Crazy Science

Presents:

The Weather Report

Teacher Resource Kit

The weather affects all life on our planet and that is why the weather is one of the most studied topics on Earth. We read about the weather in newspapers and on the Internet, watch images on television, listen to weather reports on the radio and discuss it over the fence with the neighbours.

The weather not only provides the supporting climate in which we exist, the conditions to grow the food we eat and the nutrient cycles for nature but can also have a dramatic affect on our health and well being.

Key Weather Words Defined

If you want to talk about the weather, it helps to know the lingo. The following list contains both common and uncommon words you need to know to discuss weather and weather conditions knowledgably:

Atmosphere: The envelope of gases that compose the air surrounding Earth.

Chaos: A state of a system in which disturbances large and small grow and decay. (The atmosphere is chaotic, and so is unpredictable beyond a few days.)

Coriolis Effect: The "bending" effect of the Earth's rotation on the path of things in motion in the atmosphere and the ocean. The bending or deflection of its course is to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.

Dewpoint: The temperature to which air must be cooled in order for it to become saturated with water vapor.

El Niño: The tropical Pacific Ocean becomes warmer, and air pressure changes, reducing the strength of east to west winds. These changes can affect weather in many parts of the world.

Equinox: Latin for "equal nights." The time in spring and autumn when the Sun shines directly over the Equator and hours of daylight and darkness are equal everywhere.

Global warming: The idea that the continual buildup of greenhouse gases in the atmosphere is leading to warming of temperatures that could alter climate patterns and seriously disrupt societies.

High pressure system: An area where more air has been added overhead than in surrounding areas. That accounts for higher barometric pressure. Typically, the air enters at high altitudes, sinks, and exits at ground level. The sinking motion causes warming and drying, leaving the clear sky often found in high pressure areas.

Low pressure system: An area of rising air usually marked by cloudiness, often referred to as a storm.

Ozone hole: A thinning of the protective ozone layer in the stratosphere, often observed over Antarctica since the late 1970s during the Southern Hemisphere's spring.

Precipitation: Water vapor that condenses in the atmosphere, falling to the surface as rain, snow, or ice.

Pressure: The weight of the air overhead, exerted in all directions on everything air touches. Horizontal differences in pressure cause winds. Vertical differences in air pressure influence cloud formation and storm development.

Relative humidity: The percentage of the air that is saturated with water vapor at the current temperature. A value that changes with temperature. Air that is saturated at 10 C— 100 percent relative humidity — falls to about 50 percent relative humidity when its temperature rises to 20 C.

Solstice: The point reached on or about June 21 and December 21 when the seasonal track of sunlight over the

Earth reaches its northernmost and southernmost progress.

Stratosphere: The layer of much thinner gases in the atmosphere above the troposphere, between 15 to 50 kilometres in height. It includes the ozone layer. It is called the stratosphere because the temperatures are usually stratified and uniform at this level.

Troposphere: The lowest part of the atmosphere, where all of the weather takes place. It is from 0 to 15 kilometers. It has more air and has many clouds.

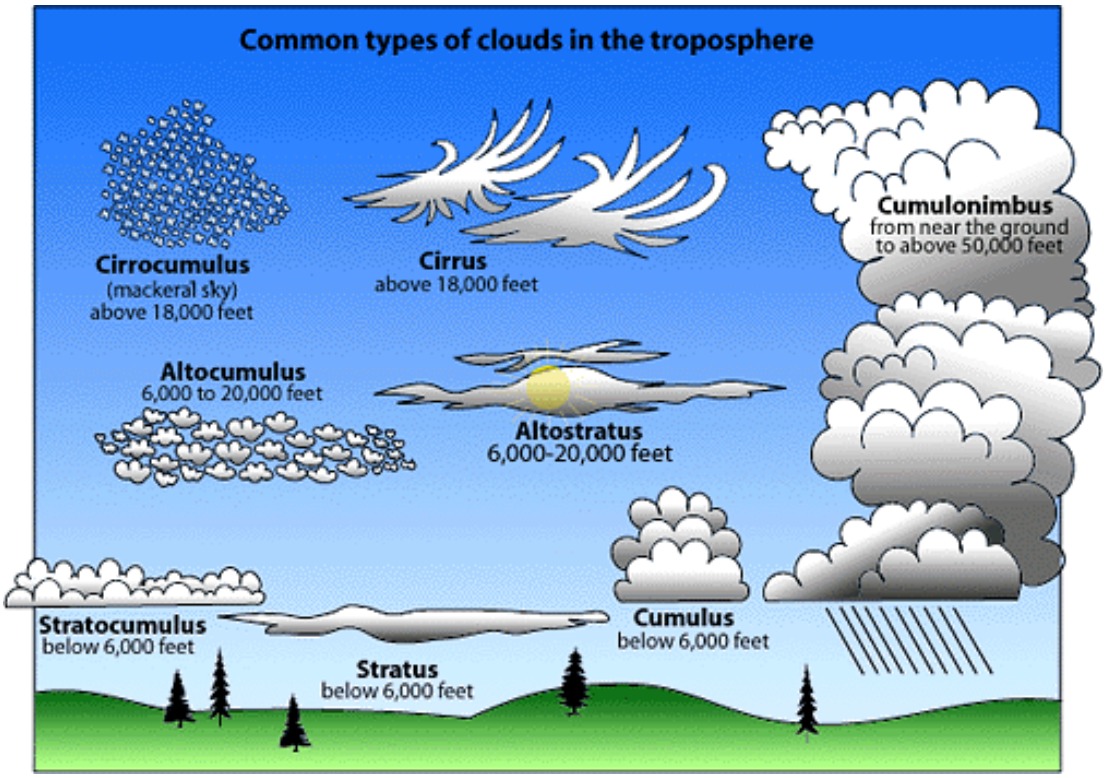
Wind chill: The additional cooling effect of wind blowing on bare skin.

Lets get Cirrus about clouds

In meteorology, a cloud is a visible mass of liquid droplets or frozen crystals made of water or various chemicals suspended in the atmosphere above the surface of a planetary body. Two processes, possibly acting together, can lead to air becoming saturated: cooling the air or adding water vapor to the air.

Types of Cloud

Clouds play a large role in discussing, predicting, and watching the weather — not to mention providing scope for daydreams and flights of fancy. The following list describes the common cloud types that form in various layers of the atmosphere — their names and what they look like — as well as clouds that form vertically.



- **High layered (above 5000 metres):**
  - **Cirrus**: These clouds are thin, wispy clouds blown by high winds into long streamers. These delicate white strands of ice crystals often form "mares tails." They generally mean fair to pleasant weather

Cirrostratus: A veil of white cloudiness often

covering the entire sky. They are so thin that the sun and moon can be seen through them, causing “halos”, and they frequently indicate an approaching storm.

Cirrocumulus: These clouds appear as small, rounded white puffs. The small ripples in the cirrocumulus sometimes resemble the scales of a fish. A sky with cirrocumulus clouds is sometimes referred to as a "mackerel sky."

- **Middle layered (2,000 to 5,000 metres):**

Clouds with the prefix "alto" are middle level clouds that have bases between 2000 and 7000 metres.

Altostratus: Altostratus is a cloud belonging to a class characterized by a generally uniform gray to bluish-gray sheet or layer. Altostratus most often takes the form of a featureless sheet

of cloud but can be wavy (undulatus) as a result of wind shear through the cloud. It can also be fragmented (fibratus) with clear sky visible, which often signals the approach of a weakened or upper level warm front. These drab gray clouds can be made of either water droplets or ice crystals. They appear as gray, puffy masses, sometimes rolled out in parallel waves or bands that obscure the image of the sun or moon. The appearance of these clouds on a warm, humid summer morning often means thunderstorms may occur by late afternoon.

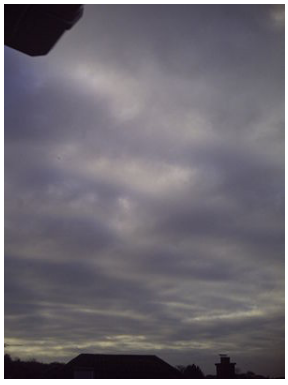
Altocumulus: Altocumulus (Alto, "high", cumulus, "heaped") is usually a white or grey cloud belonging to a class characterized by globular masses or rolls in layers or patches. Like other cumulus clouds, altocumulus signifies convection. These fluffy waves of gray clouds can bring showers or break up to give sunny periods. The small, white, puffy clouds that sometimes slowly drift across the sky can look like dozens, of small, loose cotton balls. This is Altocumulus and it forms between 2.5-5.5 km. Altocumulus can develop in several ways. Moist air is cooled by turbulence, then lifted up slightly and cooled to form a layer of cloud at that height. Altocumulus usually forms in a layer of moist air, where air currents undulate gently, like waves on the sea. As a wave rises, water vapour condenses, and there is cloud. In the wave troughs, water evaporates. There the

cloud is thinner or the sky may be clear, producing the bands of cloud that are sometimes seen.

- **Low layered (below 2,000 metres):**
  - **Stratus**: A stratus cloud (St) is a cloud belonging to a class characterized by horizontal layering with a uniform base, as opposed to convective clouds that are as tall or taller than wide (these are termed cumulus clouds). More specifically, the term stratus is used to describe flat, hazy, featureless clouds of low altitude varying in color from dark gray to nearly white. Stratus clouds may produce a light drizzle or snow. A "cloudy day" usually features a sky filled with stratus clouds obscuring the disk of the sun. These clouds are essentially above-ground fog formed either through the lifting of morning fog or when cold air moves at low altitudes over a region. They are wispy clouds of fog that hang a few hundred feet above the ground, often bringing drizzle.

- **Stratocumulus**: A stratocumulus cloud belongs to a class of clouds characterized by large dark, rounded masses, usually in groups, lines, or waves, the individual elements being larger than those in altocumuli, and the whole being at a lower altitude, usually below 2,400 m. Stratocumulus clouds generally appear as a low, lumpy layer of clouds that is sometimes accompanied by weak intensity precipitation. Stratocumulus vary in color from dark gray to light gray and may appear as rounded masses, rolls, etc., with breaks of clear sky in between. They can be dark gray clouds, often covering the entire sky, which usually do not rain or can form rounded wavelike bands that are broken by blue sky. 'Dull weather' is a common expression incorporated with overcast stratocumulus days,

  These are same in appearance to altocumuli and are often mistaken for such. A simple test to distinguish these is to compare the size of individual masses or rolls: when pointing one's hand in the direction of the cloud, if the cloud is about the size of the thumb, it is altocumulus; if it is the size of one's entire hand, it is stratocumulus. Stratocumulus is also often, though not always, darker in colour than altocumulus.



- Nimbostratus: Low, dark, ragged rain clouds that often bring continuous rain or sleet or snow. A nimbostratus cloud is characterized by a formless cloud layer that is almost uniformly dark gray. "Nimbo" is from the Latin word "nimbus", which denotes precipitation (rain).

  Nimbostratus often have very few visual features.

  On a dull day when it rains or snows gently but ceaselessly, the blanket of grey cloud hiding the sun and any higher cloud, is Nimbostratus. Nimbus means rain, and stratus means sheet, so nimbostratus is a sheet cloud from which rain or snow is falling - usually continuously.

- **Vertical clouds**:
  - **Cumulus**: Large, billowy “cotton balls” of clouds with dark bottoms and bright white tops that can reach 3,000 metres high. May produce brief showers.

    Cumulus clouds are a type of cloud with noticeable vertical development and clearly defined edges Cumulus means "heap" or "pile" in Latin. The "puffy" or "cotton-like" clouds may appear alone, in lines, or in clusters. Cumulus clouds are often precursors of other types of clouds, such as cumulonimbus, when influenced by weather factors such as instability, moisture, and temperature gradient.

Cumulonimbus: Towering thunderheads, dark on the bottom and white anvil-shaped tops that can extend to 15,000 metres. Often produces lightning and heavy precipitation, including hail. These towering tall, dense vertical clouds are involved in thunderstorms and other inclement weather. Cumulonimbus originates from Latin: Cumulus "heap" and nimbus "dark cloud". It is a result of atmospheric instability. These clouds can form alone or in clusters. They can create lightning and other dangerous severe weather. Cumulonimbus clouds form from cumulus clouds and can further develop into a supercell, a severe thunderstorm with special features.

Recipe for Weather

Ingredients:

Temperature
Pressure
Volume
Density

Combine ingredients in the troposphere.
Mix thoroughly and you will have weather

Temperature is a physical property of matter that quantitatively expresses the common notions of hot and cold. Objects of low temperature are cold, while various degrees of higher temperatures are referred to as warm or hot. When a heat transfer path between them is open, heat spontaneously flows from bodies of a higher temperature to bodies of lower temperature. The flow rate increases with the temperature difference, while no heat will be exchanged between bodies of the same temperature, which are then said to be in "thermal equilibrium".

The atoms and molecules in a substance do not always travel at the same speed. This means that there is a range of energy (the energy of motion) among the molecules. In a gas, for example, the molecules are traveling in random directions at a variety of speeds - some are fast and some are slow. Temperature is a measure of the average heat or thermal energy of the particles in a substance.

Hot: The faster the molecules that make up a substance move the hotter that substance gets.
Cold: The slower the molecules that make up a substance move the colder that substance gets.

Absolute Zero: Absolute zero (-273 C) is the theoretical lowest possible temperature. It has never been reached.

It is the temperature where all molecular movement would stop.

Pressure: The amount of force that presses on a certain area is known as pressure. The pressure on the surface will increase if you make the force on an area bigger. Making the area smaller and keeping the force the same also increase the pressure.

Question: You can push a drawing pin into a piece of wood- but you cannot push your finger into the wood even if you exert a larger force. Why? What is the difference between a sharp knife and a blunt knife?

Answer: The difference in each case is a difference of area- the point of the drawing pin and the edge of the sharp knife have a small area. A force acting over a small area gives a large pressure. Pressure is force per unit area, or pressure= force (in newtons)/ area (in square metres). Its unitis newtons per square metre(N/m2). The unit is also called the Pascal (Pa), named after Blaise Pascal, who investigated air pressure.

Atmospheric Pressure: Atmospheric pressure is the force per unit area exerted into a surface by the weight of air above that surface in the atmosphere of Earth. Atmospheric pressure is often measured with a mercury barometer

Remember: Air has weight. (A blown up balloon is heavier than non-blown up balloon).

Atmospheric pressure varies widely on Earth, and these changes are important in studying weather and climate.

Low Pressure System: A low-pressure area, low or depression, is a region where the atmospheric pressure at sea level is lower than that of surrounding locations. Low-pressure systems form under areas of wind divergence which occur in upper levels of the troposphere. During

high winds the air can’t push down as hard creating low pressure i.e. counteracts the force of gravity.
Thermal lows form due to localized heating caused by greater sunshine over deserts and other land masses. Since localized areas of warm air are less dense than their surroundings, this warmer air rises which lowers atmospheric pressure near that portion of the Earth's surface. Large-scale thermal lows over continents help drive monsoon circulations. Low-pressure areas can also form due to organized thunderstorm activity over warm water

High Pressure Systems: A high-pressure area is a region where the atmospheric pressure at the surface of the planet is greater than its surrounding environment. High-pressure systems form due to downward motion through the troposphere, the atmospheric layer where weather occurs.
Highs are frequently associated with light winds at the surface of the Earth. Wind flows from areas of high pressure to areas of low pressure.[23] This is due to density differences between the two air masses. Since stronger high-pressure systems contain cooler or drier air, the air mass is more dense and flows towards areas that are warm or moist, which are in the vicinity of low pressure areas in advance of their associated cold fronts. The stronger the pressure difference, or pressure gradient, between a high-pressure system and a low pressure system, the stronger the wind. The coriolis force caused by the Earth's rotation is what gives winds within high-pressure systems their clockwise circulation in the northern hemisphere (as the wind moves outward and is deflected right from the center of high pressure) and counterclockwise circulation in the southern hemisphere (as the wind moves outward and is deflected left from the center of high pressure).

Often, you hear a weather forecaster say that an area of high pressure will dominate the weather. This usually means your region has several partly to mostly sunny days in store with little or no precipitation. Air tends to

sink near high-pressure centers, which inhibits precipitation and cloud formation. This is why high-pressure systems tend to bring bright, sunny days with calm weather.

Volume: The amount of 3-dimensional space occupied by a substance or an object is its volume. A gas, when heated, can expand to many times the volume it had at room temperature. An object having length, width, and height of 1 meter has a volume of 1 cubic meter.

The definition of volume is the amount of space an object takes up.

With a fixed amount of gas, when the temperature is increased, the volume increases.

When the temperature is decreased, the volume decreases.

This is why weather balloons keep increasing in volume (size) as it rises through the stratosphere?

Density: Density is defined as an objects mass per unit volume.

In other words: More dense means more molecules in a certain volume. Less dense means less molecules in a certain volume.

Density is the mass found in a volume of gas, liquid, or solid. Since all atoms and molecules weigh something (have mass), the more of them you pack into a given space, the greater the density.

Weather Experiments

Track a thunderstorm

If a thunderstorm is approaching and you can see lightning and hear thunder, then now is the time to do this weather experiment.

TRACK A THUNDERSTORM

MATERIALS:

- thunderstorm
- stopwatch
- Pen
- Paper

PROCESS:

After you see a flash of lightning, use a stopwatch or count the number of seconds until you hear the thunder.

Divide the number of seconds you count by 3 to get the number of kilometres away the storm is.

EXPLANATION:

It's impossible to have lightning without thunder and it's impossible to have thunder without lightning. Light travels faster than sound. The lightning and thunder happen at the same time, but light reaches your eye instantly, while sound takes a little longer.
Have you ever seen lightning without thunder? You may have heard people call that 'heat lightning'. Well actually there is no such thing as 'heat lightning'. It's just lightning that is over 24 klms away and too far away for you to hear the thunder.

What is thunder?

Thunder is caused by the rapid expansion and contraction of the air surrounding a lighting bolt. On average, a lightning bolt is about 5 times hotter than the surface of the sun or about 27,500 C. This causes the air around the lightning bolt to become super heated and as a result, the air rapidly expands in fractions of a second. However, the air doesn't stay super heated for long and quickly dissipates the heat in fractions of second. It's this rapid expansion and contraction of the air that creates a compression wave we hear as thunder.

Make a Thunderstorm

A thunderstorm forms when a body of warm air is forced to rise by an approaching cold front. A thunderstorm is caused by unstable air and convection.

MATERIALS:

- Clear, plastic container (size of shoebox)
- Red food coloring
- Ice cubes made with blue food coloring

PROCESS:

1) Fill the plastic container two-thirds full with lukewarm water
2) Let the water sit for one minute.
3) Place a blue ice cube at one end of the plastic container
4) Add three drops of red food coloring to the water at the other end of the plastic container
5) Watch what happens.

Discussion:

1) What does the blue water and the red water represent?

The blue represents the cold front and the red water represents the warm air.

2) What happens to the warm air as a cold front approaches?
The warm air is forced to rise causing a thunderstorm.
3) Describe the process of convection using the results of this experiment.
The blue/cold water sinks while the red/warm water rises. This is a direct result of convection.

Thunderstorms occur in the presence of large amounts of condensation in the atmosphere, usually when high quantities of moisture in the lower atmosphere mix with dramatic falls in air temperature (usually brought on by a cold front). Unequal warming of the earth's surface, mountainous regions which interfere with air flow and other atmospheric conditions all contribute to a rapid upward motion of condensation which results in stormy weather.

MAKE THUNDER

MATERIALS:

- Brown paper lunch bag

PROCESS:

1) Blow into the brown paper lunch bag and fill it up with air.
2) Twist the open end and close with your hand.
3) Quickly hit the bag with your free hand.
4) What do you hear?

EXPLANATION

Hitting the bag causes the air inside the bag to compress so quickly that the pressure breaks the bag. The air rushes out and pushes the air outside away from the bag. The air continues to move forward in a wave. When the moving air reaches your ear, you hear a sound. Thunder is produced in a similar way. As lightning strikes, energy

is given off which heats the air through which it passes. This heated air quickly expands and contracts causing air molecules to collide with each other producing energetic waves of air resulting in a sound called thunder.

MAKE LIGHTNING (on a dry non-humid day)

MATERIALS:

- Aluminum pie pan
- Small piece of wool fabric
- Styrofoam plate
- Pencil with a new eraser
- Thumbtack

PROCESS:

1) Push the thumbtack through the center of the aluminum pie pan from the bottom.
2) Push the eraser end of the pencil into the thumbtack.
3) Put the styrofoam plate upside-down on a table. Quickly, rub the underneath of the plate with the wool for a couple of minutes.
4) Pick up the aluminum pie pan using the pencil as a handle and place it on top of the upside-down styrofoam plate that you were just rubbing with the wool.
5) Touch the aluminum pie pan with your finger. You should feel a shock. If you don't feel anything, try rubbing the styrofoam plate again.
6) Once you feel the shock, try turning the lights out before you touch the pan again. Check out what you see! You should see a spark!!

EXPLANATION:

Why does this happen? It's all about static electricity. Lightning happens when the negative charges (which are called electrons) in the bottom of the cloud, or in this experiment your finger are attracted to the positive

charges (which are called protons) in the ground or in this experiment the aluminum pie pan. The resulting spark is like a mini lightning bolt

What is Lightning?

Lightning is a massive electrostatic discharge caused by unbalanced electric charge in the atmosphere, either inside clouds, cloud to cloud or cloud to ground, accompanied by the loud sound of thunder.

Lightning is an electric current. Within a thundercloud way up in the sky, many small bits of ice (frozen raindrops) bump into each other as they move around in the air. All of those collisions create an electric charge. After a while, the whole cloud fills up with electrical charges. The positive charges or protons form at the top of the cloud and the negative charges or electrons form at the bottom of the cloud. Since opposites attract, that causes a positive charge to build up on the ground beneath the cloud. The grounds electrical charge concentrates around anything that sticks up, such as mountains, people, or single trees. The charge coming up from these points eventually connects with a charge reaching down from the clouds and - zap – lightning.

A typical cloud to ground lightning strike can be over 5 km long. A typical thunderstorm may have three or more strikes per minute at its peak. Lightning is usually produced by cumulonimbus clouds up to 15 km high, based 5-6 km above the ground.

How many times does the lighting strike the earth in one day?

When you include observations of weather over the whole earth, you get some pretty amazing numbers. Here are a couple-

Number of thunderstorms occurring at any given time: 2000

Number of lightning strikes over the earth per second: 100

Expanding the lightning numbers... 100 per second equals 6000 strikes per minute, 6000 per minute equals 360,000 per hour, 360,000 per hour equals 8,640,000 per day!!!

A number of studies have been done using lightning detection networks located in some countries and using a couple of satellites that have optical detectors designed to recognize lightning flashes. The most recent data suggests that the long used statistic of around 100 flashes per second globally is close to being correct, of which 80% are in-cloud flashes and 20% are cloud-to-ground flashes.

This gives us approximately 20 flashes to the ground per second globally and therefore 1,728,000 flashes to the ground per day! This seems like a huge number, but it is necessary to maintain an electrical balance between the Earth's surface and the atmosphere.

BEND WATER

MATERIALS:

1) Comb
2) A piece of wool, nylon or fur

PROCESS:

1) Rub a comb quickly against the piece of wool, nylon or fur for about a minute.
2) Hold the comb near a trickle of water from a faucet.
3) The charged comb should attract the water toward it.

EXPLANATION:

Why does this happen? By rubbing the comb, you’re covering it with little negative charges. The negative

charges are attracted to the positive charges against the water.

MAKE YOUR HAIR STAND UP

MATERIALS:

1) Balloon
2) Long hair

PROCESS:

1) Blow up the balloon and tie it.
2) Rub it against your hair on top of your head.
3) Watch what happens! Your hair will stick up!

This also happens when you take off your wool hat in the wintertime. You usually notice static electricity in the winter when the air is very dry. During the summer, the air is more humid. The water in the air helps electrons move off you more quickly, so you cannot build up as big of a charge.

EXPLANATION:

Why does this happen? It's because of static electricity! When you rub the balloon on your hair, you're covering it with little negative charges. Now that each of the hairs has the same charge, they want to repel each other. In other words, the hairs try to get as far away from each other as possible. The farthest they can get is by standing up and away from each other. Talk about a bad hair day!

INDOOR RAINBOW

MATERIALS:

1) Glass jar or a large drinking glass
2) Small mirror

3) Flashlight
4) Dark room with white walls

PROCESS:

1) Fill the jar or glass with water.
2) Place the mirror inside the water filled jar or glass.
3) Tilt the mirror slightly upward.
4) In a very dark room with white walls, shine the flashlight onto the mirror.
5) A rainbow should appear! (Note: If no rainbow appears at first, just change the angle of the light from the flashlight or change the angle of the mirror.)

EXPLANATION:

The mirror reflects light that passes back through the water, traveling at an angle. The water bends, or refracts, the light. As the light bends, it separates into the colors of the rainbow...red, orange, yellow, green, blue, indigo and violet.

How does a Crazy Scientist remember the order and colours of a rainbow?

They remember the name: Roy G. Biv

BAKING SODA VOLCANO

MATERIALS:

1) 6 cups of flour
2) 2 cups of salt
3) 4 tablespoons cooking oil
4) tablespoons of baking soda
5) Dishwashing detergent
6) Food color
7) Vinegar

8) Warm water
9) Baking dish or pan

PROCESS:

1) First, make the cone of the baking soda volcano. Mix 6 cups flour, 2 cups salt, 4 tablespoons cooking oil and 2 cups warm water. The mixture should be smooth and firm. Add more warm water if needed.
2) Stand the soda bottle in the baking pan and mold the dough around it into a volcano shape.
3) Don't cover the opening or drop dough in it.
4) Fill the bottle most of the way full with warm water and a bit of red food color.
5) Add 6 drops of detergent to the bottle contents.
6) Add 2 tablespoons of baking soda to the contents.
7) Slowly pour vinegar into the bottle.
8) Watch the eruption.

EXPLANATION:

Why does this happen? The red lava is the result of a chemical reaction between the baking soda and vinegar. In this reaction, the carbon dioxide gas is produced, pressure builds up inside the plastic bottle until the gas bubbles out of the volcano. This is a good representation of what happens in real volcanoes.

CREATE EVAPORATION

MATERIALS:

1) Hand sanitizer

PROCESS:

1) Pour some hand sanitizer on your hands and rub your hands together, as if you were washing your hands.
2) Your hands are now wet, so do your hands feel cooler? Answer: Yes!

3) After waiting a few seconds, are your hands now dry? Answer: Yes!
4) Repeat the steps above, but this time move your hands through the air. This simulates the wind. Do your hands feel even colder now? Answer: Yes!

Explanation:

The hand sanitizer evaporated off your hands and your hands felt cool, therefore evaporation is a cooling process!

What happens when you move your hands? Again, evaporation is a cooling process and adding wind to the picture makes evaporation happen faster. This makes your hands feel even colder. This is why we have a "Wind Chill" factor. The wind causes moisture on your skin to evaporate at a faster rate, therefore making you feel colder.

WHAT'S IN THE WIND

MATERIALS:

1) A few plastic lids
2) Petroleum jelly
3) Magnifying glass
4) Paper punch
5) Yarn
6) Windy day

PROCESS:

1) Punch a hole at one end of each lid.
2) Thread each hole with a length of yarn and knot the ends of the yarn together to form a loop for hanging.
3) Spread petroleum jelly over one side of each lid.
4) Take the lids outdoors on a windy day and hang them in various areas.
5) Leave them outside for about an hour or two to collect what may be blowing in the wind.

6) Retrieve the lids and see what they have collected.

EXPLANATION:

Some of the items that you may have been collected include insects, dirt, seeds and leaves. Use the magnifying glass for further observation.

MAKE A THERMOMETER

MATERIALS:

1) Clear, plastic bottle (e.g. 300mls)
2) Water
3) Isopropyl Alcohol (IPA, rubbing alcohol, over 99%)
4) Clear plastic drinking straw
5) Modeling clay
6) Food coloring

Procedure:

1) Fill about 1/4 of the bottle full with equal parts of water and rubbing alcohol.
2) Add a few drops of food coloring.
3) Put the straw in the bottle, but don't let it touch the bottom.
4) Use the modeling clay to seal the neck of the bottle, so the straw stays in place. (Make sure the straw does not touch the bottom of the bottle.)
5) Hold your hands on the bottom of the bottle and watch the mixture move up through the straw.

EXPLANATION:

Why does this happen? Just like any thermometer, the mixture expanded when it was warmed. This made the mixture no longer fit in the bottom of the bottle. As the alcohol expanded the colored mixture moved up through the straw. If the bottle were to get extremely hot, the

mixture would have come up through the top of the straw.

CLOUD IN A BOTTLE

MATERIALS:

1) 2-liter clear plastic pop bottle.
2) Matches (children will need adult assistance to light matches)
3) Warm water

PROCESS:

1) Fill the clear plastic 2-liter bottle one-third full of warm water and place the cap on. As warm water evaporates, it adds water vapor to the air inside the bottle. This is the first ingredient to make a cloud.
2) Squeeze and release the bottle and observe what happens. You'll notice that nothing happens. Why? The squeeze represents the warming that occurs in the atmosphere. The release represents the cooling that occurs in the atmosphere. If the inside of the bottle becomes cover with condensation or water droplets, just shake the bottle to get rid of them.
3) Take the cap off the bottle. Carefully light a match and hold the match near the opening of the bottle.
4) Then drop the match in the bottle and quickly put on the cap, trapping the smoke inside. Dust, smoke or other particles in the air is the second ingredient to make a cloud.
5) Once again, slowly squeeze the bottle hard and release. What happens? A cloud appears when you release and disappears when you squeeze. The third ingredient in clouds is a drop in air pressure.

EXPLANATION:

Water vapor, water in its invisible gaseous state, can be made to condense into the form of small cloud droplets. By adding particles such as the smoke enhances the process of water condensation and by squeezing the

bottle and letting go you cause the air pressure to drop. This creates a cloud!

SODA BOTTLE VOLCANO

MATERIALS:

1) Roll of mint Mentos (type of candy)
2) Clear 2-liter bottle of Coke (diet works better)

PROCESS:

1) Go outside to an area where you have a lot of room. This experiment is messy!
2) Open the bottle of soda carefully. Position the bottle on the ground, so that it will not tip over.
3) Diet soda works better than regular soda. Plus, diet doesn't leave a sticky mess.
4) Unwrap the roll of Mentos.
5) The goal is to drop the Mentos into the bottle at the same time, which is very tricky. One method is to roll a piece of paper into a tube just big enough to hold the loose Mentos. Put a card under the roll and on top of the bottle top, so you can pull the card and the candies will just drop in at once.
6) Drop all of the Mentos into the bottle at the same time and then move out of the way just as quick as you can.
7) Watch the eruption

EXPLANATION:

Why does this happen? Water molecules attract to other, linking together to form a tight mesh around each bubble of carbon dioxide gas in the soda. When you drop the Mentos in the soda, the gelatin and gum arabic from the dissolving candy break the surface tension. Each Mentos candy has thousands of pits on the surface. These tiny pits are called nucleation sites, perfect places for the carbon dioxide bubbles to form. As soon as you drop the Mentos in the soda, bubbles form all over the surface of

the candy. Couple this with the fact that the candies are heavy and sink to the bottom of the bottle and you're just asking for an explosion. When all this gas is released, it literally pushes all the liquid up and out of the bottle in an amazing blast.

EXAMINING COLORS

MATERIALS:

1) Red, blue and yellow food color (primary colors)
2) 1 cup of milk
3) Dish soap
4) Shallow and flat bowl or container

PROCESS:

1) Pour 1 cup of milk into the bowl.
2) Add 3 drops of red food color to one edge of the bowl.
3) Add 3 drops of blue food color 1/3 of the way away.
4) Add 3 drops of the yellow food color 1/3 of the way away.
5) Don't mix of jiggle the bowl.
6) Squeeze a drop of the dish soap in the center of the bowl.
7) Watch what happens!

EXPLANATION:

The dish soap does not mix with the milk. Instead, it floats on top and spreads over the surface. As it spreads, it grabs the food color of the primary colors you dropped into it. Where the colours meet, they combine and form new colors. We call these colours, secondary colours!

Red + Yellow = Orange

Blue + Red = Purple

Yellow + Blue = Green

Crazy Weather Facts

Queensland's Highest Maximum

The states hottest day was 49.5C at Birdsville on December 24, 1972

World's Highest Temperature

56.7C, Death Valley, California, 10/07/1913

Most consecutive days above 37.8 °C (100 °F): 160 days; Marble Bar, Western Australia from 31 October 1923 to 7 April 1924.

Fastest temperature rise: 27 °C (49 °F) in two minutes; Spearfish, South Dakota, 1943-01-22

Queensland's Lowest Minimum

The coldest recorded temperature was -11C in Stanthorpe on July 4, 1895.

World's Lowest Temperature

-89.2C, Antarctica, 21/07/1983

Queensland's Strongest Wind Gust

185 km/hr, Brisbane Airport, January 18,1985

World's Strongest Wind Gust

407 km/hr wind on Australia's Barrow Island during Cyclone Olivia in 1996.

Queensland's Record Rainfall

548mm in 24 hrs, Townsville, January 11th, 1998

World's Record Rainfall

24 hrs: 1,825mm in Foc Foc, La Reunion

1 year: 26,461mm in Cherrapunji, India, August, !860 – July 1861

World Record Deaths from Weather

Tsunami

The earthquake that generated the great Indian Ocean tsunami of 2004 is estimated to have released the energy of 23,000 Hiroshima-type atomic bombs unleashing a series of killer waves that sped across the Indian Ocean at the speed of a jet airliner. The final death toll was 283,000.

Earthquake

Shaanxi, China, 23/01/1556, 860,000 deaths

Haiti, 12/01/2010 316,000 deaths

Avalanche

1970 Huascarán avalanche, Peru, 20,000 max

Blizzard

1972 Iran Blizzard, Iran, 4000

Cyclones (including Hurricanes)

1970 Bhola cyclone East Pakistan (now Bangladesh)

Floods and Landslides

1931 China floods, China, 3,700,000 max

Heat Wave

2003 European heat wave, Europe, 70,000 max

Tornadoes

26/04/1989 The Daulatpur – Salturia Tornado, Bangladesh, 1300 deaths

Volcanic Eruptions

10/04/1815, Mount Tambora, Indonesia, 92,000

Bushfires

8/10/1871, Peshtigo Fire, Wisconsin, USA, 2,500 max

Victoria, Australia, Black Saturday Fires, 7/02/2009, 173 dead