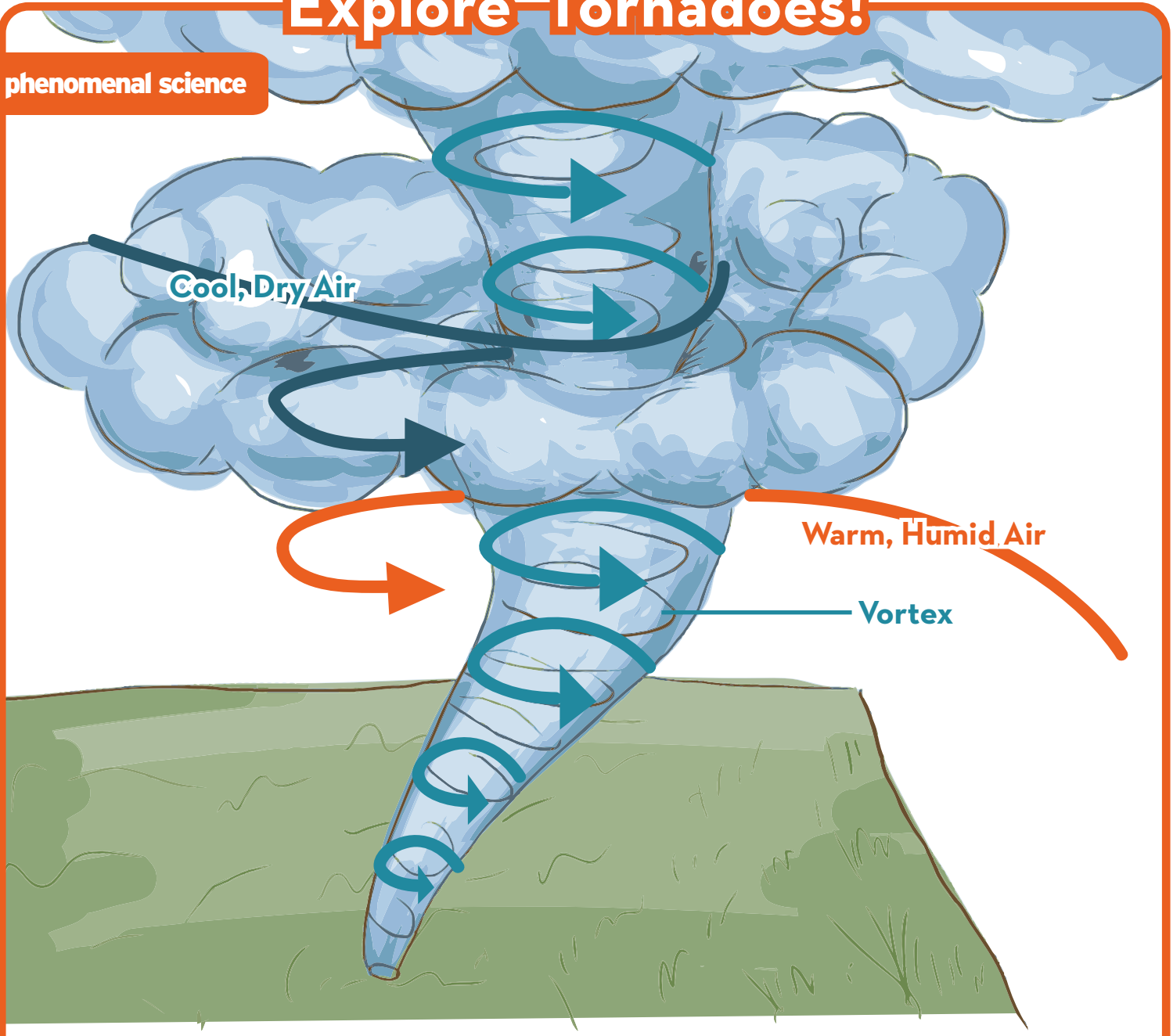
2011 — Joplin Tornado
One of the costliest single tornadoes in US history, the cost to rebuild after the Joplin disaster reached $3 billion.

Safety Tips

1. Seek shelter immediately during a tornado.
2. Keep away from windows.
3. Keep away from electric sockets and wires.
4. Keep an emergency radio.
5. Move to a basement or under a sturdy table.
6. Research ways to secure and prepare your home.
7. Lay face down on the ground and cover yourself.

Explore Tornadoes!

phenomenal science



After reading the article on tornadoes, please answer the following questions:

What makes a tornado spin?_____

What is the Fujita Scale?_____

Describe how a tornado moves._____

Explore Earthquakes!

phenomenal science

Have you ever felt an earthquake? If you have, you'd know it's a sickening feeling. It seems impossible that the entire earth can move so dramatically, but during an **earthquake** it actually does.

So how does the ground shake and move the way it does during an **earthquake**? In order to answer that question, it's important to know exactly what is happening. An **earthquake** is a vibration that travels through the earth's crust. **A volcanic eruption**, **a large meteor impact**, or any sort of **big underground explosion** can create that vibration.

The most common cause of **earthquakes** are the earth's **tectonic plates**. These plates are in constant motion and when they bump into one another it can cause underground vibrations. Each year, more than *three million earthquakes* are an after effect of **tectonic plates** moving.

There are three different ways for plates to interact with each other. In a **normal fault**, the plates are separating. In a **reverse fault**, the plates are running into each other. In a **slip fault**, the plates move in opposite directions, with one plate sliding against the other. **Slip faults** cause the most dramatic **earthquakes**. The edges of these plates can actually lock together as they slide against each other, building up pressure. Then, in an instant, the pressure releases.

When the shift occurs in the earth's crust, the energy radiates **seismic waves**. These waves are like waves of water in a pond, but here the waves radiate through the earth and make the ground shake. There are three kinds of waves: **P waves**, **S waves**, and **L waves**. **P waves** cause the thud in the beginning of the quake, while **S waves** and **L waves** cause the most damage because they both move plate foundations.

The largest **earthquake** ever registered on earth measured 9.5 on the **Richter scale**. **Earthquakes** that register at 3 aren't usually felt by humans. For us to tfeel an **earthquake**, it must measure around 5 on the **Richter scale**.

Historical Earthquakes

1811 **Madrid Missouri Quakes**
These earthquakes happened along the Mississippi river, lasting for months. These quakes actually caused the river to run backwards.

1906 **San Francisco Earthquake**
One of the most famous US disasters, the fires started by this earthquake actually did more damage than the quake itself.

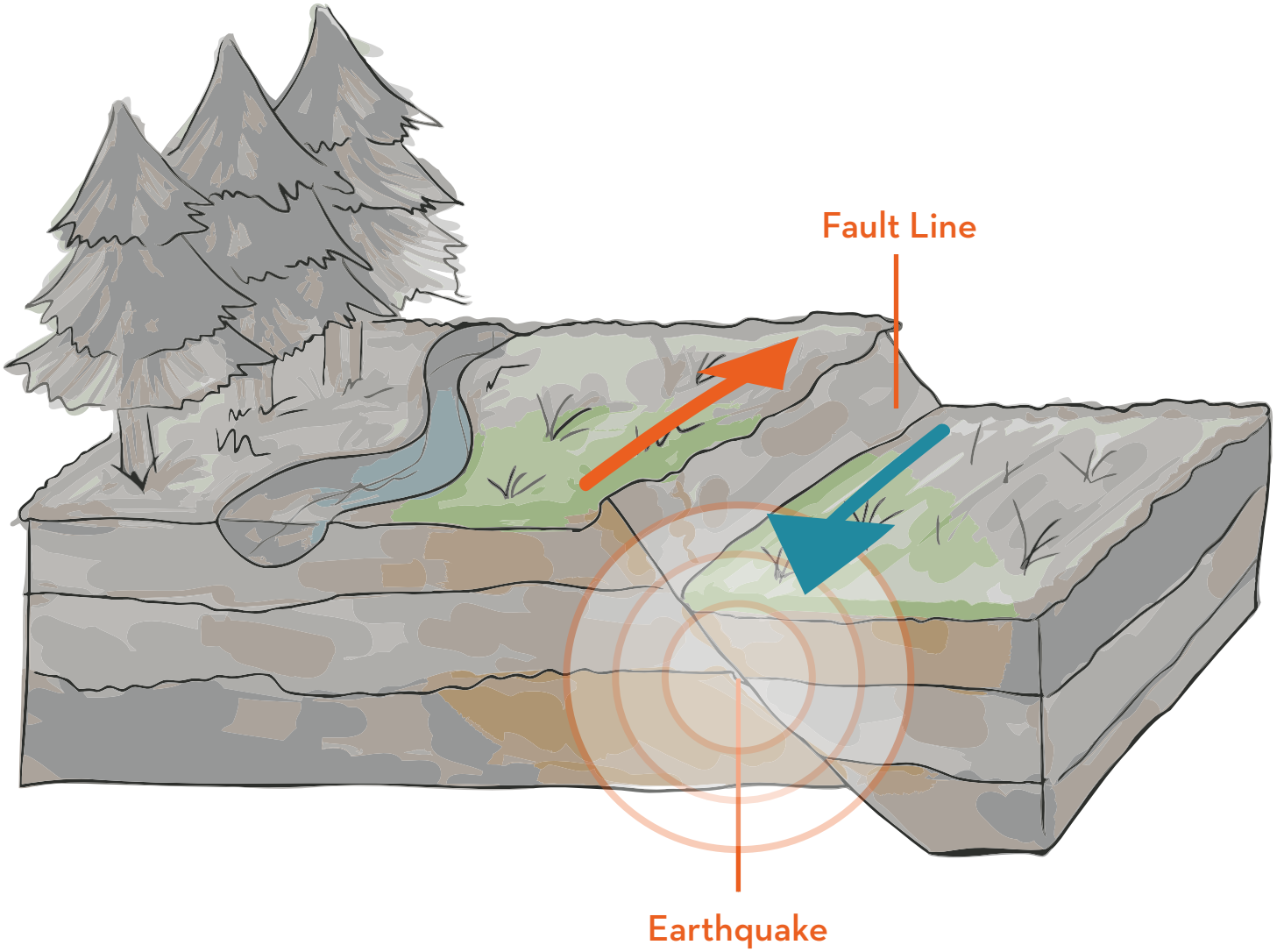
1970 **Ancash Earthquake**
One of the biggest earthquakes ever recorded, the Ancash earthquake caused landslides, destroyed homes and took away many lives. This quake hit 7.8 on the Richter scale.

Safety Tips

1. Stay away from windows.
2. Stay indoors.
3. Take cover under a sturdy piece of furniture.
4. Secure shelves and heavy objects against the wall.
5. Plan an earthquake preparation kit with your family.
6. If advised to evacuate, do so immediately.
7. Stay away from electrical wires.

Explore Earthquakes!

phenomenal science



After reading the article on tsunamis, please answer the following questions:

Name two different events that would cause an earthquake._____

What are the three ways tectonic plates interact with each other?_____

What are seismic waves?_____

Explore Tsunamis!

phenomenal science

On **December 26th 2004**, a massive **tsunami** rose from the Indian Ocean. This **tsunami** was one of the most destructive natural disasters anyone had ever seen before. Where did these disastrous waves come from, and how was this **tsunami** able to hit so quickly, without warning?

There are several different situations that can cause a **tsunami**: **underwater volcanic eruptions**, **meteor strikes**, **coastal landslides**, and, most commonly, **underwater earthquakes**.

Earthquakes that cause **tsunamis** involve the earth's **tectonic plates**. These plates are constantly moving over and under one another. The upper plate can get stuck on the lower one, building pressure. When the pressure grows large enough, the upper plate will snap upwards *very* quickly. When the plate snaps up by several inches, it also pushes an entire section of the ocean with it. This part of the ocean will suddenly be several inches above sea level. Once this spike happens, the water will spread out in order to restore equilibrium. This bump will spread out with incredible speed, moving at *hundreds of miles per hour*. When the wave reaches the shallower waters of the coast, the compressed energy of the wave will transform it into a **tsunami**. A typical **tsunami** approaching land will slow down to speeds of 30mph as the wave grows to *heights of up to 90ft above sea level*. A **tsunami** almost always promises flooding, destruction, and sometimes loss of life.

Scientists have the equipment to detect underwater earthquakes, just before a **tsunami** can hit the coast. However, because these giant waves form so quickly and hit coastal areas at hundreds of miles per hour, these detections often come too late. If you live near the coast, be aware of **tsunami zones**. Make sure your family has a plan in case you are caught near the wave.

Historical Tsunamis

1755 **Lisbon Tsunami**
Following the devastating Lisbon earthquake, the tsunami nearly destroyed the Portuguese city of Lisbon.

1883 **Krakatoa Tsunami**
The volcanic island of Krakatoa destroyed two-thirds of the Indonesian island, and sent high waves across the Indian Ocean, killing 36,000 people.

2004 **Indonesian Tsunami**
Over 230,000 people in 14 countries died after this tsunami hit. It was one of the deadliest natural disasters in recorded history.

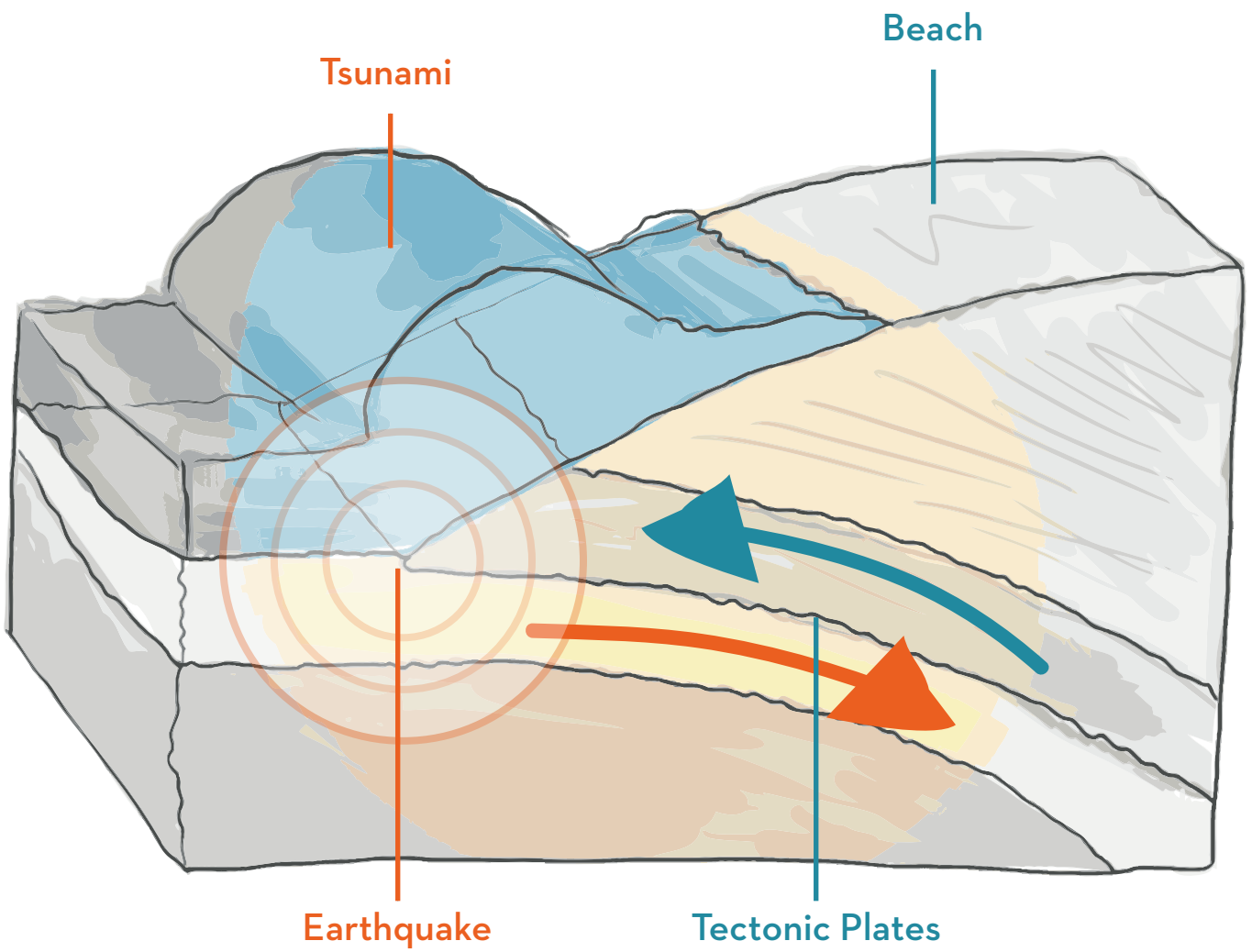
2011 **Tohoku Tsunami**
Following one of the most powerful earthquakes, a series of giant tsunamis hit Japan. The disaster cost Japan 15,000 lives and $235 billion in economic loss.

Safety Tips

1. If you live near the coast, look up your local tsunami broadcast.
2. Be aware of nature's warning signs. Tsunamis often follow after earthquakes, landslides near the coast, volcanic eruptions, and meteor strikes.
3. If you see a tsunami happening, leave the beach immediately and go to higher ground.
4. If you don't have an emergency kit, help your family put together one that includes a first aid kit, a supply of fresh water and canned food.

Explore Tsunamis!

phenomenal science



After reading the article on tsunamis, please answer the following questions:

Name two different events that would cause a tsunami. _____

_____

How do tectonic plates cause earthquakes? _____

_____

What are some ways you can prepare for a tsunami? _____

_____

Explore Hurricanes!

phenomenal science

Anyone who has ever lived through a **hurricane** knows that they are the biggest, baddest storm nature can dish out. A large **hurricane** can grow to be *600 miles* across and packs the power of *many* nuclear bombs. These super-storms unleash high winds and rain on states like Florida and Louisiana year after year.

In contrast to the tremendous power they have when they arrive on American shores, **hurricanes** start in a simple way. A normal thunderstorm in North Africa will blow out into the Atlantic ocean, near the earth's equator. Once the storm is over the water, it will begin to gain *more* power. The water around the equator collects a lot of solar energy, which adds to the storm's power. Hot air rises up the center of the thunderstorm, cooling off as it makes contact with a colder atmosphere and dumping moisture. **All that energy only adds to the storm.**

This exchange of hot air and moisture creates a giant column of air. As the storm picks up more energy, a rotation will form, causing the storm to start spinning faster and faster, picking up wind speeds. **As soon as the winds begin to blow at 75 mph or more, a hurricane is born.**

How does a hurricane move from the Atlantic ocean to North America? Over the summer, trade winds blow from Africa to the United States. These winds *push* newly-formed **hurricanes** across the Atlantic, helping the storm build up power. By the time the storm reaches the United States, its winds will have reached speeds of 100 mph or *more*.

Once a storm hits the US, the storm can *"come undone"* or the winds can shift and blow the **hurricane** harmlessly up the coast. In worst-case scenarios, the storm will hit land and cause massive damage to land and property. The storm's strong winds are capable of ripping out trees from the ground, and producing 1-2 feet of rainwater in less than a day. Over the course of one season, a **hurricane** will often leave some towns flooded and devastated.

Historical Hurricanes

1900 — Galveston Hurricane
This hurricane hit Texas with winds of 145 mph. It is estimated about 6,000 - 12,000 people were killed.

1969 — Hurricane Camille
The 2nd of three category 5 hurricanes to make landfall in the US during the 20th century. This storm is also the first named after a person.

1992 — Hurricane Andrew
This storm caused $26.5 billion in damages across Florida and Louisiana.

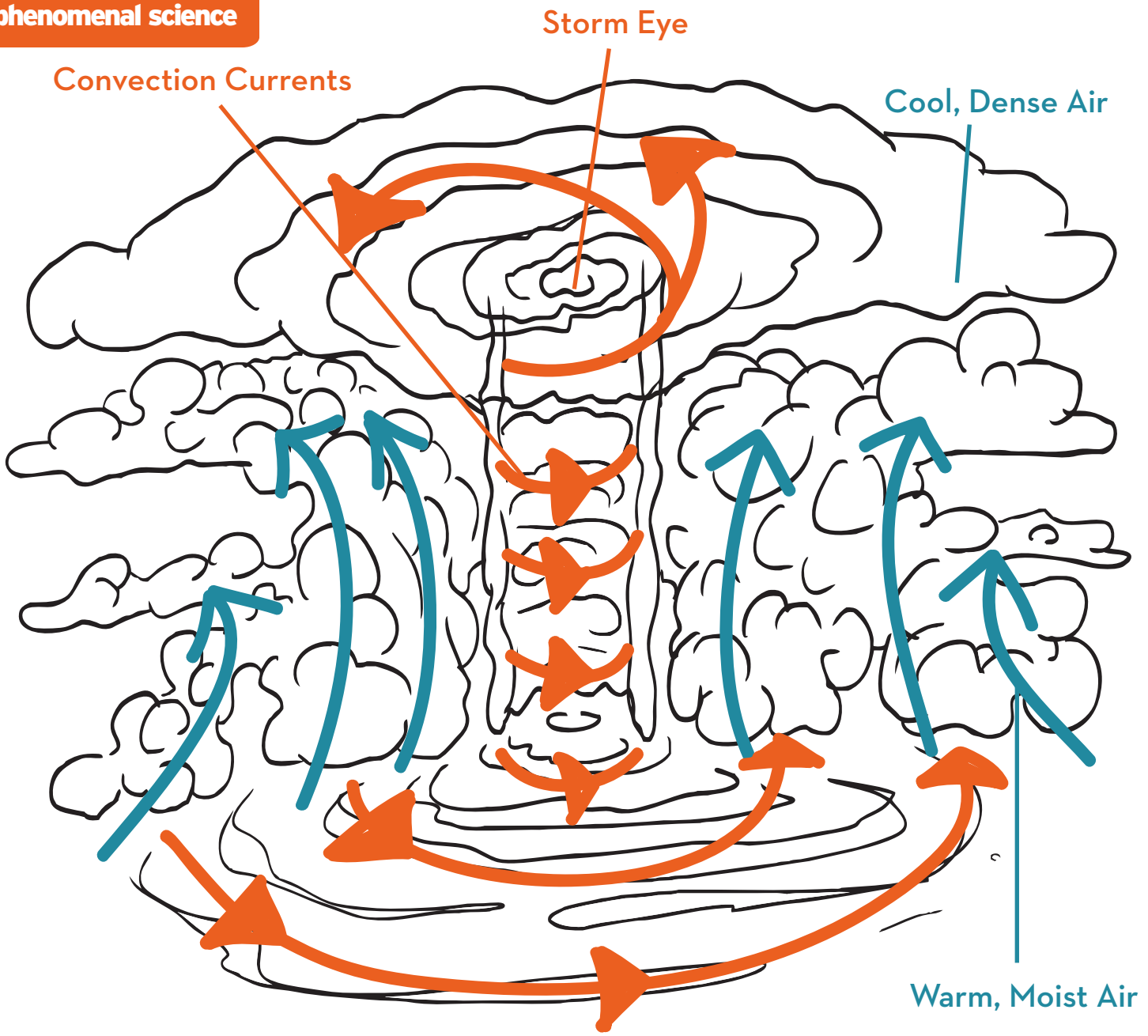
2005 — Hurricane Katrina
One of the deadliest hurricanes in US history, Katrina killed over 1,000 people and cost $81 billion in damages.

Safety Tips

1. Help your family put together a disaster kit.
2. Keep records of your valuables.
3. Plan an evacuation route with your family.
4. Keep an emergency radio.
5. During a storm, stay clear of electrical wires.
6. Research ways to secure and prepare your home.
7. If major flooding occurs, try staying above the water.

Explore Hurricanes!

phenomenal science



After reading the article on hurricanes, please answer the following questions:

Where do North American hurricanes originate? _____

What was the first US Hurricane named after a person? _____

How does a hurricane move across the Atlantic ocean? _____

Great job!

_____

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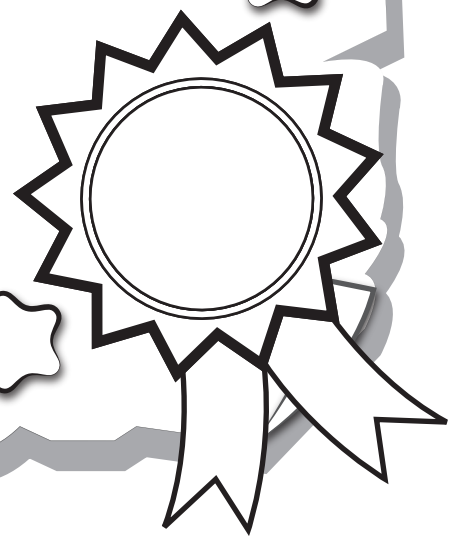


Answer Sheets

Fascinating Facts About Earth Science

Sort Out the Scientific Method #1
Scientific Method Steps
Sort Out the Scientific Method #3
Sort Out the Scientific Method #4
The Water Cycle
Read Up On Pollination
Photosynthesis
The Sun
Learn About Hurricanes
Learn About Tornadoes
Explore Tornadoes!
Explore Earthquakes!
Explore Tsunamis!
Explore Hurricanes!

Answer Sheet

Sorting out the Scientific Method #1 with Dr. E. McSquare

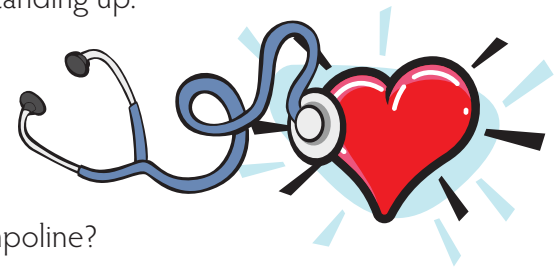
5TH GRADE
PHYSICAL SCIENCE

Scientist Dr. E. McSquare is compiling his scientific findings into a single volume. He forgot to give titles to the sections of his reports and now they're all mixed up! Use the definition guide to help Dr. McSquare label his reports.

Definition Guide:
Q = Question: The question is the first part of the scientific process. What question do you want to answer?
H = Hypothesis: A hypothesis is a statement that can be proven true or false. It is often written in the form "If (a) then (b)."
E = Experiment: The experiment is an activity that is used to test if your hypothesis is true or false.
D = Data: Data are the results of the experiment.
C = Conclusion: The conclusion is a final statement that describes what you learned from the experiment and results.

E I will test my lab partners' resting heart rates by counting their heart beats in three different positions: lying down, sitting, and standing up.

D **Object: Bounce count**
Golf ball: 4 bounces
Medicine Ball: 7 bounces
Baseball: 5 bounces



Q Do heavier objects bounce higher on a trampoline?

H If standing up requires more physical effort than lying down, then one's pulse standing up will be faster than one's pulse lying down.

E From a fixed height, I will drop a variety of objects onto a trampoline several times and observe the number of bounces.

H If there is and equal an opposite reaction to every action, then heavier objects will bounce higher off a trampoline.

D **Maurice:** Lying down - 55 bpm, Sitting - 59 bpm, Standing - 65 bpm
Lucy: Lying down - 58 bpm, Sitting - 60 bpm, Standing - 70 bpm
Carlos: Lying down - 51 bpm, Sitting - 54 bpm, Standing - 56 bpm

Q How does your resting heart rate change depending on your position?

C The experiment and data show that heavier objects bounce higher on trampolines.

C A person's position affects his or her resting heart rate. The heart rate is higher if the body is upright.

Answer Sheet

5TH GRADE
PHYSICAL SCIENCE

Scientist Dr. E. McSquare is compiling his scientific findings into a single volume. He forgot to give titles to the sections of his reports and now they're all mixed up! Use the definition guide to help Dr. McSquare label his reports.

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E = Experiment: The experiment is an activity that is used to test if your hypothesis is true or false.
D = Data: Data are the results of the experiment.
C = Conclusion: The conclusion is a final statement that describes what you learned from the experiment and results.

C The results of this experiment show that the boiling point of water does rise as the amount of salt in the water increases.

E I will drop a variety of objects from a height of 10 feet and use a stopwatch to record the time it takes for them to hit the ground.

H Ignoring wind resistance, if two objects are dropped at the same time, they will both hit the ground at the same time because gravity is the same for both of them.

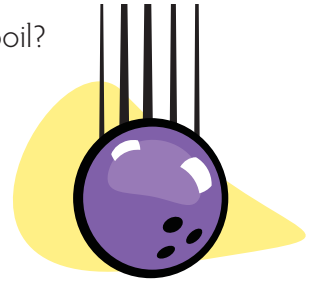
C The results of this experiment showed that objects fall at the same rate despite weight differences.

D **Object (weight) (drop time)**
Shoe: (15 oz) (.82 seconds)
Bowling ball: (12 pounds) (.82 seconds)
Pencil: (2 oz) (.84 seconds)

E I will put a thermometer in each of 3 pots of boiling water. Each pot will contain a different amount of salt. I will observe and compare the temperatures in each pot when the water begins to boil.

Q Does adding salt change the temperature at which water begins to boil?

Q Do heavier objects fall faster than lighter objects?



D **Temperature when boiling begins (salt quantity)**
Pot 1: 214.2 F (0g)
Pot 2: 216.3 F (50g)
Pot 3: 218.3 F (100g)

H If adding salt to water increases the density of water, then it requires more energy to make it boil, thus increasing the boiling point temperature.

Answer Sheet

Sorting out the Scientific Method #3 with Dr. E. McSquare

5TH GRADE
PHYSICAL SCIENCE

Scientist Dr. E. McSquare is compiling his scientific findings into a single volume. He forgot to give titles to the sections of his reports and now they're all mixed up! Use the definition guide to help Dr. McSquare label his reports.

Definition Guide:
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H = Hypothesis: A hypothesis is a statement that can be proven true or false. It is often written in the form "If (a) then (b)."
E = Experiment: The experiment is an activity that is used to test if your hypothesis is true or false.
D = Data: Data are the results of the experiment.
C = Conclusion: The conclusion is a final statement that describes what you learned from the experiment and results.

H If plants reflect green light, then they must absorb red light (the opposite of green) and thus grow faster under red lights.

D **Plant Specimen - Light color: Growth**
Yellow Hibiscus - Green light: +9.4cm, **Red light:** +12.2cm, **Blue light:** 11.9cm
Golden Sage - Green light: +6.6cm, **Red light:** +8.1cm, **Blue light:** +7.1cm
Soybean Plant - Green light: +7.4cm, **Red light:** +10.1cm, **Blue light:** +10.0cm
Common Gardenia - Green light: +5.1cm, **Red light:** +6.9cm, **Blue light:** +6.9cm

E I will place 4 different plants under green lights and compare their growth over a month with identical plants under red and blue lights.

E Using clear containers with measurement marks, I will compare the volume of a glass of water at room temperature with a glass of frozen water.

Q Which color lights cause plants to grow more effectively?

D **Container# - State of water: height**
Container 1 - Water: 14.0ml, **ice:** 14.8ml
Container 2 - Water: 20.0ml, **ice:** 20.8ml
Container 3 - Water: 24.0ml, **ice:** 24.9ml

Q Does the volume of water change when it freezes?

C After consistent results, I found the that water increases in volume when it freezes.

C The results of this experiment showed that green light was the least effective color for growing our plants. Blue and red lights caused the greatest amount of growth.

H If the molecular structure of solids is more dense than liquids, then water will decrease in volume when it freezes.

Answer Sheet

Sorting out the Scientific Method #4 with Dr. E. McSquare

5TH GRADE
PHYSICAL SCIENCE

Scientist Dr. E. McSquare is compiling his scientific findings into a single volume. He forgot to give titles to the sections of his reports and now they're all mixed up! Use the definition guide to help Dr. McSquare label his reports.

Definition Guide:
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E = Experiment: The experiment is an activity that is used to test if your hypothesis is true or false.
D = Data: Data are the results of the experiment.
C = Conclusion: The conclusion is a final statement that describes what you learned from the experiment and results.

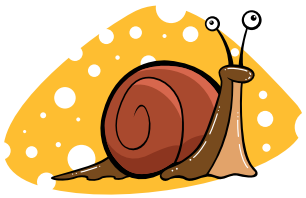
Q Do snails crawl faster on concrete or glass?

D **Amber: Left eye:** decreased. **Right eye:** decreased.
Julio: Left eye: decreased. **Right eye:** decreased.
Claudia: Left eye: decreased. **Right eye:** decreased.

E I will test my lab partners' pupils by covering one eye and shining a light directly into the other. Then, I will note the change in pupil size.

H If snails move faster on smoother surfaces, then a snail will move faster on glass than on concrete.

C The results of the experiment showed that pupil size decreases when there is more light present. In order to absorb less light, the pupils shrink.



D **Snail 1:** Glass - 45s, Concrete - 55s
Snail 2: Glass - 49s, Concrete - 49s
Snail 3: Glass - 55s, Concrete - 56s

H If a pupil absorbs all visible light, then it will get smaller in size when there is more light.

C Snails move faster on glass than on concrete.

Q What makes the pupil in the eye change size?

E I will organize snail races on glass and concrete and compare how fast snails travel on each surface.

Answer Sheet

The Water Cycle

Since the very first years of Earth's existence, there has been water present. No water is ever added or taken away from our atmosphere because it's constantly moving in a *water cycle*. Read the definitions below and put the corresponding letter in the squares marking each part of the cycle in the diagram.

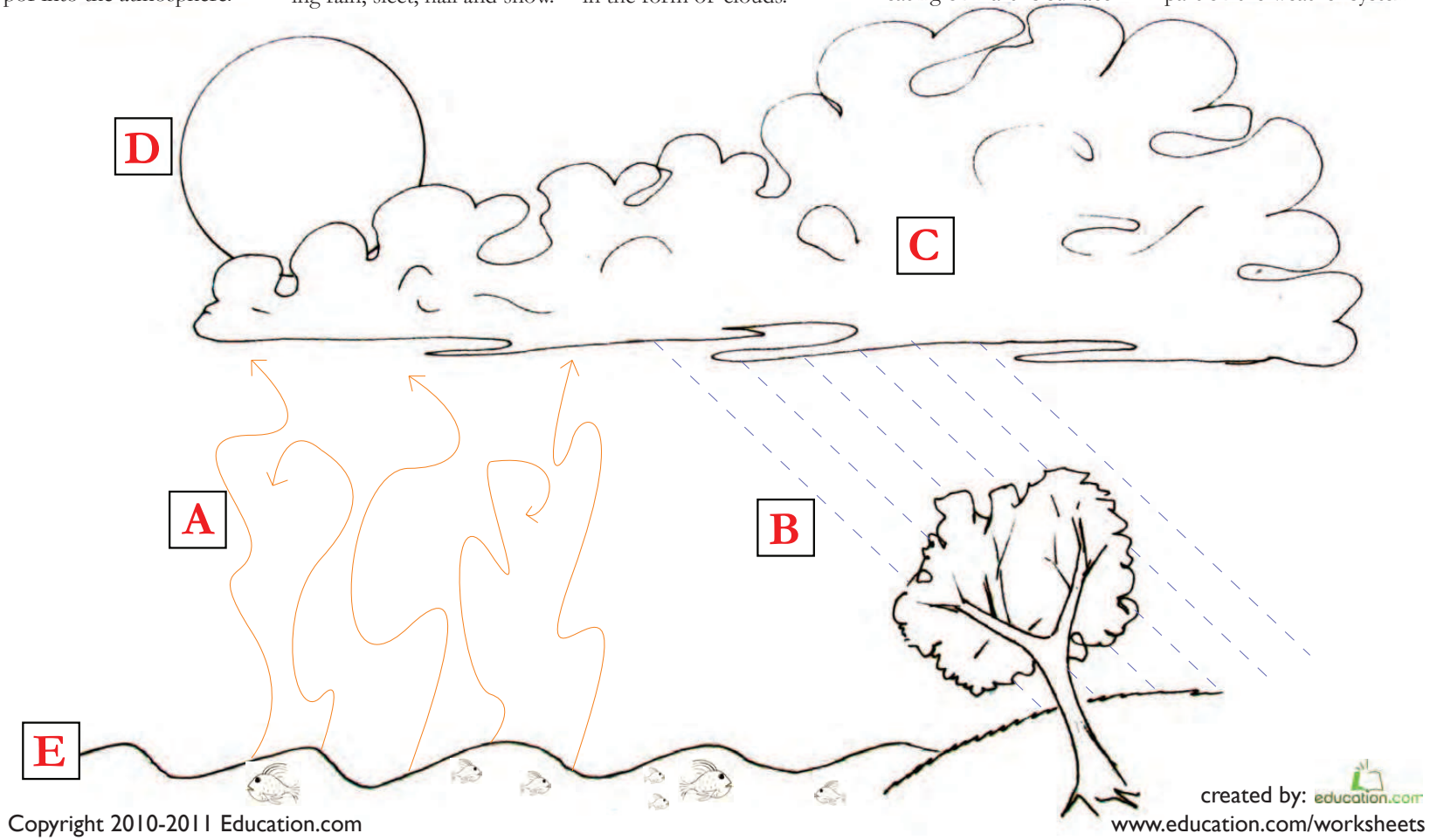
A Evaporation:
Liquid water is heated by the sun until it rises as water vapor into the atmosphere.

B Precipitation:
Water falling to the Earth in the form of weather - including rain, sleet, hail and snow.

C Condensation:
Water vapor molecules join together, becoming liquid, in the form of clouds.

D The Sun:
Creates all of the weather on Earth through the uneven heating of Earth's surface.

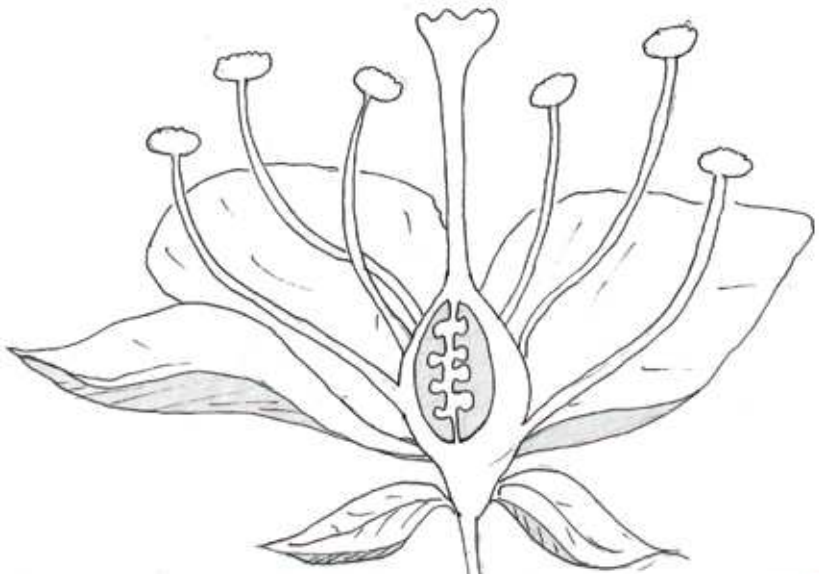
E Liquid Water:
All living things need this to survive and it is an important part of the weather system.

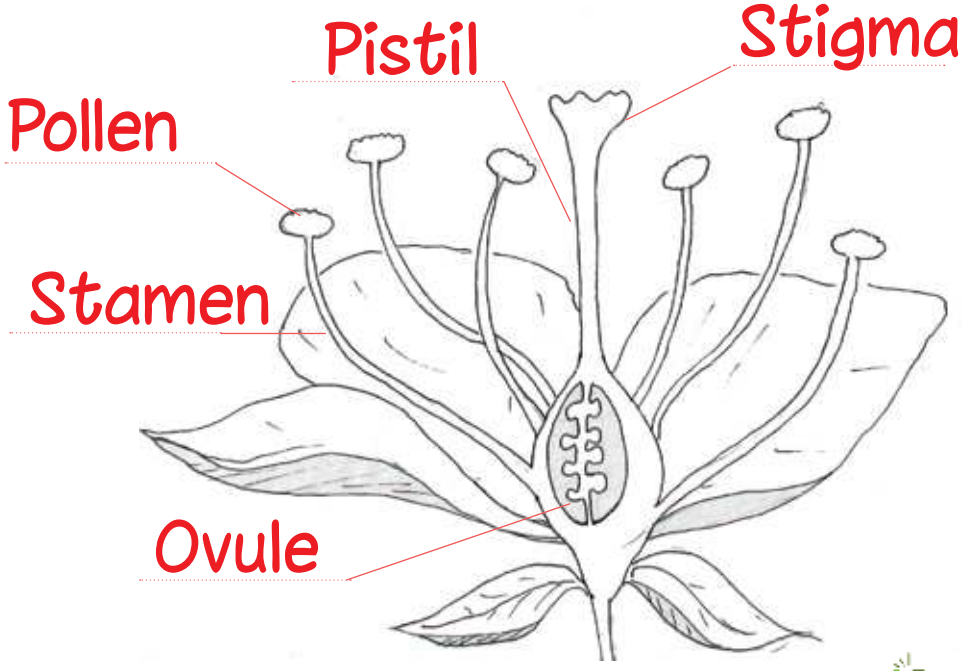


ANSWER SHEET

Pollination is very important and neccessary to the reproduction of plants. There are several stems within a flower. These are called **stamen**. At the top of each stamen is a small pad where **pollen** sits. At the center of a flower there is a tube. The top of the tube is a sticky platform called a **stigma**. Pollen from the stamen must be transported to the stigma. This is typically done when bees and other insects feed on the nectar of the flower. The pollen sticks to the feeding bee. When the bee flies away to feed on another flower, it carries the pollen from the first flower to the stigma of the second flower. From the stigma pollen travels through a tube called the **pistil** down to the base of the flower. At the base of the flower is the **ovule**. That is where the pollen mixes with the other reproductive elements of the flower to make the seeds for new plants. It is important that the pollen of one flower reaches the stigma of the other. This creates diversity in the new plant's genes. Diversity means the new plant will not not inherit all the traits of either of its parents so it is less likely to inherit any problems they might have had.

First, find the different parts of the flower in the diagram, label and color them in. Color the stamen black, the pollen yellow, the stigma red, the pistil green and the ovule blue. Then with a blue line trace the path the bee must take to pollinate these two flowers. Using a green line trace the path the pollen takes to create new seeds with a different plant.



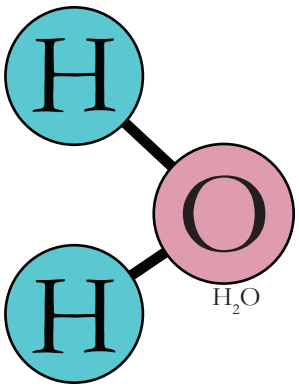


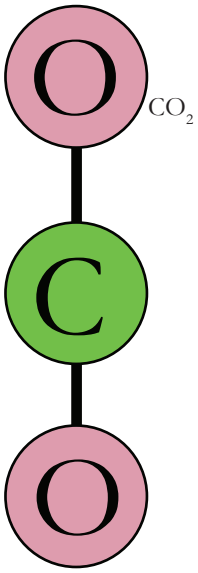
Photosynthesis

Use the word bank below to fill in the empty spaces in the paragraph to the right.

Word Bank

CARBON DIOXIDE
CHLOROPHYLL
GLUCOSE
FOOD
LIGHT
BREATHING
WATER





Photosynthesis is a process where plants create their own food using sunlight.

Plant leaves absorb red and blue light into their leaves, reflecting green light. This is why most plants are green in color. A chemical called chlorophyll is found inside most plant cells. This is the substance that absorbs sunlight.

Meanwhile, plants are absorbing water (H_2O) through their roots and storing it within their cells. When the sunlight hits the water molecules, the water breaks apart into hydrogen and oxygen.

Plants also take carbon dioxide (CO_2) in through holes in their leaves, called stomata. This is a plant's way of breathing. When the carbon dioxide combines with hydrogen, a type of sugar called glucose is formed. This is a plant's food, and it uses this energy to live and grow. The extra oxygen molecules are released back into the atmosphere.

The Sun

Answer Sheet

What is the difference between a flare and a prominence?

A flare flashes off of the sun's surface, while a prominence loops back to the sun's surface.

What part of the sun produces the majority of heat and light?

The core produces the majority of the sun's heat and light.

What two parts of the sun's outer layer are only visible from Earth during a solar eclipse?

The corona and the chromosphere are both visible during a solar eclipse, but normally are not visible to the naked eye.

Why are sunspots darker than surrounding areas?

Sunspots are darker than surrounding areas because they are a lower temperature.

What part of the sun do we see from Earth?

We can see the photosphere from Earth.

Learn About Hurricanes

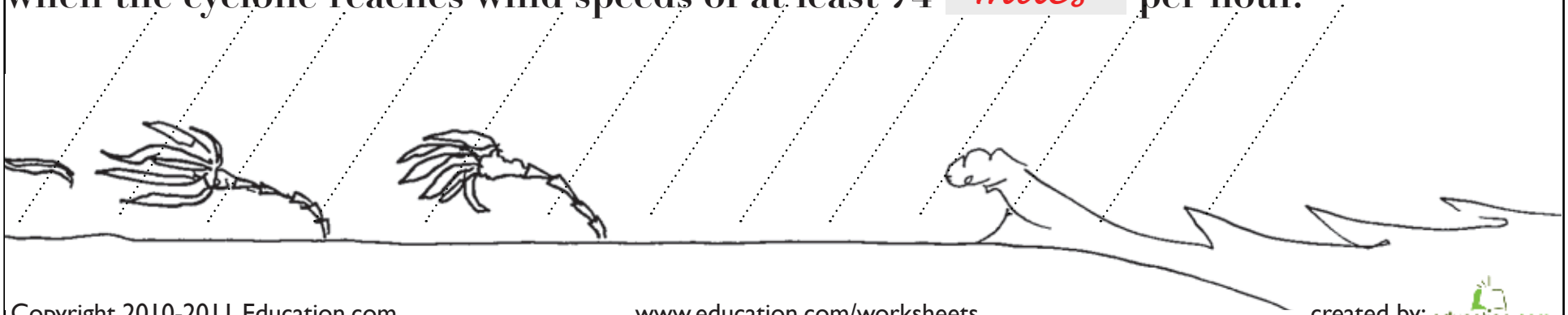
Use the word bank to fill the empty spaces in the paragraph.

ANSWER SHEET

Word Bank

ISLANDS
HUMID
OCEAN
ENERGY
RAIN
MILES
WINDS
SPIRALS

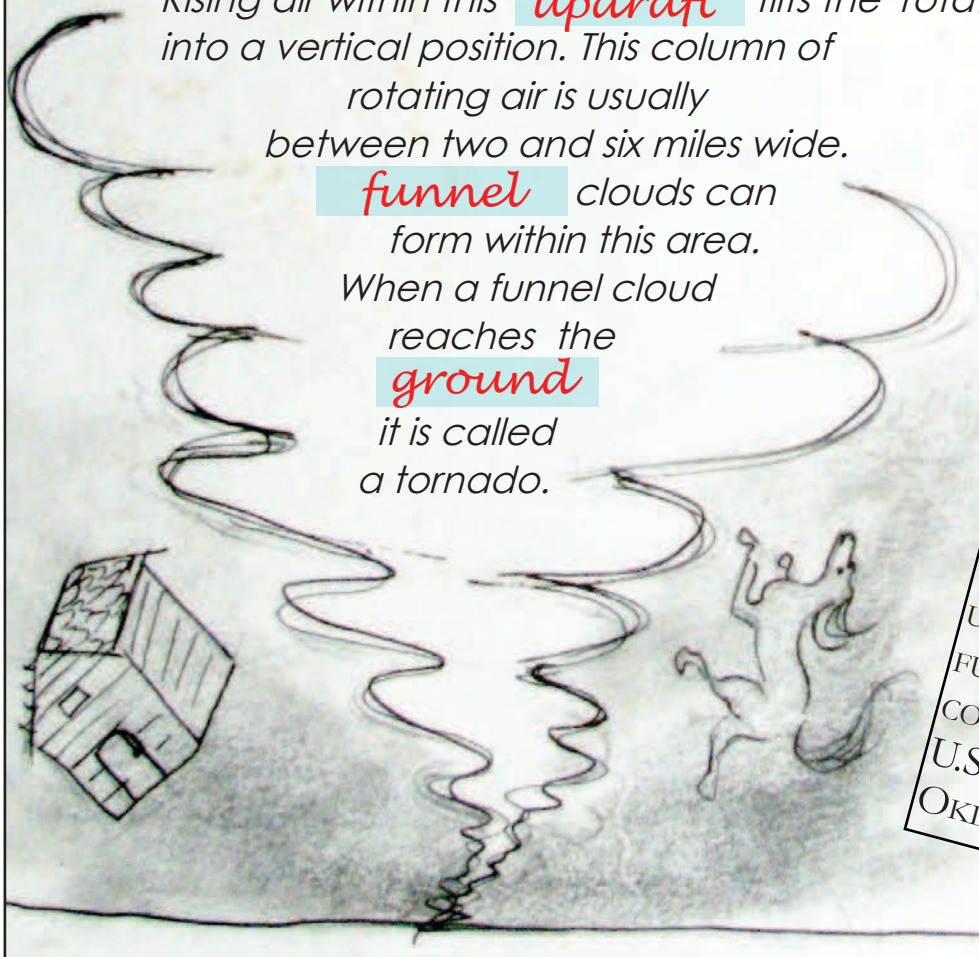
A hurricane is a huge storm that forms over the open *ocean*. Hurricanes are made up of strong *winds* and are usually accompanied by heavy *rain*. They can create large waves and cause a great amount of damage. Because a hurricane only travels over open ocean waters the places most at risk are *islands* and coastal towns. Hurricanes are formed over ocean water that is 80° F or warmer. The warm water provides *energy* for the hurricane. Winds come together above the water and force the air upward. *Humid* air, which is hot and moist, rises from the water to create storm-clouds. Above the storm clouds wind flows outward and allows the air to rise. The wind *spirals* around and around the storm. This storm becomes a hurricane when the cyclone reaches wind speeds of at least 74 *miles* per hour.



Learn *About* Tornadoes

Answer Key!

A tornado is a spiraling **column** of air that reaches from a cloud to land. Tornadoes can reach speeds of up to **300** miles per hour and can cause significant destruction! In the **U.S.A.** there are about 1,000 tornadoes each year. Most of these tornadoes occur in an area called Tornado Alley. Tornado alley is right in the middle of the country and includes the states Texas, Kansas and **Oklahoma**. Most tornadoes form during **thunderstorms**. When warm, moist air and cool, dry air mix the atmosphere becomes unstable. With a change in wind speed and direction a spinning effect begins to take place. Rising air within this **updraft** tilts the rotating air into a vertical position. This column of rotating air is usually between two and six miles wide. **funnel** clouds can form within this area. When a funnel cloud reaches the **ground** it is called a tornado.



Use the word bank below to fill the empty spaces in the paragraph.

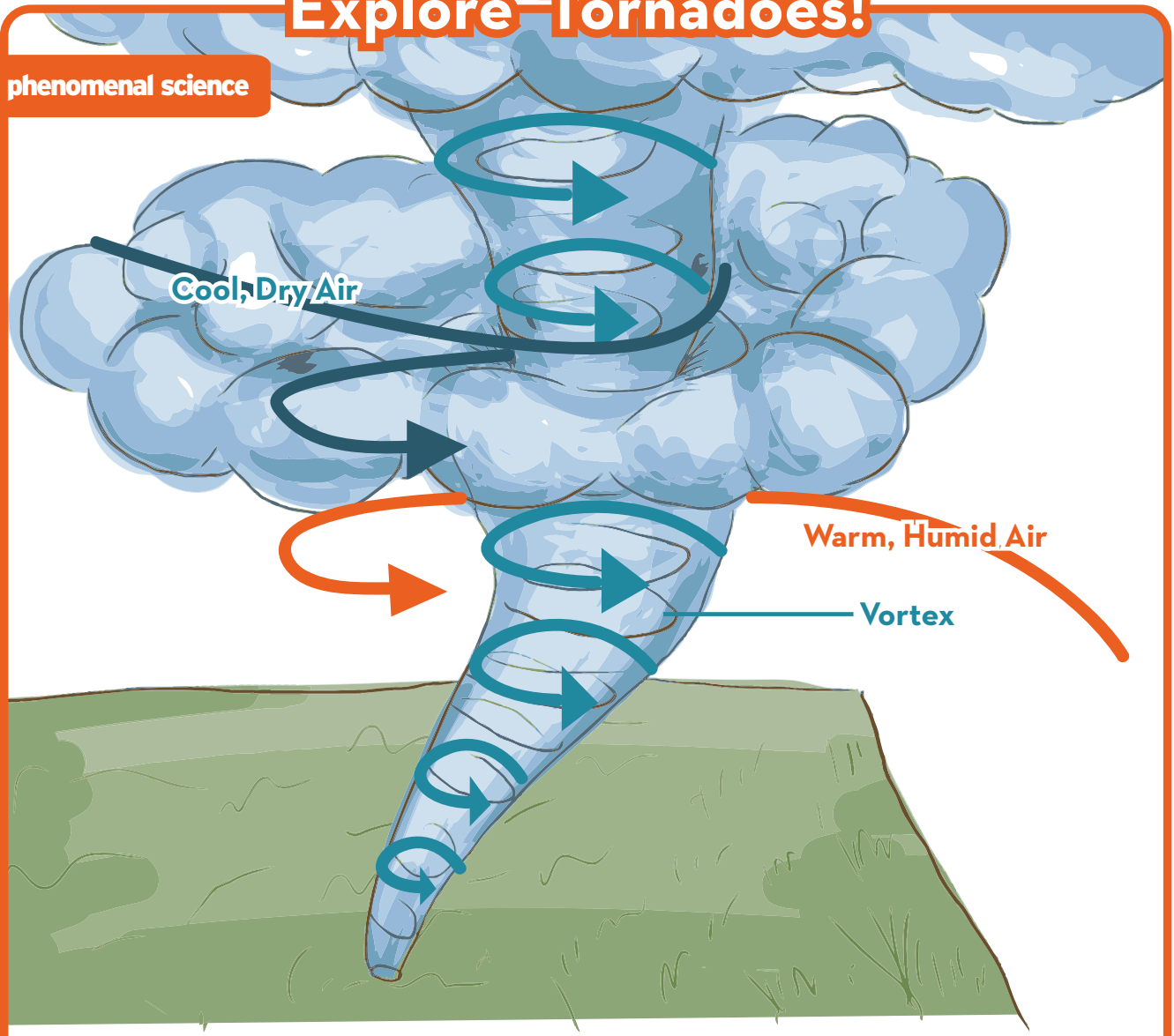
Word Bank

300
GROUND
THUNDERSTORMS
UPDRAFT
FUNNEL
COLUMN
U.S.A.
OKLAHOMA

Answer Sheet

Explore Tornadoes!

phenomenal science



After reading the article on tornadoes, please answer the following questions:

What makes a tornado spin? **When warm, wet air collides with cool, dry air causing the storm to spin faster and faster, creating a vortex.**

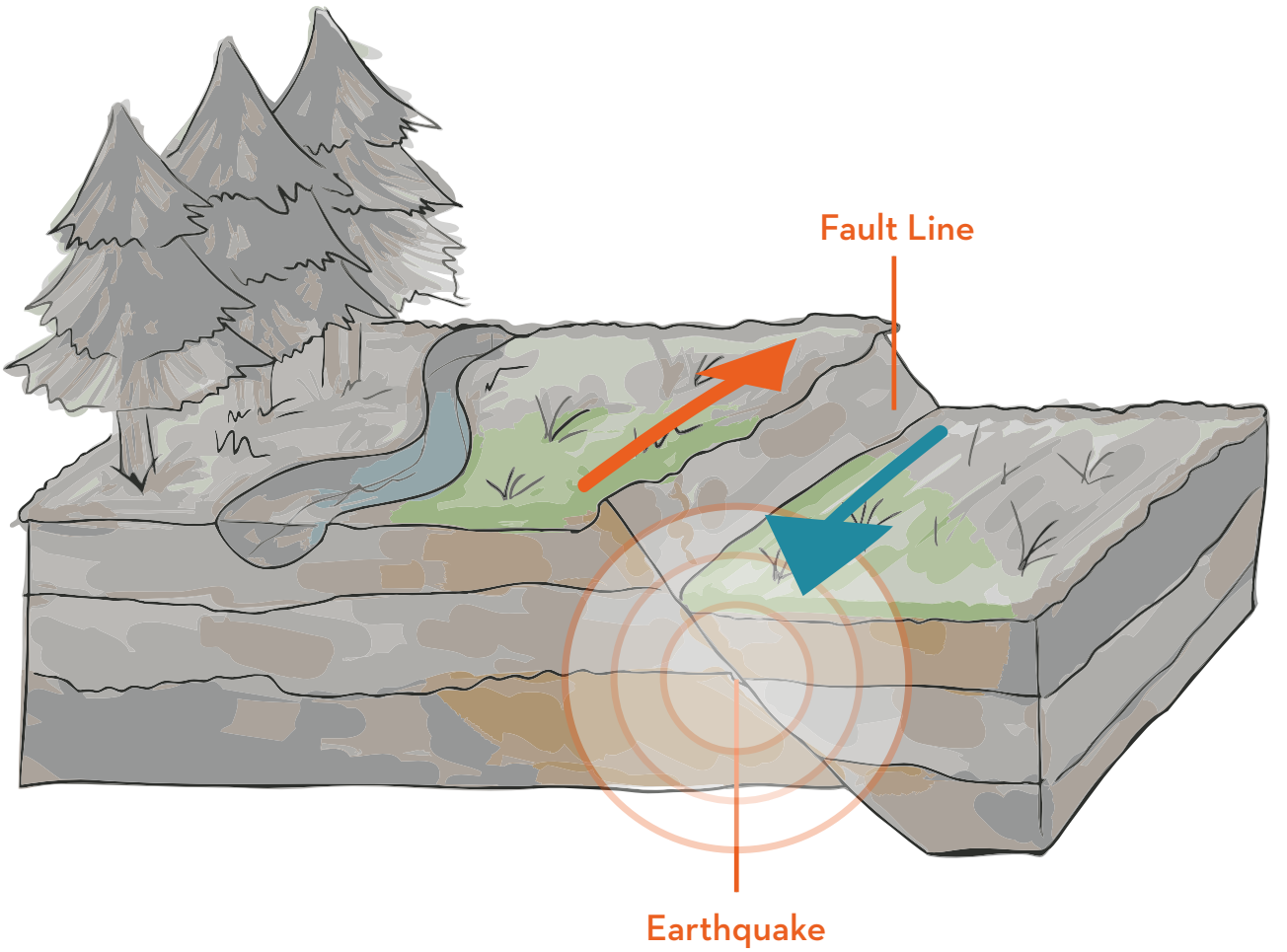
What is the Fujita Scale? **The Fujita Scale measures a tornado's strength.**

Describe how a tornado moves. **The tornado follows a path that is controlled by its parent thunder cloud. When the vortex is disturbed, the tornado appears to hop and skip.**

Answer Sheet

Explore Earthquakes!

phenomenal science



After reading the article on tsunamis, please answer the following questions:

Name two different events that would cause an earthquake. **Volcanic eruptions, Meteor strikes, big underground explosions, and/or the earth's tectonic plates.**

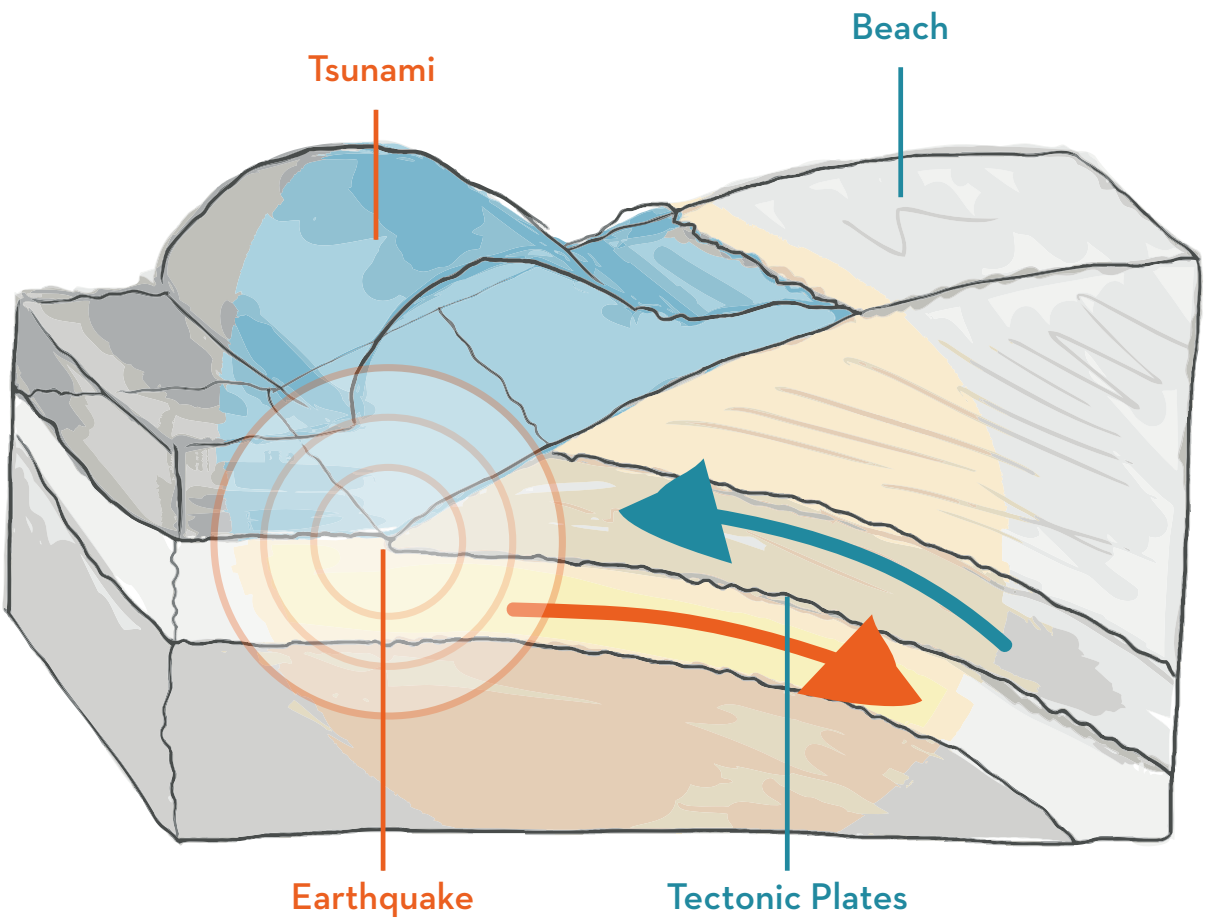
What are the three ways tectonic plates interact with each other? **Normal fault, reverse fault, and slip fault**

What are seismic waves? **Waves that radiate through the ground and cause the earth to shake.**

Answer Sheet

Explore Tsunamis!

phenomenal science



After reading the article on tsunamis, please answer the following questions:

Name two different events that would cause a tsunami. **Underwater volcanic eruptions, meteor strikes, coastal landslides, and underwater earthquakes.**

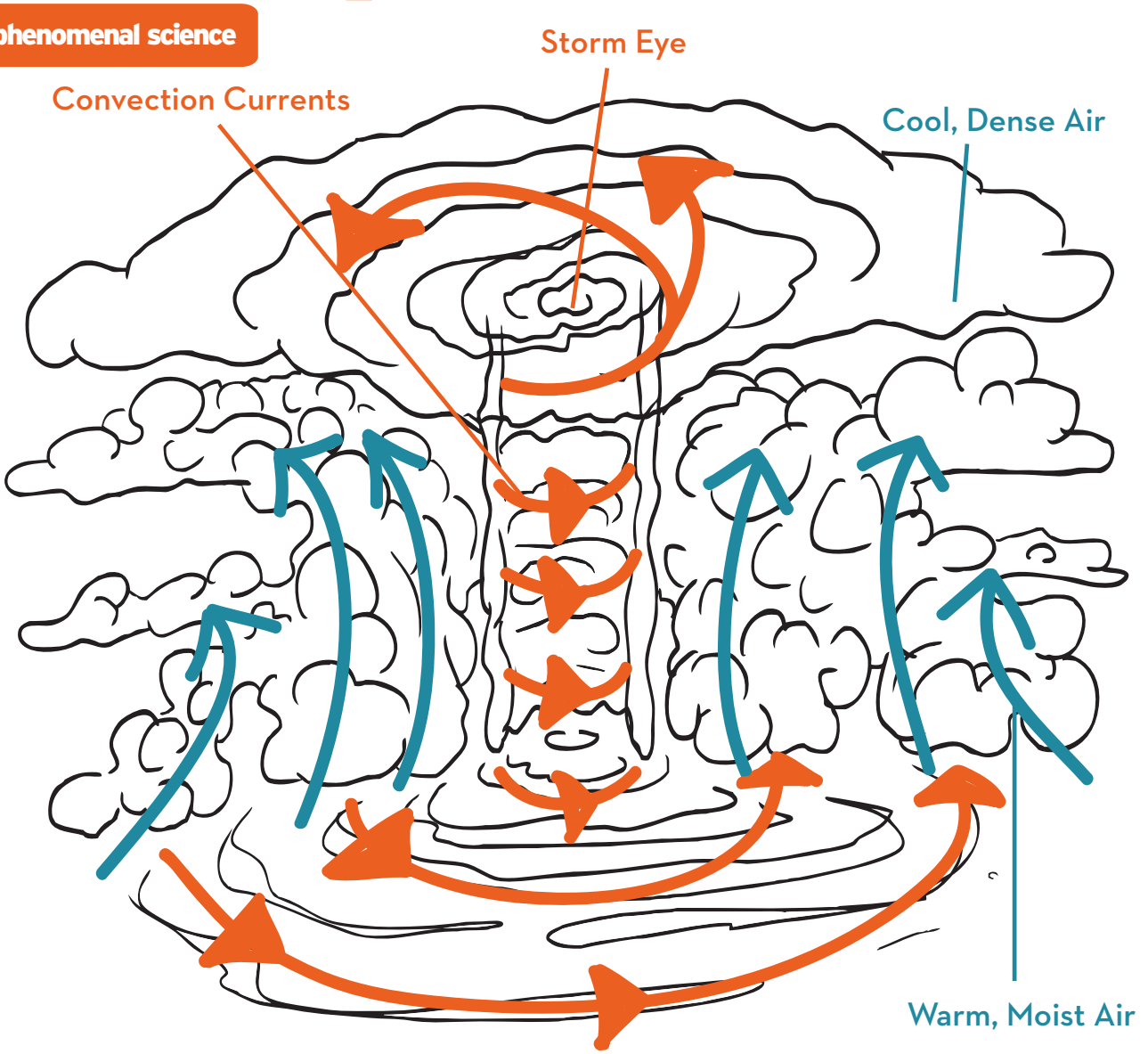
How do tectonic plates cause earthquakes? **Pressure builds as the plates move against each other. Releasing the pressure creates earthquakes.**

What are some ways you can prepare for a tsunami? **Refer to 'Safety Tips' in the article.**

Answer Sheet

Explore Hurricanes!

phenomenal science



After reading the article on hurricanes, please answer the following questions:

Where do North American hurricanes originate? **Hurricanes start as thunderstorms in Africa that are blown east into the Atlantic ocean.**

What was the first US Hurricane named after a person? **Hurricane Camille.**

How does a hurricane move across the Atlantic ocean? **Trade winds from Africa will push the hurricane east, towards the US.**