where challenge

Step 1

Think of What to Write

Step 2

Write it Down With a Pencil

Step 3

Hand it in, Get a Good Mark

Graphite Pencil

The Universally Acclaimed, Portable Writing Utensil!

Created By: Oliver Yee
School: Georgetown District High School
Teacher: Miss Price

The Parts of a Graphite Pencil

The Tip of the Pencil

It is a common misconception that pencils are made of lead, when in fact, it uses graphite. Lead is an entirely different mineral and would be pretty dangerous to use (lead poisoning).

Graphite is a blackish to light gray opaque mineral that is found in metamorphic rock and is an allotrope of carbon (diamond being one as well).

Graphite is used in pencils because of its ability to leave a dark streak across many surfaces (especially paper). Graphite means "to write/draw", taken from the Greek word "graphein".

Pencil manufacturers do not use graphite in its pure form as it would break easily. Instead, they grind up graphite and add clay and water, which is then heated up to form the graphite that will be inserted into the pencil. The more clay added to the mixture, the harder the pencil is, the lighter the line it makes. Therefore, when there is less clay added to mixture, the lighter the pencil, the darker the line it makes.

In Canada, graphite is abundantly found in Quebec and Ontario, although it is found in smaller amounts in other provinces.

Top Producers in 2005 (Tons)

China	India	Brazil	N. Korea	Canada
720,000	120,000	75,600	32,000	28,000

The Body of the Pencil

The California Incense Cedar (also known as Calocedrus decurrens, or just incense cedar) is the universal choice to use for the body of the pencil for several reasons:

1. This tree is soft (easy to cut)
2. Is relatively large in size
3. Does not splinter when sharpened (that would be dangerous)
4. There is an abundance of it
5. Can survive a drought and fire.

Don't worry of a shortage on this tree, as there are strict regulations set in place. For every tree cut down, 2 more are grown, meaning that if this continues, we will enjoy pencils for generations to come.

In the 1800s the California Incense Cedar was a substitute for the Eastern Red Cedar (which was the universal choice). But later, this tree found its way to the top and has remained there.

As the name implies, this tree is abundantly found in California (the Sierra Nevada mountains), but can be also be found in the southern parts of Oregon, the western parts of Nevada and Mexico.

Top Producers

United States	Mexico
#1	#2

The Common Graphite Pencil

The Ferrule

If you did not know, the ferrule is the metal part that attaches the top of the pencil to the eraser. Currently, most pencil companies make the ferrules out of aluminum, but in the past, steel or brass was commonly used.

Aluminum (also spelled aluminium) is a light-weight, malleable, ductile, strong, silvery white metal. Aluminum is the most abundant metal in the Earth's crust and the 3rd most abundant element overall (behind oxygen and silicon).

Aluminum has the remarkable ability to resist corrosion (as a shiny, thin layer of aluminum oxide is formed when it comes in contact with oxygen).

You can't find aluminum in its free form in Earth, as it is always combined with other elements to form compounds, such as aluminum oxide. As well, aluminum is found in over 270 minerals, but is mainly extracted bauxite ore.

You can't find bauxite ore in Canada, but Canada does the majority of the smelting (extracting the aluminum from the ore) and is the 3rd largest producer of aluminum in the world.

Top Producers in 2006 (Thousands of Tons)

China	Russia	Canada	U.S.	Australia
9,349	3,717.91	3,051.91	2,284	1,932

Top Production of Bauxite Ore in 2007 (Thousands of Tons)

Australia	China	Brazil	Guinea	Jamaica
64,000	32,000	24,000	14,000	14,000

The Eraser

The eraser is composed primarily of 2 materials, rubber and pumice. If you did not know, erasers have the ability to get rid of graphite marks.

Rubber is really latex that has coagulated. Latex usually comes from the pará rubber tree (although many plant produce smaller amounts of latex), which only grows in tropical climates that receive lots of precipitation.

Collecting latex is like collected maple syrup, as a small incision is made in the bark of tree, where latex then drips out. A dilute acid is added to the latex, where parts of it turn into a solid (and thus rubber to formed). Sulfur and high temperatures is usually added to prevent the rubber from rotting (this is called vulcanization)

In the past, latex was collected from trees in South America, but this has since change, as 90% latex production now comes from Southeast Asia.

Top Producers in 1998 (Tons)

Thailand	Indonesia	Malaysia	India	China
2,065,000	1,680,000	866,000	591,000	450,000

Pumice is added specifically to pencil erasers to increase its abrasiveness (thus increasing its effect on graphite)

Pumice is a paled color, low density igneous rock (the only rock that can float on water) that is formed when a rock, filled with water and gas, is extruded from a volcano. This causes the rock to cool and depressurize quickly, thus causing its unique form.

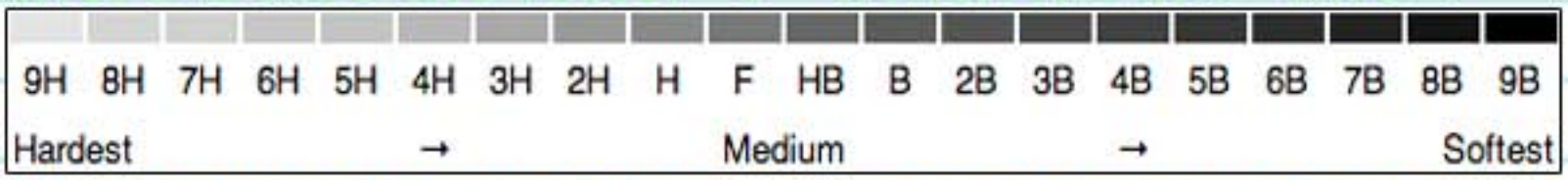
Pumice is found in areas that have very young volcanic fields, therefore pumice is not found in Canada.

Top Producers in 2006 (Tons)

Italy	Greece	Chile	Iran	U.S.
4,600,000	2,250,000	1,620,000	1,600,000	1,540,000

Pencil Facts

- The average sized pencil can draw a line 35 miles long, or about 45,000 words!
- The word "pencil" comes from the Latin word "penicillus" which means "little tail", how appropriate.
- Even though graphite is not poisonous, do not ingest, as it can cause stomach ache and vomiting!
- When graphite was discovered, they thought that it was a form of lead (due to lack of knowledge) and even called it "plumbago" or "black lead". This is why people still call graphite "lead"!
- Pencils have different grades, although the most used grade is HB. As you have already learned, harder pencils have more clay and are lighter. Softer pencils have less clay and are darker. The H refers to "hardness" and the higher the number, the lighter it is. The "B" refers to "blackness" and the higher the number, the darker it is. In the middle, there is also the letter "F" which means "fine".



- Pencils used to not have erasers because teachers felt they would encourage children to make mistakes. So much for the saying "pencils have erasers to correct mistakes"!
- Did you know that the first erasers were pieces of bread?

Sources for Information and Pictures

Thank you to all these sites, for without them, none of this could have been made possible!

Information Sources

http://www.nrcan-rncan.gc.ca/mms-smm/busi-indu/cmy-amc/content/1998/29.pdf
http://en.wikipedia.org/wiki/Incense-cedar
http://www.madehow.com/Volume-1/Pencil.html
http://www.pencils.com/pencil-information/pencil-lead
http://www.pencils.com/pencil-information/pencil-history
http://www.wisegeek.com/how-are-pencils-made.htm
http://en.wikipedia.org/wiki/Graphite
http://www.indexmundi.com/en/commodities/minerals/graphite/graphite_t8.html
http://www.galleries.com/minerals/elements/graphite/graphite.htm
http://www.indexmundi.com/minerals/?product=aluminum&graph=production
http://www.indexmundi.com/en/commodities/minerals/pumice_and_pumicite/pumice_and_pumicite_t4.html
http://discovermagazine.com/2007/may/20-things-you-didnt-know-about-pencils
http://en.wikipedia.org/wiki/Calocedrus_decurrens
http://www.calcedar.com/about/history/incense.htm
http://www.fs.fed.us/database/feis/plants/tree/caldec/all.html
http://healthguide.howstuffworks.com/pencil-lead-dictionary.htm
http://74.125.95.132/search?q=cache:RIZ3IK0wxdcJ:www.pencils.net/facts.cfm+pencil+facts&hl=en&ct=clnk&cd=1&client=safari
http://en.wikipedia.org/wiki/Aluminium
http://wiki.answers.com/Q/What_metal_is_the_ferrule_on_a_pencil
http://en.wikipedia.org/wiki/Bauxite
http://en.wikipedia.org/wiki/Eraser
http://www.madehow.com/Volume-5/Eraser.html
http://www.azom.com/details.asp?ArticleID=3580
http://en.wikipedia.org/wiki/Pumice
http://www.mii.org/Minerals/photopumice.html

Picture Sources

http://www.iccsd.k12.ia.us/schools/City/photos/a.jpeg
http://www.pool.org.au/files/imagecache/full_size/files/image/audio/Bud-Petal/brain.jpg
http://www.quabbinvalley.com/images/notebook_paper.jpg
http://www.thedailyplanner.com/images/Spare_Pencil_Brwn.jpg
http://home.comcast.net/~thehiredhand/2hand.jpg
http://www.funfacts.com.au/images/lead-graphite-pencil.jpg
http://www.paperchaseproducts.com/catalog/images/EX006809.jpg
http://webmineral.com/specimens/Lead.jpg
http://z.about.com/d/geology/1/0/4/F/graphite.jpg
http://upload.wikimedia.org/wikipedia/en/b/b9/Incensecedar_sanjacintomts.JPG
http://upload.wikimedia.org/wikipedia/en/2/29/Incense_Cedar_in_Lassen_VNP-750px.JPG
http://upload.wikimedia.org/wikipedia/commons/2/2b/Calocedrus_decurrens_7947.jpg
http://www.magellanmerchandise.co.uk/images/productpics/1267-Rainbow-Pencil.gif
http://images.birthdayinabox.com/BIABviewLarger/BluePencil.jpg
http://upload.wikimedia.org/wikipedia/en/9/97/2005graphite.PNG
http://ipa.tamu.edu/news/china_flag_large.bmp
http://www2.warwick.ac.uk/alumni/professional/regions/india/india-flag.jpg
http://www.stacey.peak-media.co.uk/Year8/8-7Brazil/8-7Brazil-land/brazil-flag.gif
http://www.mpcquality.com/images/North-Korea-Flag.jpg
http://www.britishcouncil.org.br/champions/blog/upload/06052008075923_Canada_flag.gif
http://www.thegeminiweb.com/babyboomer/wp-content/uploads/2007/08/pencil.jpg
http://upload.wikimedia.org/wikipedia/commons/0/01/Pumice_stone444.jpg
http://allergyadvisor.com/Educational/Images/Latex%20tree.jpg
http://christianspravingforobama.com/sitebuildercontent/sitebuilderpictures/us-flag-640.gif
http://upload.wikimedia.org/wikipedia/commons/f/fc/Mexico_flag_large.png
http://conifers.org/cu/calo/decurrens1.gif
http://webfortheworld.org/webquests/korean_nuclear/Russia_flag.gif
http://webzoom.freewebs.com/jakamneziak/800pxd-Flag_of_Australia.svg.png
http://www.hercules-online.com/catalog/pics/Aluminium_Composit_Panels.jpg
http://www.usinenouvelle.com/industry/img/aluminium-000051314-4.jpg
http://www.thedailyplanner.com/images/Spare_Pencil_Blck.jpg
https://www.cia.gov/library/publications/the-world-factbook/flags/gv-lgflag.gif
http://www.riversskb.org/Live_Broadcasting/Images/Jamaica-flag.gif
http://www.webflags.com/flags/t/thailand.gif
http://www.architecturelist.com/wp-content/uploads/2007/11/Indonesia_flag_large.jpg
http://dansemacabre.files.wordpress.com/2008/08/malaysia_flag_300.png
http://www.mii.org/Minerals/Minpics1/Bauxite.jpg
http://library.thinkquest.org/07aug/01105/images/flag_italy.gif
http://upload.wikimedia.org/wikipedia/commons/2/2a/Chile_flag_300.png
http://www.zdruzenje-manager.si/storage/3979/Iran-flag.gif
http://wwp.greenwichmeantime.com/time-zone/europe/european-union/greece/images/greece-flag.jpg

The End
and thank you for reading!