**Topic 4.3: Carbon Cycling Review**

**Essential Idea: Continued availability of carbon in ecosystems depends on carbon cycling.**

**4.3.U1 Autotrophs convert carbon dioxide into carbohydrates and other carbon compounds.**

State the role of photosynthesis in the carbon cycle.

(**State:** Give a specific name, value or other brief answer without explanation or calculation)

**4.3.U2 In aquatic ecosystems carbon is present as dissolved carbon dioxide and hydrogen carbonate ions.**

Outline the process that converts CO2 to hydrogen carbonate ion in water, leading to a reduction of the pH in the water.

**(Outline**: Give a brief account or summary)

**4.3.U3 Carbon dioxide diffuses from the atmosphere or water into autotrophs.**

State that in diffusion, molecules move from an area of higher concentration to an area of lower concentration. ​

(**State**: Give a specific name, value or other brief answer without explanation or calculation)

**4.3.U4 Carbon dioxide is produced by respiration and diffuses out of organisms into water or the atmosphere.**

**​**State that carbon dioxide is a waste product of aerobic cellular respiration.​

(**State:** Give a specific name, value or other brief answer without explanation or calculation)

**State that carbon dioxide diffuses out of cells into the atmosphere or water.**

(**State:** Give a specific name, value or other brief answer without explanation or calculation)

**4.3.U5 Methane is produced from organic matter in anaerobic conditions by methanogenic archaeans and some diffuses into the atmosphere or accumulates in the ground.**

​Outline the role of methanogenic archaea in the transformation of organic material into methane.

**(Outline**: Give a brief account or summary)

**4.3.U6 Methane is oxidized to carbon dioxide and water in the atmosphere.**

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State that methane is oxidized to carbon dioxide in the atmosphere.

(**State:** Give a specific name, value or other brief answer without explanation or calculation)

**4.3.U7 Peat forms when organic matter is not fully decomposed because of acidic and/or anaerobic conditions in waterlogged soils.**

Define peat.

**(Define**: Give the precise meaning of a word, phrase, or physical quantity.)

Outline formation of peat.

**(Outline**: Give a brief account or summary)

**4.3.U8 Partially decomposed organic matter from past geological eras was converted either into coal or into oil and gas that accumulate in porous rocks.​**

Outline formation of coal.

**(Outline**: Give a brief account or summary)

Outline formation of oil and natural gas**.**

**(Outline**: Give a brief account or summary)

**4.3.U9 Carbon dioxide is produced by combustion of biomass and fossilized organic matter.**

Define combustion.

**(Define**: Give the precise meaning of a word, phrase, or physical quantity.)

State the products of a combustion reaction.

(**State:** Give a specific name, value or other brief answer without explanation or calculation)

State sources of fuel for a combustion reaction**.**

(**State:** Give a specific name, value or other brief answer without explanation or calculation)

**​​**

**4.3.U10 Animals such as reef-building corals and Mollusca have hard parts that are composed of calcium carbonate and can become fossilized in limestone.**

State that hard shells, such as in mollusk and coral, are made of calcium carbonate.

(**State:** Give a specific name, value or other brief answer without explanation or calculation)

**4.3.A1  Estimation of carbon fluxes due to processes in the carbon cycle.**

List seven flux processes in the carbon cycle.

State the unit of measure for carbon flux values.

(**State:** Give a specific name, value or other brief answer without explanation or calculation)

**4.3.A2  Analysis of data from air monitoring stations to explain annual fluctuations.​**

Sketch a graph of the annual fluctuation in atmospheric carbon dioxide concentration.

**(Sketch**: Represent by means of a diagram or graph(labeled as appropriate). The sketch should give a general idea of the required shape or relationship, and should include relevant features.)

Explain the annual fluctuation in atmospheric carbon dioxide concentration in the northern hemisphere.

(**Explain:** Give a detailed account including reasons or causes)

**4.3.S1  Construct a diagram of the carbon cycle.**​

Draw a diagram of the terrestrial carbon cycle.

**(Draw** : Represent by means of a labeled, accurate diagram or graph, using a pencil. A ruler(straight edge) should be used for straight lines. Diagrams should be drawn to scale. Graphs should have points correctly plotted (if appropriate) and joined in a smooth curve. )

Draw a diagram of the aquatic carbon cycle.

**(Draw** : Represent by means of a labeled, accurate diagram or graph, using a pencil. A ruler(straight edge) should be used for straight lines. Diagrams should be drawn to scale. Graphs should have points correctly plotted (if appropriate) and joined in a smooth curve. )

Define pool and flux.

**(Define**: Give the precise meaning of a word, phrase, or physical quantity.)

**4.3.NOS  Making accurate, quantitative measurements-it is important to obtain reliable data on the concentrations of carbon dioxide and methane in the atmosphere.​**

Explain why accurate measurements of CO2 and methane in the atmosphere are important.

(**Explain:** Give a detailed account including reasons or causes)

Outline how data on concentration of atmospheric CO2 and methane are collected.

**(Outline**: Give a brief account or summary)

**Key Terms**

carbon

glucose

​carbon dioxide

​peat

​carbon fixation

monoatomic oxygen

​fossilized organic matter

hydrogen carbonate

methanogenesis

organic acids

acetate

​Archaeans

​combustion

​sedimentary rock

methanogenic

​carbohydrate

​fossil fuels

​hydrocarbons

carbonic acid

​hydroxyl radicals

limestone

​coal

carbonates

​excretion

​cycling

​limestone

Ruminant mammals

​peat

carbon flux

​methanogenesis

autotrophs

​combustion

​methane

​biogas

​landfill site

​coal

​photosynthesis