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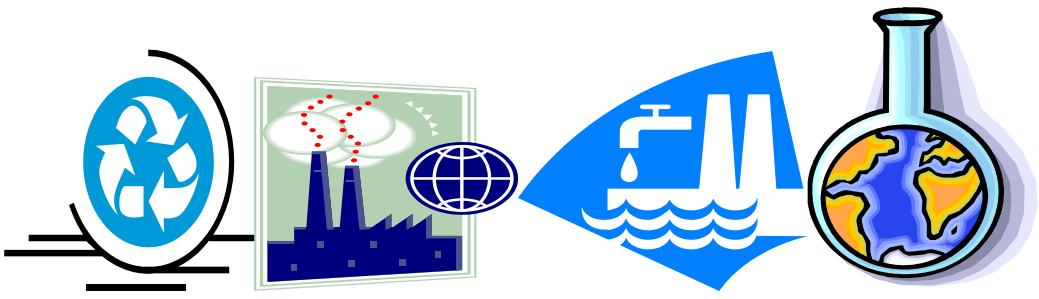
Presents

Extreme Environment



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Activity 1: Acid Rain and Cabbage

This is a good activity to introduce the concept of acids and bases to students. Some substances are classified as either an acid or a base. Think of acids and bases as opposites - acids and bases are on opposite sides of a see saw. Scientists can tell if a substance is an acid or a base by means of an indicator. An indicator is typically a chemical that changes colour if it is exposed to an acid or a base. This experiment will teach you how to make your own indicator using cabbage juice. Students can then test the rainfall to see if it acidic or not.

The term "acid rain" is commonly used to mean the deposition of acidic components in rain, snow, fog, dew, or dry particles. The more accurate term is "acid precipitation." Distilled water, which contains no carbon dioxide, has a neutral pH of 7. Liquids with a pH less than 7 are acid, and those with a pH greater than 7 are alkaline (or basic). "Clean" or unpolluted rain has a slightly acidic pH of 5.6, because carbon dioxide and water in the air react together to form carbonic acid, a weak acid. Around Washington, D.C. for example, however, the average rain pH is between 4.2 and 4.4. The extra acidity in rain comes from the reaction of air pollutants, primarily sulfur oxides and nitrogen oxides, with water in the air to form strong acids (like sulfuric and nitric acid). The main sources of these pollutants are vehicles and industrial and power-generating plants. The main local sources are cars, trucks, and buses[1].

[1] Did you know that there are 206 bones in the adult human body and there are 300 in children (as they grow some of the bones fuse together). – keep drinking the milk

Materials Required

6 red cabbage leaves, 3 glass beakers, strainer, hot plate, large beaker to boil cabbage, baking soda, vinegar, rain water.

Procedure

1. Boil the cabbage for 30 mins, do not let the water boil off.
2. Let cool and remove cabbage with the strainer.
3. Pour 1/3 of the water into each of the beakers.
4. Place a table spoon of baking soda in one, note the colour change
5. Place a table spoon of vinegar in one, note the colour change.
6. Place a table spoon of rainwater in one, note the colour change.

The baking soda and water will turn from purple to green, indicating the presence of a base

The vinegar and water mix will turn from purple to red, indicating the presence of an acid.

The rainwater mix may not change colour as it should be around pH 6. However, for the purpose of the experiment the water can be spiked with the vinegar to make it appear acidic.

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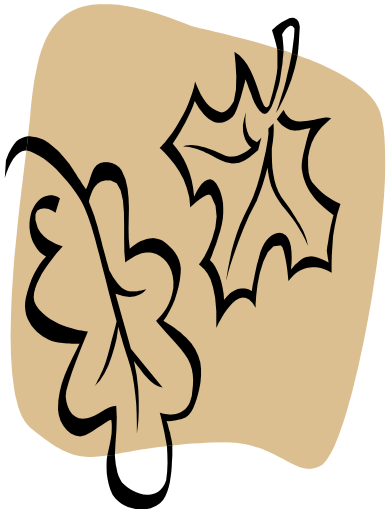
[2] Flea's can jump 130 times higher than their own height. In human terms this is equal to a 6ft. person jumping 780 ft. into the air. – we would have a new high jump record

Activity 2: Turn Over a New Leaf

This activity is aimed at teaching the students how to identify trees from the shape and colour of the leaf. I t also aims at getting the students into the outdoors and getting themselves a bit of exercise and fresh air whilst learning.

Long ago Ireland was covered with forests. People from Europe came to Ireland. First they settled on the coastline. Later they moved inland. They had to cut down trees to get there. Some trees fell into lakes and formed bogs. The trees that the other people cut down made space to grow crops. Other people went to bogs to get to get turf, which was used for burning. During the 16th century many of the finest tress were cut down and exported to England for shipbuilding and furniture making.

There are two types of tree. These are deciduous and coniferous. Deciduous trees loose their leaves during the winter months and sprout new ones in the spring. Coniferous trees are also known as evergreens and the retain their leaves throughout the year. Usually their leaves are like needles rather than leaves, like Christmas trees.[3]



[3] The most dangerous animal in the world is the common housefly. Because of their habits of visiting animal waste, they transmit more diseases than any other animal. – fly swatters please

Instruct children to collect a different variety of leaves from as many trees as they can find. Create a chart on A1 paper and write they tree names along side them. Display the chart in a nature section in the class room.
Main tree types include oak, ash, cedar, willow, birch, chestnut, maple, larch, pine, fir, beech, spruce, plum, hazel, furze, broom, cherry and hawthorn.

Information on preserving the leaves properly, and identifying the individual leaves can be found at

http://forestry.about.com/od/treeidentification/a/leaf_collection.htm

[4]

[4] Snakes are true carnivorous because they eat nothing but other animals. They do not eat any type of plant material. – can't be good for their hearts

Activity 3: Whirlpools in a Bottle

This activity is aimed at teaching the children about the environmental phenomenon's of vortices, specifically whirlpools and tornadoes. This is a hands on, visual activity that students will find very interesting.

A whirlpool is a large, swirling body of water produced by ocean tides. In popular imagination, but only rarely in reality, they can have the dangerous effect of destroying boats. Very small whirlpools can easily be seen when a bath or a sink is draining, but these are produced in a very different manner from those in nature. Smaller whirlpools also appear at the base of many waterfalls. In the case of powerful ones like Niagara Falls, these whirlpools can be quite powerful. The most powerful whirlpools are created in narrow shallow straits with fast flowing water. The Moskstraumen off the Lofoten islands in Norway is generally considered the world's most powerful whirlpool, along with Saltstraumen which reaches speeds of 40 km/h.

Although tornadoes occur in many parts of the world, these destructive forces of nature are found most frequently in the United States east of the Rocky Mountains during the spring and summer months. In an average year, 800 tornadoes are reported nationwide, resulting in 80 deaths and over 1,500 injuries. A tornado is defined as a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one mile wide and 50 miles long. Once a tornado in Broken Bow, Oklahoma, carried a motel sign 30 miles and dropped it in Arkansas![5]

[5] The world's largest amphibian is the giant salamander. It can grow up to 5 ft. in length.- ugly thing

Materials

2 empty 2L bottles, water, food colouring, heavy duty tape.

Procedure

1. ¾ fill one bottle with water.
2. Tape the empty bottle onto the bottle containing the water, ensuring the spouts were lined up.
3. Turn the bottles so that the bottle with water is on top of the empty bottle.
4. The water will start to form a whirlpool. To increase the effect, swirl the bottles in a circular motion.

When you swirl the bottle, the water starts to move in a circle. When the water moves fast enough, it pushes out against the bottle and leaves a hole in the middle. There's no water in the hole, only air. The hole allows the air from the bottom bottle to come up to the top bottle. When the air moves, there's then space in the bottom bottle, which makes room for the water from the top to flow into the bottom.

This sort of water movement, with the special hole in the middle, is usually called a whirlpool. A tornado happens in air and a whirlpool happens in water. So, it is really a "Whirlpool in a Bottle."

Adding food colourants can increase the visual effect of the whirlpool[6].

[6] The smallest bone in the human body is the stapes or stirrup bone located in the middle ear. It is approximately .11 inches (.28 cm) long. – tom thumb eat your heart out

Activity 4: Growing Ice

The purpose of this activity is to show how water expands when it freezes. It can also be used to explain how icebergs operate in the oceans. Water is an odd substance. Normally a substance expands when heated and contracts when cooled. This is true for water but it has a strange exception. When water is heated it expands, hence boiling water takes up more space than at room temperature. However, when looking at the other temperature extremes, water at 0 ºC, when starting to freeze begins to expand, and can expand by up to about 10%. The thing that makes water different is that when water heats from 0 to 4 ºC, the water contracts. One of those things that makes water a little bit different.

An iceberg is a large piece of freshwater ice that has broken off from a snow-formed glacier or ice shelf and is floating in open water. Since the density of pure water ice is lower than that of sea water, typically only one ninth of the volume of an iceberg is above water. The shape of the remainder under the water can be difficult to surmise from looking at what is visible above the surface. This has led to the expression "tip of the iceberg", generally applied to a problem or difficulty, meaning that the visible trouble is only a small part of the bigger problem.[7]

[7] The longest cells in the human body are the motor neurons. They can be up to 4.5 feet (1.37 meters) long and run from the lower spinal cord to the big toe. – not all our cells are tiny

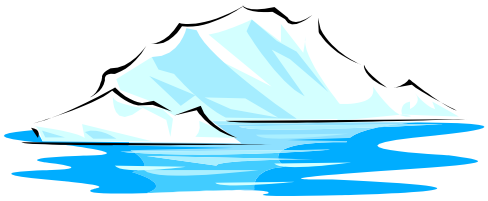
Materials

2L plastic milk jug, water, freezer.

Procedure

1. Fill the milk jug with water to the brim and put on the cap.
2. Place the jug in the fridge freezer overnight and allow to freeze solid.
3. When you take out the jug it should be bent out of shape, proving that the ice has grown.

To explain how icebergs operate, cut the jug away from the block of ice. Drop the ice into a sink full of water. The sink should be big enough so that the jug doesn't hit the bottom. Once floating, the students will notice that most of the ice is under water, just like the real icebergs.



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[8] The blue whale can produce sounds up to 188 decibels. This is the loudest sound produced by a living animal and has been detected as far away as 530 miles. – I thought my teacher let out a roar

Activity 5: Fog in a Bottle

The purpose of this experiment is to explain condensation and the changing of materials states from solid to liquid to gas. It is also a very attractive experiment as it seems like a magic trick. It can also be used to explain to the students about fog and clouds and how they form.

The months of October and November are the foggiest months, but even winter has a lot of fog. During Autumn, the ground heats up during the day then cools quickly at night, making prime conditions for fog. Overall, the nights of autumn and winter are long and the long periods of cooling make it more likely for fog to form. Clouds are formed when water vapour is cooled enough to form tiny water droplets. This is exactly what happens when moist air rises in the atmosphere, cools, and water droplets form into clouds.

Materials

Large necked flask, 125 mls of hot water, ice cubes, sieve.[9]

[9] The human eye blinks an average of 4,200,000 times a year. – may as well just keep our eyes closed

Procedure

1. Fill large jar or wide mouthed bottle with the 125mls hot water.
2. All of the hot water is poured out except for an inch (25mm) or so at the bottom.
3. A strainer is set over the mouth of the jar, and ice cubes are placed in the strainer.
4. Before too long the cold air from the ice cubes will cause the water to condense from the warm, moist air in the bottle, forming fog or clouds.

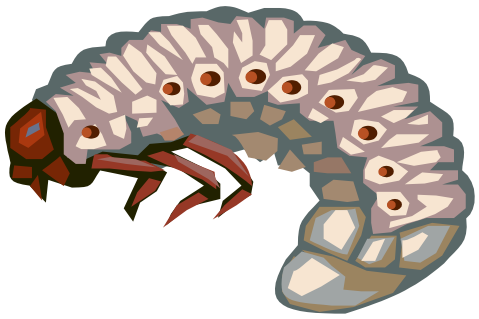
A very straight forward experiment that can be carried out at home by the students. However do explain that as hot water is being used it should be supervised by a parent.[10]

[10] It takes approximately 12 hours for food to entirely digest. – note the time you go to the toilet next, is it 12 hrs since dinner.

Activity 6: Creepy Crawlies in a River

This is an excellent, very hands and feet on activity that is guaranteed to keep the students entertained. It is a good way of introducing the concepts of river water pollution as well as getting the students introduced to collecting samples and using microscopes to identify the creatures.

The presence of certain creatures in a sample of river water will indicate how clean the water is. Mayfly and stonefly larvae indicate the water is unpolluted, whereas the presence of leeches and worms indicate the water is polluted. This activity does not need to go into the individual creatures. It will focus on the children seeing if they can find mayfly or stonefly, as these are easily recognisable.



Catching the samples is often the fun part. The teacher/demonstrator needs to down in to the river. Be sure to pick a shallow part of the bed and it probably isn't advisable to let the students do this. However you will get a great reaction off the students when you go in.

Materials

Bucket, wellies, net, white tray or bowls, microscope if available.

Procedure

1. Wade into a shallow preferably quick moving part of the river.
2. Facing the direction of flow, place to net about two feet in front of you.

3. Kick the bed of the river and let the silt flow into the net. Do not kick the stones into the net.[11]

4. Empty out the net into the bucket with some river water.
5. Repeat this process to ensure a good sample is taken.
6. Back in the classroom, pour some of the water into bowls and allow the children to look for the stoneflies and mayflies.

This is a fun experiment as the bowls will be full of life. The key to identifying the flies is that mayflies have 3 tails and stonefly have 2. Care should be taken to ensure that the analysis of the samples is carried out asap after the sample is taken as the insects will eat each other after a while.

[11] 40 to 50 percent of body heat can be lost through the head (no hat) as a result of its extensive circulatory network. – keep your hat on your head

Activity 7: Build a Compost Facility

This activity aims to introduce the idea of recycling and general reuse of materials. The concepts of the problems associated with waste management should be raised. It is thought that if everyone composts their organic waste it would reduce our waste by about 540 pounds per year.

what can be composted?? Any plant residue can be composted, including weeds, lawn clippings, spent plants, leafy pruning's and clippings, vegetable tops and vines, manure, sawdust and non-glossy newsprint. Composting materials are divided into two types, green and brown. Green materials include green leafy plant residues like weeds, grass clippings, vegetable tops and flower clippings. Brown materials include fall leaves, straw, sawdust, wood chips and shredded newspapers. To speed up decomposition, use two-parts green material to one-part brown material. Grass clippings can be composted, but it's best to mulch them and leave them on the lawn. This recycles nutrients and decreases the amount of lawn fertilizer needed. If you compost your grass clippings, mix them with brown materials to prevent over-packing, which leads to obnoxious odours. Brown materials composted alone require supplemental nitrogen to feed the decomposing bacteria. Add one-quarter to one-half cup nitrogen fertilizer per bushel of brown material. Woody materials also require extra composting time.

It's probably easier to suggest materials you should not compost. Don't use meat, bones, cooking-oil products, eggs and dairy products. These materials slow decomposition and may attract rodents and other animal pests. You also should not compost pet faeces, as they may spread diseases. It's also inadvisable to compost[12]

[12] Armadillos, opossums, and sloth's spend about 80% of their lives sleeping. – lazy gits

diseased plants, insect-infested plants, and weeds loaded with seeds. These pest problems may survive the composting process and cause problems in the Garden later.

Materials

Compost bin, organic waste from above, time.

Procedure

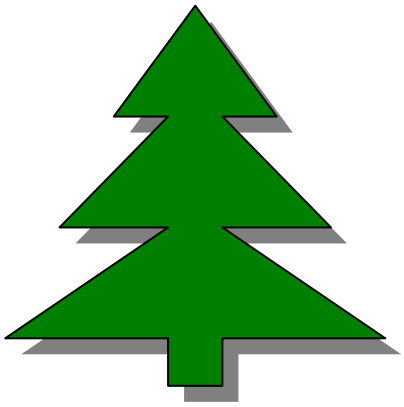
1. Obtain a bin from your local authority.
2. Follow the instructions on the bin.
3. Throw in your waste and wait.
4. Carry out the next activity.

This experiment can be very interesting for the students, as they see the compost gradually form, especially when they get to use the compost and see that it can be used for good purposes.[13]

[13] The heaviest human brain ever recorded weighed 5 lb. 1.1 oz. (2.3 kg.). – very smart indeed

Activity 8: Grow Plants from your Compost

This activity is aimed at demonstrating to the students how to utilise the compost they made, and simply to get a background idea of the planting, especially trees. It would be a very worthwhile project if the class actually planted a tree in the school grounds. A plaque could be placed beside it to note the class who planted it and the year. This will succeed in giving the class a sense of pride as well as doing their bit for the environment. It is also a good method of introducing the importance of trees as the remove carbon dioxide and produce oxygen.



Trees are available from Coillte, however they can also be grown from seeds as follows;

Seeds have been sprouting and trees have been growing for an awfully long time without any help from humans. The "natural way" to germinate tree seeds, then, is to allow nature to take its course. Most seeds, when sown in the fall without any pre-treatment, will begin to germinate the following spring. Be sure to sow the seeds at the recommended depth. If the seeds are planted too deep, this could delay or inhibit the spring germination process. With some seed varieties you may see germination spread over two or three years with some seeds germinating in the first spring and others taking longer to break dormancy and germinate.

It is important to remember that many species originated in cooler climates where seeds drop to the ground and are covered by leaves in the fall. Over the winter, the seeds remain bedded in this cool moisture environment. As the warm spring weather[14]

[14] The ears of a cricket are located on the front legs, just below the knee. – can't play football so I guess

arrives the seeds then begin the germination process. For many types of seeds, the embryo inside the seeds is immature and unable to germinate (this is called ‘dormancy’) until it matures in this manner. The delay in the germination process is vital to the survival of many tree species. In a natural forest, if seeds germinated immediately upon falling to the ground in late summer or fall, the tender seedlings would die off during the cold winter.

15

[15] Sound travels about 4 times faster in water than in air**. –** so singing in the bath would be better

Activity 9: Recycle, Recycle, Recycle

This activity like number seven is aimed at introducing the students to all concepts of recycling. In this day and age, the proper recycling of waste is of critical importance. The easiest method is to get the students to start bringing in empty cans and glass bottles. Fill bags full with these and when they are full organise a trip to the local recycling centre. Your local council will be of great help in sorting this trip out for you.

Why recycle?

- Most of what we throw away is made from products that are slowly running out or cannot be replaced quickly enough because of the amount we consume.
- Many of the materials we throw in landfill tips have a value and can be used again.[16]

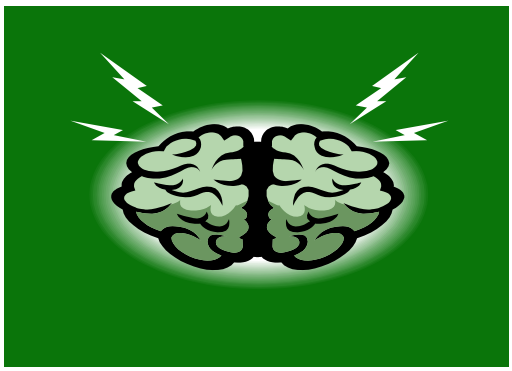
[16] A car travelling at 80 km/h uses half its fuel to overcome wind resistance. – slow down boys

- Many gardeners use peat as a soil improver. This contributes to the destruction of peat bogs, which are non-renewable habitats for wild flowers and animals.
- The use of peat is unnecessary because gardeners can make compost from their kitchen and garden waste to use as a soil improver.
- In addition to saving our peat bogs, composting green waste saves valuable landfill tip space which is running out.
- Making new goods out of recycled material saves energy. For example, making new aluminium cans from recycled cans uses 20 times less energy than making cans from the raw material.[17]

[17] By raising your legs slowly and lying on your back, you can't sink in quicksand. – might be handy to know

Activity 10: The Environmental Quiz

1. **What is the largest element in the air we breath? Nitrogen**
2. **What do trees convert carbon dioxide to? Oxygen**
3. **What is the longest river in Ireland? The Shannon**
4. **What is the highest mountain in the world? Mount Everest**
5. **What is the biggest animal in the world? The Blue Whale**
6. **What does EPA stand for? Environmental Protection Agency**
7. **Which moves faster, a badger or a fox? Fox**
8. **What do you call a baby lion? Cub**
9. **What comes out of a volcano? Lava, Magma**
10. **What is another name for a tidal wave? Tsunami**[18]



[18] Diamonds are the hardest substance known to man. – and are a girls best friend, how apt.