**Earth and Space--The Lithosphere**

**The Lithosphere**

* a hundred km outer shell of the Earth
* crust and upper mantle
* rocks and minerals
* **building materials, metals, precious jewellery stones**



**Soil**

* relatively thin surface layer of the Earth's crust consisting of mineral and organic matter that is affected by agents such as weather, wind, water, and organisms
* at risk--we do not have enough of it



**Buffering Capacity of Soil**

* soil acidity or pH can vary from very acidic to very alkaline (basic)
* either end of pH scale hinders plant growth
* **plants like pH 6-7**
* conifers like more acidic
* **soil can neutralize a certain amt of acidity or alkalinity without its pH changing**
* soils can compensate somewhat for variations in pH
* the ability to resist changes in its pH when acidic or alkaline compounds are added to it is called its **buffering capacity**
* the finer the texture the better the buffering capacity

Summarize your **lab results** with water, sand and soil:

Data Table

What does each of the results mean?

**Permafrost**

* in Northern regions large expanses of soil are permanently frozen
* **permafrost is ground whose T has been 0 oC or lower for at least 2 years**
* almost 50 % of land in Canada
* less than or equal to 500 m deep
* at high altitudes too -- so can be found on mountains



* top layer AKA the active layer sometimes thaws in summer
* **houses have to be built on piles** that pass through the active layer and sit directly on permafrost
* the active layer is very sensitive to T fluctuations
* global warming has wreaked havoc with the permafrost

**Permafrost Video**

https://www.youtube.com/watch?v=2w4UQfJHD-A

**Lithosphere Energy Resources**

* oil, natural gas and coal resources
* fossil fuels, Uranium, geothermal

**Fossil Fuels**

* 2/3 of world’s electricity from FF
* oil (a liquid) from small marine animals and algae in sea which died, sank and covered with rocks and minerals
* pressure turned them into oil or natural gas
* coal (a solid) from terrestrial plants and trees in swamps
* burn to emit thermal energy → mechanical energy → electrical energy

**Combustion:**

* emits carbon dioxide = chief greenhouse gas
* sulfur dioxide and nitrogen oxides = acid rain
* methane = 21 x more powerful greenhouse gas than CO2

**Uranium**

* radioactive element that occurs naturally
* splitting (fission of) the nucleus produces large amts of energy → electricity
* a handful U = same amt of HE as 70 000 kg of coal
* fission = splitting
* no greenhouse gases
* **huge amount of energy stored in the bonds btw the particles in the nucleus of an atom**
* heat energy **AND** radioactivity released
* containment buildings of reinforced concrete
* buildings supposed to be earthquake resistant (Fukushima Japan, 2011)
* radioactive waste last for hundreds of years
* cool in huge pools, buried in mines or concrete pits
* 1 plant only in Gentilly QC

**Geothermics**

* molten rock contains enormous amts of energy (earth and hot)
* internal heat of the earth
* fluid is circulated deep underground
* it heats up and rises to the surface
* converted to electricity or used to heat buildings
* **volcanic regions** where hot rock is near surf
* hot water rises to the surface by itself
* reduce heating costs and CO2 emissions
* renewable
* installation is very expensive



**Energy of Tomorrow?????**

* fossil fuels = non-renewable = will run out in the next few decades (your lifetime!!!!!)
* hydrogen cells instead?
* H2 is most abundant element on the earth
* lit splint test = H2 gas explodes -- pops and goes out = heat energy released

**Pollution and Degradation**

**Soil Depletion**

* farming practices use heavy machinery that compact soil (removing oxygen)
* compaction prevents rain from penetrating the earth
* rainwater runs off the surf into lakes and rivers carrying organic matter, microorganisms and essential nutrients for plant life
* loss of soil fertility
* need to let land rest
* crop rotation instead and lots of fertilizer and pesticides

**Eutrophication**

fertilizer → run off → growth of algae in lakes (cyano-bacteria = blue-green algae in QC)

**Bioaccumulation**

pesticides → accumulate in tissues of organisms → kill microorganisms, insects and small animals

* organisms are needed to maintain balance
* biodiversity threatened

**Contamination**

* gas station leaks of hydrocarbons
* landfills leak water containing heavy metals
* mining spreads acid residue
* contamination is the abnormal presence of a harmful substance in the environment
* precipitation carries all kinds of chemicals
* sulfur dioxide and nitrogen oxides from factories and fossil fuel combustion become mixed with ppt
* sulfuric acid and nitric acid form acid rain



* **acidified soil** can no longer retain nutrients essential to plant life
* acid rain kills microorganisms beneficial to plants
* trees and plants grow more slowly and **soils with low buffering capacity** are affected