

CHAPTER 14

Geology and Nonrenewable Resources

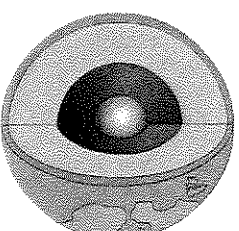
Core Case Study: Environmental Effects of Gold Mining

1. _____ tons of mineral waste is created to make 2 gold wedding rings.
2. What is cyanide heap leaching and why is it so harmful?

14-1: What Are the Earth's Major Geological Processes and Hazards?

Define: Geology-

Label and define the 3 major concentric zones of the Earth.



_____ moves large volumes of rock and heat in loops within the mantle.
 _____ plates move very _____ atop the denser _____ on hot soft
 rock. The plates are composed of _____ crust, _____ crust,
 and the outermost part of the mantle.

What happens when...

oceanic plates move apart from one another:	an oceanic plate collides with a continental plate:	two continental plates collide:
		* Transform Fault-

Geological Processes- generated by _____ from the earth's interior and typically build up the earth's surface in the form of continental and oceanic crust. Ex: _____ and _____
 Geological Processes- driven by energy from the _____ (flowing water and _____) and influenced by gravity tend to wear down the earth's surface.
 Ex: _____ - break rocks into smaller pieces to build _____
 _____ - material is loosened or worn away and deposited elsewhere
 * _____ also cause erosion

<p>VOLCANOES</p> <ul style="list-style-type: none"> - form from _____ plate movement and usually found along boundaries of tectonic plates - occurs when _____ reaches earth's surface through a central vent, or _____ - lava= _____ - eruption releases large chunks of lava, liquid lava, ash, _____, and _____ - benefit: highly fertile _____ from the weathering of lava ➤ 1991- Mount Pinatubo- reduced solar energy and cooled atmosphere for 15 months ➤ 1980- Mount St. Helen's- worst in history 	<p>EARTHQUAKES</p> <ul style="list-style-type: none"> - Cause: Define: Seismic Waves- Focus- Epicenter- Magnitude- Amplitude- Seismograph- Richter Scale- Aftershock-
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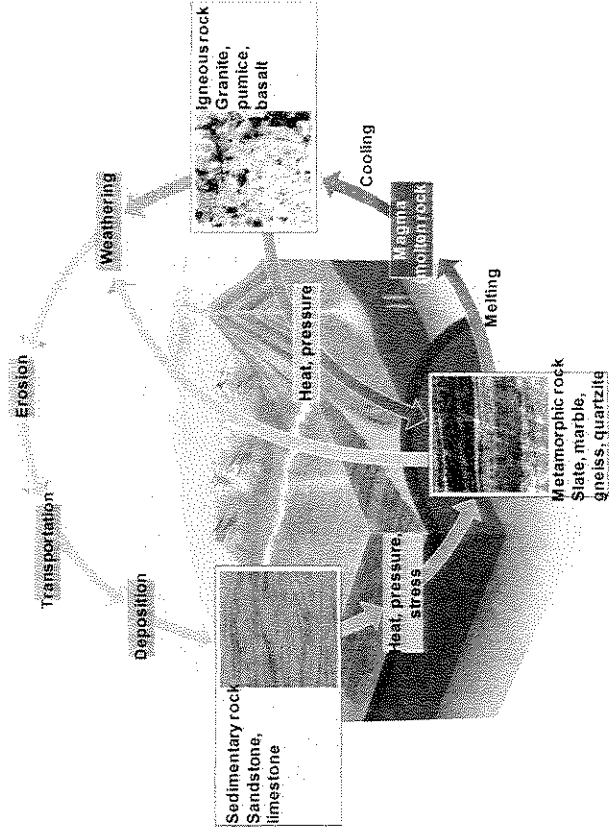
Effects of earthquakes:

TSUNAMIS

- series of large _____ generated when ocean floor suddenly rises or falls or underwater earthquake
- detected by ocean _____
- Dec 2004- tsunami in _____ Ocean, earthquake had a magnitude of _____ and waves _____ ft high
 - _____ Forests- reduced death toll by protecting buildings and people from force of the waves
- element or inorganic compound that occurs naturally as a solid
- EX: _____
- solid combination of one or more _____
- EX: _____

3 Major Types of Rocks:

Sedimentary Rock	Igneous Rock	Metamorphic Rock



ROCK CYCLE
 - chemical and physical processes that change rocks from one type to another
 - recycles the Earth's 3 types of rocks over millions of years
 - slowest of all earth's cyclical processes

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Fig. 14-13, p. 354

14-3: What Are Mineral Resources & What Are the Environmental Effects of Using Them?

Mineral Resources- concentration of naturally occurring material that can be _____ and processed into useful _____ or raw materials at an affordable cost.

EX:

High Grade Ore:	_____ - rock that contains large enough concentration of a particular mineral (usually metal) to make a profit
Low Grade Ore:	_____

Describe how each is a part of our lives:

Aluminum	
Manganese, Cobalt, and Chromium	
Copper	
Platinum	
Gold	
Sand	
Limestone	
Phosphate salts	

Mineral Resource Reserve- estimate of a mineral resource's supply based on ability still be profitable at current prices.

Fill in the typical life cycle of a metal resource:



Advantages:		Mineral Use	Disadvantages:

Types of Mining

1. Surface Mining	<ul style="list-style-type: none"> Shallow deposits removed by _____ mining, whereas deep deposits are removed by _____ mining Gigantic equipment strips away the _____ - the soil and rock overlying a mineral deposit *Deposited as a waste material called _____ or _____ Used to extract 90% of _____ mineral and 60% of _____ in the US Type of surface mining where machines dig _____ and remove ore, sand, gravel, and stone
2. Open Pit Mining	<ul style="list-style-type: none"> Extract deposits that lie _____ to the surface in _____ beds * Strip Mining- terrain is flat and equipment removes overburden, removes mineral deposit, and then fill resulting trench back up with overburden. * Strip Mining- used to mine _____ on _____ terrain
3. Strip Mining	

4. Mountain Top Removal

- The top of the mountain is removed to seams of _____
- Seen heavily in Appalachian Mountains

Describe 4 ways mining is harmful to the environment:

- 1.
- 2.
- 3.
- 4.

Removing Metal From Ores:

Ore has two components:

1. Ore _____ the desired metal
2. _____ waste material which produces tailings

*Particles of toxic metals blow by the wind or leached from tailings by rainfall can contaminate _____

After removal of the gangue, _____ is used to release metals from the ore.

* Smelting releases many air pollutants like _____

Summitville Gold Mine:

* A Canadian company used the 1872 mining law to buy the land very cheap.

* They spent \$1 million to develop the site.

* They mined \$98 million worth of gold...

* During the mining process, they used highly toxic cyanide salts to extract gold from ore.

* Then they declared bankruptcy and walked away without cleaning anything up!

14-4: How Long Will Supplies of Nonrenewable Mineral Resources Last?

Which 5 nations supply the most nonrenewable mineral resources?

The US _____ some resources (even though they can be found in US) because we use them _____ than they can be produced.

The future supply of a nonrenewable mineral depends on :

- 1.
- 2.

A mineral becomes _____ depleted when it costs more than it is worth to find, extract, transport, etc. At this point we can do one of five things:

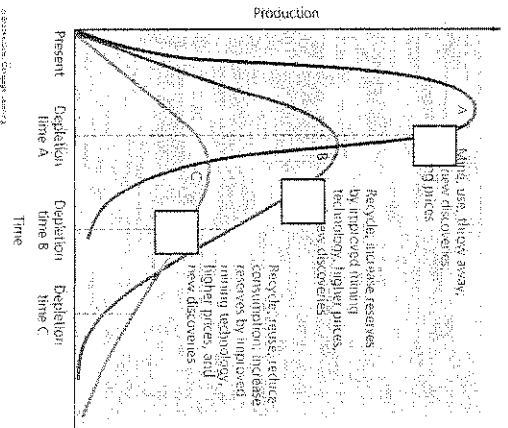
1. _____ existing supplies
2. _____ less
3. _____ less
4. Find a _____
5. Do without

_____ Time- time it takes to use of _____ % of the reserve at a given rate

Which curve represents the shortest depletion time?

Which curve relies heavily on recycling or hope that better mining technology will be invented?

Most mineral prices are kept artificially _____ because of government _____ to help promote economic growth.



US General Mining Law of 1872- some people have gotten rich off this little known law!

-designed to encourage mineral _____ and the mining of _____ minerals on US lands to help develop the then sparsely populated West.

-allows people to buy land very _____ if they file a claim stating that they believe the land contains valuable minerals

Improvements for Mining:

1. Extract minerals from _____ grade ores to increase supplies
2. Use _____ that can extract minerals "biomining"
3. _____ ore- deposits form when super-heated water shoots out of vents in the ocean

14-5: How Can We Use Mineral Resources More Sustainably?

Materials Revolution- _____, ceramics, and _____ are used in _____ place of metals.

3M's 3P Program:

1. Redesign equipment and processes
2. Uses fewer hazardous materials
3. Cut waste and air pollution

Mimic How _____ Deals With Waste:

- waste output becomes nutrient input for another
- reuse or recycle mineral products
- resource exchange webs
- ecological parks- some are being built on abandoned industrial sites, called brownfields
- biomimicry

