

BOOK

5

SEVENTH GENERATION SCIENCE EXPERIMENTS

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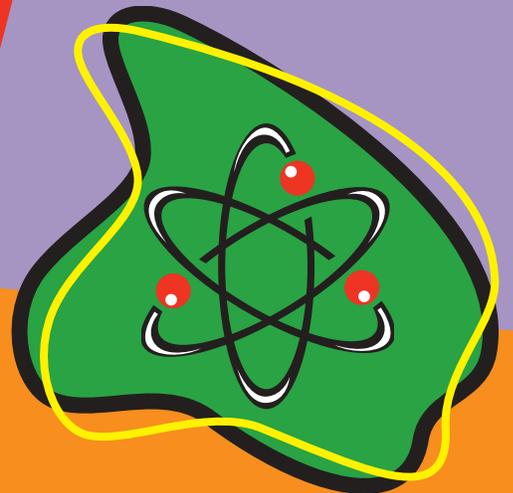
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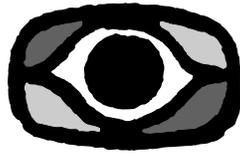
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SEVENTH GENERATION CLUB



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The Galaxy
we live in is
called the
Milky Way.
It is shaped
kind of like

- a) A round ball
- b) A pretzel
- c) A doughnut
- d) A flat spiral

If you want to see the centre of the Milky Way, face south during an evening in August to October. Looking above the horizon, you will see the centre of the flat spiral that is our galaxy.

Answer: A flat spiral

The Spinning Spool

Have you ever seen or rode on a hovercraft? Hovercrafts, also called air-cushioned vehicles (ACV), can carry passengers, vehicles, and freight across land and water. Some hovercrafts can travel as fast as 130 kilometers per hour!

What you need:

Cardboard	Ruler
Scissors	Sharpened pencil
Glue	Paper
Balloon	
Styrofoam or plastic spool (like the ones used for thread)	

What you do:

Cut a 4-inch square out of cardboard.

Using a sharpened pencil, carefully poke a hole in the center of the piece of cardboard. Ensure that the hole in the cardboard is the same size as the hole in the center of the spool.

Glue the spool to the cardboard so that the hole in the cardboard is in line with the hole in the center of the spool. Use a generous amount of glue, but ensure that the glue does not obstruct the hole in the center of the spool.

Create a lid for the other end of the spool. Cut a circle out of paper that has the same diameter as the spool. Glue the paper cover to the top end of the spool.

Poke a hole in the paper cover so that is in line with the hole in the spool. At this point, you should have a hole running through the paper, spool, and cardboard without any obstructions.

Blow up a balloon and twist the end to keep the air from escaping. Stretch the mouth of the balloon over the top end of the spool.

Place your hovercraft on a level table and let go of the balloon!

What's going on?

The air flowing from the balloon through the hole in the center of the spool forms a layer of air between the cardboard and the table. This layer of air acts like an invisible cushion and eliminates the friction that normally exists when the cardboard rests directly on the table. This reduction in friction causes the "hovercraft" to scoot across the table!

How many
bones are in
your body

- a) 600
- b) 250
- c) 130
- d) 206

You were born with 250 bones, but some of your bones fused together. By the time you reach your parents' age, you will only have 200!

Acid Attack

Have you ever eaten something that made your tummy hurt? Maybe you heard your parents complain about heartburn after eating a large meal? There is a very strong acid in our stomach that helps us to digest the food that we eat. Occasionally, when we eat too much, some of that stomach acid makes its way up and out of our stomach, and into our esophagus. The esophagus is part of the tube that food travels down on the way to our stomach. Your stomach has a very strong lining so the acid doesn't hurt it, but the esophagus does not. Stomach acid can make your esophagus feel like it is burning! Your esophagus is right in front of your heart, which is why this strange burning feeling is called heartburn.

What you need:

Newspaper
Spoon
Two small bowls

Rolaids®, Tums®, or other antacids
Lemon juice or vinegar

What you do:

Spread out some newspaper on the table where you will be working.

Squirt some lemon juice or vinegar into one of the small bowls.

Put two antacid tablets into the other small bowl. Use the back of the spoon to crush the tablets into powder.

Spoon a small amount of antacid powder into the lemon juice or vinegar.

Stir the mixture and observe, or watch, what happens. You should be able to observe the solution foaming, or producing small bubbles.

When the foaming has stopped, add a little more antacid powder to the lemon juice or vinegar. Stir, and observe what happens.

Continue adding small amounts of antacid powder until the lemon juice or vinegar does not bubble any more.

What's going on?

Normally, our stomach digests the food that we eat without any problems. However, every once in a while, we get an upset stomach or a burning feeling in our chest. By taking an antacid like the ones used in this experiment, we can neutralize the acid that is bothering us, making it harmless. How do antacids work? Antacids all have one thing in common: they all contain a chemical known as a base. Bases react with acids, often producing a gas and neutralizing the acid. When you added the antacid to the lemon juice or vinegar (acids) the mixture bubbled and the amount of acid in the mixture dropped. Antacids work the same way in your stomach. Antacids reduce the level of acidity and help your stomachache go away.

True or
False:

The largest
organ in
your body is
your liver

If you were able to stretch
your skin out flat, it would
cover about the same area
as a pool table.

Answer: False

Balloon-mobile

Build and test a race car that uses a balloon as its only energy source!

What you need:

2-L milk carton
Scissors
Large balloon
2 drinking straws
4 Styrofoam or plastic spools (like the ones used for thread)
4 straight pins

What you do:

Cut off the top of a 2-L milk carton.

Cut the milk carton in half, the long way. This will form the body of your car.

Cut a small hole in the middle of the end of the carton. The hole should be big enough so that the end of a deflated balloon can be placed into it with ease. Note: If the hole is too big or too small, there won't be enough air force to move the car.

Make 2 holes, close to the bottom, at opposite ends of one side of the carton. Do the same thing on the other side of the carton. These holes are for the wheel axles of your car. Stick the drinking straws through these holes.

Slide the spools onto the straws and use pins to secure the straws to the spools (i.e., stick the pins through the straws on either side of the spools to prevent them from sliding one way or another).

Blow up the balloon (don't tie the end) and let the air in the balloon out so that it pushes your car forward!

What's going on?

The air rushing out of the balloon pushes the balloon in the opposite direction from the airflow. This is called propulsion. The racecar is propelled along the floor according to the principle stated in Newton's Third Law of Motion: "Every action has an equal and opposite reaction." The escaping air is the action and the movement of the car in the opposite direction is the reaction.

True or False:
The most powerful muscle in the human body is your jaw muscle

Muscles get stronger by being used and your jaw muscle certainly gets a lot of exercise, whether it be when you chew your food or talk to your friends.

Balloon Barometer

A barometer is an instrument used for determining the weight or pressure of the atmosphere. When scientists know the pressure in the air, they can use it to predict changes in weather. Learn how to make your own barometer and become a weather expert at home!

What you need:

Glass jar (e.g., pickle jar)	Balloon	Rubber band
2 drinking straws	Tape	Play-dough
Construction paper	Ruler	

What you do:

Cut open a balloon and stretch it over the mouth of a jar.

Secure the balloon on the mouth of the jar using a rubber band.

Tape 2 drinking straws together to make a really long straw.

Tape one end of the long straw to the middle of the stretched balloon so that the straw is sticking out, perpendicular to the jar.

Cut a small triangle out of construction paper and tape it to the end of the long straw that is pointing away from the jar. This paper triangle will act as a pointer.

Support a ruler with play-dough in an upright position on a flat surface (e.g., table or counter).

Arrange the glass jar in such a way that the paper triangle at the end of the straw is pointing at the ruler.

Record the height on the ruler that the triangle aligns with at various times during the day.

Use the table below to record the reading at the same time of the day for at least a week.

Collect weather charts each day and check to see whether the changes in pressure that you record match those recorded by your local weather bureau. Compare your pressure readings with those from a real barometer.

What's going on?

When the pointer on your homemade barometer is pointing at the high numbers on the ruler, it means that the air pressure is high and that it is pushing down on the balloon covering the mouth of the jar. When the air pressure is high, you generally have nice, sunny weather. When the pointer is pointing at the lower numbers on the ruler, the air pressure is low and it is not pushing down on the balloon. When the air pressure is low, you generally have rainy weather.

True or False:
The air you expel in a sneeze travels about as quickly as a hurricane force wind

Hurricanes move clockwise or counter-clockwise, depending on what part of the world they are spinning around in!

Day	Time	Barometer Reading
1		
2		
3		
4		
5		
6		
7		

Construct a Compass

A magnet is the key part of a compass. A magnetic compass consists of a small, lightweight magnet balanced on a nearly frictionless pivot point. The magnet is generally called a needle. One end of the needle is marked with an "N" for north or is colored in some way to indicate that it points toward north.

Option 1

What you need:

Shallow dish (e.g., a pie plate)

Needle (or some other wire-like piece of steel such as a straightened paper clip)

Something small that floats (e.g., piece of cork, bottom of a Styrofoam coffee cup, piece of plastic, cap from a milk jug)

Magnet

Water

What you do:

Fill the pie plate so that there is about an inch (2.5 cm) of water in it

Stroke the magnet along your needle 10-20 times. If you don't have a magnet lying around the house, try using the magnet from a can opener. Stroke your needle from the center to the end. Test the magnetized needle by placing it near an iron or steel surface to see if there is an attractive force.

Place your float in the middle of the dish of water.

Center your magnetic needle on the float. It very slowly will point toward north. You have just created a compass!

What is a
"googol"?

- a) a large sea bird
- b) a mammal found only in Australia
- c) a number written as "1" followed by 100 zeros
- d) a delicious frozen dessert

There is also something called a "googolplex" which is equal to a googol times a googol. Now that's big!

Construct a Compass

Cont.

Option 2

What you need:

Needle (or some other wire-like piece of steel such as a straightened paper clip)
Wide-mouthed glass jar
Pencil
Construction paper
Scissors
Thread
Magnet

What you do:

Obtain a clean, wide-mouthed glass jar.

Cut a circle/disk out of a piece of stiff paper. Make the diameter of the disk about half the diameter of the inside of your jar.

Magnetize a darning needle by stroking it several times with a magnet. Stroke the needle from the center to the end. Test the magnetized needle by placing it near an iron or steel surface to see if there is an attractive force.

Carefully poke the needle through the center of the paper disk and leave the needle stuck in the disk.

Use thread and a pencil to suspend the needle and stiff paper apparatus you have just made inside the jar. Make certain that the apparatus does not touch the sides of the jar.

Test your homemade compass by comparing the direction of your hanging needle to the direction of a needle in a real compass.

What's Going On?

No matter where you stand on Earth, you can hold a compass in your hand and it will point toward the North Pole. Think of the Earth as having a huge bar magnet buried inside. For the north end of the compass to point toward the North Pole, the buried bar magnet must have its south end at the North Pole. The normal "opposites attract" rule of magnets applies in this case and causes the north end of the compass needle to point toward the south end of the buried bar magnet. So the compass points toward the North Pole.

True or
False:

Fish Can't
Close their
eyes

Your eyelids protect your eyes from dirt and dust, and allow them to stay wet. Fish don't need eyelids because their eyes always stay wet.

Answer: True

Enviroeducation

Be a Pollution Preventer!

Air is all around us, and it is constantly moving. As air moves, it picks up dust, smog, pollen and dirt. This is the air we breathe into our lungs. Have you ever wondered what is in the air that we breathe? As the world population grows, more people drive cars, use air conditioning, create waste, and depend on production factories that produce waste by-products. All of these factors and many others contribute to the pollution of the air around us. In this experiment, you will be able to see exactly what is in the air you are breathing!

What you need:

2 pieces of wax paper (10 cm x 10 cm)	Petroleum jelly
2 pieces of cardboard (10 cm x 10 cm)	Magnifying glass
Tape	

What you do:

Tape the wax paper onto each piece of cardboard – these will serve as your dirty air collectors.

With your fingers, spread petroleum jelly lightly onto the wax paper surface.

Place the collectors in an area where it will be easy to retrieve them (your backyard garden, your bedroom, or your garage).

Leave your collectors in place for 24 hours. Using a magnifying glass, observe your collectors carefully.

Do you notice anything in the petroleum jelly? Is there a difference between some of the collectors? For example, is there a difference between what was collected from the sidewalk as compared to your bedroom?

What's going on?

What can you do to help reduce the amount of pollution in the air? Walk or ride your bike instead of getting your parents to drive you somewhere. Or, if you have to drive a long distance, see if you can carpool with your friends and neighbours. Taking public transportation is also a good way to reduce harmful gas emissions. Don't keep the air conditioning on during mild days. Save energy to cut down on emissions. The reservoirs where most of our household energy comes from produce methane, a greenhouse gas. To reduce the amount of energy you use, take shorter and cooler showers or baths. Hang dry your clothes instead of using the dryer. Turn the lights off when you leave a room, and turn the T.V off when you're not watching it – as a matter of fact, why don't you try turning the T.V off for a whole week. You'll be saving a lot of energy, and you'll find yourself with more time to read a good book, play outdoors and spend time with your friends!

How long
does it take
for sunlight
to travel
from the sun
to the earth

- a) 8 seconds
- b) 8 hours
- c) 8 minutes
- d) 8 days

The sun is approximately 149,600,000 km away and light travels at an amazing 299,4792,458 metres per second.

Enviroeducation

Cont.

Be a Water Conservor!

Speaking of conserving energy, have you ever considered how much water you use in a day? Think about it, you use water to wash your face, brush your teeth, take a bath or shower, flush the toilet, water your plants, sprinkle the garden, change the water in your fish bowl or aquarium, wash fruits and vegetables, wash your clothes, clean up messes, maybe you even fill your swimming or wading pool with water. Not to mention we are supposed to be drinking 6-8 glasses of the stuff per day! Phew, that's a lot of water consumption. But did you know that there is only a limited amount of water left in the world? We are not in danger of running out any time soon, but we should be more careful with how much clean water we are using. How much water are you using?

What you need:

Heavy, narrow, waterproof object (like a narrow detergent bottle filled with water)
Small cooking pot
Measuring cup

Flushing

Ask an adult to lift the cover off your toilet tank. Flush the toilet, and observe how the mechanism works. Each flush uses about 20 litres of water, much more than you need on your average flush!

Place a heavy object into your toilet tank without disturbing the flushing mechanism. This will displace some of the water so that a lot less is needed to fill the tank.

Brushing

Do you brush your teeth with the water running? If so, you may be wasting more water than you think.

Put a pot in the sink the next time you brush your teeth. When you finish, turn off the tap. How much water is in the pot? Measure it with a measuring cup. Think of all the water you could be saving if you remembered to turn the tap off every time you brushed!

By conserving water you're also saving on the energy required to clean, purify and transport water into the tap in your sink!

Which of
these

animals Can
live the
longest
without
water

- a) rat
- b) water buffalo
- c) camel
- d) turtle

The jaws of the rat are so powerful, they have been known to gnaw through lead pipes to get to food!

Flazoot Toot

Some wind instruments use a vibrating membrane (e.g., wax paper, balloon rubber) to help make sounds. These instruments are called mirlitons. The flazoot is an example of a mirlition, along with its close cousin, the kazoo.

What you need:

2 balloons
2 rubber bands
Toilet paper tube
Scissors

What you do:

Get an adult to help you punch a hole halfway down the tube with scissors. The hole should be about 1 cm wide.

Trim off the excess cardboard carefully until you have a nice neat hole.

Cut the necks off the two balloons and stretch one over one end of the tube.

Secure it in place with the rubber band.

Repeat the process for the other side of the tube. Make sure the balloons are stretched nice and tight.

Flazoot Away!

Put your lips up to the hole and gently blow across it. If you don't get a sound right away, you might want to practice with an empty soda bottle. Once you have got the sound with a bottle, then go back and try your Flazoot. When you have a steady sound, gently push on the rubber walls. What happens? Also try pushing one side at a time, or with different amounts of pressure on each side.

What's going on?

The flazoot's balloon walls vibrate as you blow air across the hole on the paper roll. The sound of the vibrations is amplified in the roll, and changes as you compress and release the balloon walls. When you compress the balloon walls, the pitch is higher. When you release the balloon walls, the pitch is lower.

How many
times does
the average
person blink
in one
minute

- a) 56
- b) 12
- c) 25
- d) 110

Your eyelids may feel heavier when you are tired, but they really aren't. You just lose control over them when you are tired and getting ready for sleep.

Frosty Broth

Imagine that you are in a movie studio. You are standing in front of a movie set in which actors are seated at a dining room table having dinner, snow is blowing around outside and frost is accumulating on the windows. How would you create this set? Would you use real snow and real frost? Of course not – it would melt in the indoor studio! In this activity, you will learn how to create a special type of frost that doesn't melt!

What you need:

Box of Epsom salts	Large, clear jug
Wooden spoon	Electric tea kettle
Styrofoam cup	Small paintbrush
Sheet of black construction paper	

What you do:

Ask an adult to help you fill a kettle with water and plug it in to boil.

Once the water has boiled, ask an adult to help you pour it into a large, clear jug.

★ Add a small amount of Epsom salts to the hot water and stir it with a wooden spoon until the salts have dissolved.

Continue adding Epsom salts until the solution becomes saturated (i.e., until the salts can no longer dissolve and a layer of salt can be seen collecting at the bottom of the jug).

Fill your Styrofoam cup halfway with the saturated salt solution.

Dip the paintbrush into the solution and paint a design on the sheet of black construction paper.

Allow your design to dry. A "frost" will begin to appear on the black paper.

Compare your "frost" to the salts that were dissolved in the hot water.

What's going on?

When the saturated salt solution was painted on the dark paper, the water in the solution evaporated into the air, causing the volume of the solution to drop. This caused the salts to re-crystallize and accumulate on the dark paper, taking on the appearance of frost. This technique is often used in the film industry to create the appearance of frosty windows or beer mugs!

True or
False:

As we grow,
our eyes
don't grow
with us

Our eyes stop growing when we are young. The actual process of seeing is performed by the brain rather than the eye.

Rain Gauge

Rain clouds are made of droplets of water that are so small that there are billions of them in a single cloud. How much rain falls during a shower, or during a day, week, or month? Find out by measuring it with a rain gauge.

What you need:

2-L plastic bottle
2 cups of sand
Knife
Permanent marker
Ruler

What you do:

Ask an adult cut the top portion off the plastic bottle just before the bottle begins to taper.

Pour 2 cups of sand into the bottle to even out the bottle's irregular bottom. Pour enough water into the bottle to cover the sand. This will weight your rain gauge and keep it from falling over.

Use a marker to draw a line at the top surface of the water. Mark a "0" next to the line. This is your baseline.

Use a ruler to measure 1", 2", and 3" up the bottle from the baseline. Draw a line at each inch mark and label the lines. If you want to make your rain gauge more accurate, use the ruler to measure $\frac{1}{2}$ ", 1 $\frac{1}{2}$ ", and 2 $\frac{1}{2}$ " on the bottle.

Flip the cut-off portion of the bottle upside down and insert it into the bottle. This will cause the water top to be funneled from the top of the bottle into the bottom of the bottle and prevent the water from evaporating.

Place the rain gauge in an open area outside and record the amount of water in the bottle after each rainfall.

What's going on?

A rain gauge is a special device that scientists use to measure rainfall. The scientific name for rain gauge is pluviometer.

The only
bird that
can fly
backwards
is the

- a) penguin
- b) seagull
- c) hummingbird
- d) woodpecker

Some hummingbirds are less than 3 inches in length. This makes them the smallest of all birds.

Soda Spew

Entertain your friends with a soda pop explosion!

What you need:

Package of Mentos® candies Small bowl
2-L bottle of clear diet soda Sheet of paper
Tape

What you do:

Open a package of Mentos® candies and put them all into a small bowl.

Roll up a sheet of paper to form a tube that can loosely hold the Mentos® candies. Put the candies into the tube one at a time and tape one end of the tube so that the candies don't fall out.

Go outside with your tube of candies and a 2-L bottle of clear diet soda. Place the bottle on a flat surface.

Take the cap off the soda bottle and quickly pour the Mentos® candies from the paper tube into the soda bottle. Try and pour the candies out of the tube so that they all hit the soda in the bottle around the same time.

Step away quickly and watch the soda spew!

What's going on?

What makes soda drinks bubbly is an invisible gas called carbon dioxide. Carbon dioxide gas is pumped into soda pop bottles at bottling factories using large amounts of pressure. Although gases have a natural tendency to expand or spread out, this does not occur in a bottle of soda pop. This is because the water molecules in soda pop are attracted to each other and link together to form a tight mesh around each bubble of carbon dioxide gas. The bond that the water molecules form around the gas bubbles is referred to as surface tension. Large amounts of energy are required to break the surface tension! In fact, until you open the bottle and pour a glass of soda, the gas stays suspended in the liquid and does not expand to form more bubbles, which gases naturally do.

Mentos® candies have a chalky texture and irregular surface. As soon as the Mentos® candies came in contact with the soda, they began to dissolve. As the candies dissolved, the surface tension in the soda was disrupted (i.e., the water molecules surrounding the gas bubbles were forced apart) and the gas bubbles were able to expand. At the same time, the candy's rough surface made it easier for new bubbles of gas to form - as the candy dissolved, tiny pits were formed on the surface of the mint in a process called nucleation. When all the gas was released, the liquid in the bottle was propelled upward in an incredible soda blast!

True or
False:

Cranberries
are sorted
for ripeness
by bouncing
them

Growing in marshlands and bogs, cranberries belong to the blueberry family.

Answer: True

The Balancing Act

Learn how objects can balance more easily when the center of gravity is below the point of support.

What you need:

Bottle cork	Steel washer (1/2 cm in diameter)
Construction paper	Scissors
Tape	Markers
5 toothpicks	Play-dough
Steel wire (30 cm in length; 20-22 gauge)	

What you do:

Draw the head of your favourite animal on a piece of construction paper.

Cut the head out of the paper and tape it to a toothpick. The toothpick will be your animal's neck.

Stick the free end of the toothpick into one end of a bottle cork. The bottle cork will be your animal's body.

Stick the other 4 toothpicks into the side of the cork to form arms and legs.

Roll up 4 small pieces of play-dough (all the same size) and stick them on to the toothpicks. The play-dough will be your animal's paws.

Use your hands to curve the piece of steel wire and stick one end of the wire into the free end of the cork.

Slide the washer on to the free end of the wire.

Hold a pencil horizontally, in front of you.

Place the feet of your animal on the pencil and watch how the animal balances. You may need to adjust the curve of the wire and/or change the position of the washer to get the animal to balance.

What's going on?

The center of gravity of an object is the point at which the object will balance. Any object will balance when the center of gravity is below the point at which it pivots. When you placed the washer on the wire of your balancing toy, you lowered the center of gravity and enabled the toy to balance. If you tip the balancing toy backward or forward, gravity will pull it back into position.

Objects that have a center of mass above the point of support are not able to balance as easily. Consider the tightrope walker. As their center of gravity is above the tightrope, they must constantly adjust their arms, hips and other body parts in order to move their center of gravity and stay atop the rope. In fact, many tightrope walkers carry a sagging bar or pole to help lower the center of gravity as they balance on the narrow rope.

The lifespan
of a taste
bud is

- a) 1 day
- b) 10 days
- c) 1 week
- d) 10 weeks

In general, women have more taste buds than men.

The Comeback Can

Discover a coffee can with a mind of it's own!

What you need:

Coffee can with plastic lid	Nail
Hammer	Large rubber band
Scissors	Cotton string
Small weight (e.g., heavy nut)	

What you do:

With the help of an adult, use a nail to poke two holes in the lid of a coffee can, about 50 mm apart.

With the help of an adult, hammer two matching holes in the base of the coffee can.

Cut an elastic band so that it is one long piece instead of a loop.

Thread the elastic through the holes in the base of the coffee can so that it crosses over itself in the middle of the can.

Take the two ends of the elastic up through the holes in the lid, put the lid on the can, and tie up the two ends.

Take the lid off the can, being careful not to stretch the elastic band to the point that it breaks.

Using string, tie the weight to the elastic band at the point where the band crosses.

Put the lid back on the can and gently roll the can away from you.

Watch how the can magically rolls back to you!

What's going on?

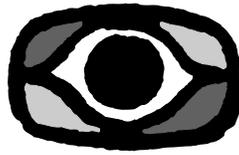
As the can rolls, the heavy weight stays hanging below the elastic band, causing the band to become twisted. The twisted elastic band stores enough energy to drive the can back in the opposite direction. Note: If the can is pushed too hard, the experiment won't work because the weight will spin too.

True or
False:

The amount
of Carbon in
the human
body is
enough to
fill 9,000
lead pencils

Graphite is the form of carbon used to make pencils. This is mixed with clay and baked.

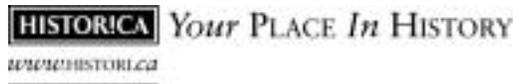
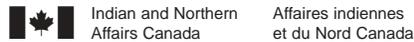
Answer: True



Seventh Generation Club Mission Statement

To create a club where First Nations youth can envision their future by recognizing their own energy, the culture of their people, and the teamwork needed to succeed by giving them opportunities to make healthy life choices, participate in their community, and to meet the challenges of life.

The Seventh Generation Club would like to thank the following partners:



Administration and coordination is provided by the
First Nations Schools Association



Seventh
Generation Club

113-100 Park Royal South
West Vancouver, BC
V7T 1A2
Tel: (604) 925-6087
Fax: (604) 925-6097



SEVENTH GENERATION CLUB