

Ecology
4.3- Carbon Cycling

Organic Molecules + O₂ → CO₂ + H₂O + Heat with (C,H and O)

Essential idea:

- Continued availability of carbon in ecosystems depends on carbon cycling.

Nature of science:

- Making accurate, quantitative measurements
 - it is important to obtain reliable data on the concentration of carbon dioxide and methane in the atmosphere. (3.1)
 - CO₂ is higher than any time in past 20 million years
 - Human activity has increased CO₂ and methane levels
 - Human activity will cause CO₂ levels from 397 micromoles/mole (2014) to above 600 by end of the century

Applications and Skills

- Application: Analysis of data from air monitoring stations to explain annual fluctuations. (*Analyze Mauna Loa data*)

Understandings

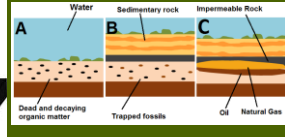
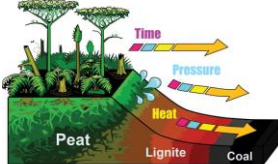
- Autotrophs convert carbon dioxide into carbohydrates and other carbon compounds. (DBQ 221)
 - Carbon fixation is removing CO₂ from the atmosphere
 - Currently .039%

Understandings

- In aquatic ecosystems carbon is present as dissolved carbon dioxide and hydrogen carbonate ions.
 - CO₂ is water soluble
 - Can produce carbonic acid when combined with water (pH)
 - Used by aquatic autotrophs to produce carbon compounds

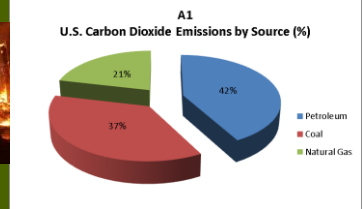
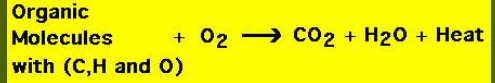
Understandings

- Partially decomposed organic matter from past geological eras was converted either into coal or into oil and gas that accumulate in porous rocks.
 - Coal is metamorphic peat deposits.
 - Oil and natural gas.
 - Formed at bottom of seas and lakes.
 - Anaerobic conditions produce incomplete decomposition.
 - Metamorphic conditions chemically change material.



Understandings

- Carbon dioxide is produced by the combustion of biomass and fossilized organic matter.



Understandings

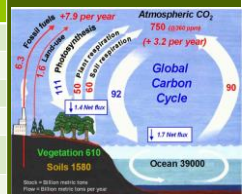
- Animals such as reef-building corals and mollusca have hard parts that are composed of calcium carbonate and can become fossilized in limestone.
 - About 10% of all sedimentary rock is limestone.
 - About 12% of limestone is carbon.



Applications and Skills

- Application: Estimation of carbon fluxes due to processes in the carbon cycle. (DBQ 227)
 - Quantities of Carbon movement can only be estimated
 - One gigatonne is 1x10¹⁵ grams

Processes	Flux/gigatonnes year ⁻¹
Photosynthesis	120.0
Cell respiration	119.6
Ocean uptake	92.8
Ocean loss	90.0
Deforestation and land use changes	1.6
Burial in marine sediments	0.2
Combustion of fossil fuels	6.4



Applications and Skills

- Skill: Construct a diagram of the carbon cycle. (Use Carbon Flux Table 1 pg 227 – add flux values above arrows)

