**Topic 2.9: Photosynthesis**

**Essential Idea: Photosynthesis uses the energy in sunlight to produce the chemical energy needed for life.**

**Statements & Objectives:**

**2.9.U1 Photosynthesis is the production of carbon compounds in cells using light energy.**

Define photosynthesis.

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

State the chemical equation for photosynthesis.

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

**2.9.U2 Visible light has a range of wavelengths with violet the shortest wavelength and red the longest.**

Define visible light.

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

State the relationship between wavelength and energy.

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

State the range of wavelengths that fall within the visible spectrum.

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

**2.9.U3 Chlorophyll absorbs red and blue light most effectively and reflects green light more than other colours.**

Define pigment.

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

State the primary and accessory pigments found in chloroplasts.

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

Explain why plants are green.

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

**2.9.U4 Oxygen is produced in photosynthesis from the photolysis of water.**

**​**

Define photolysis.

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

State the equation for photolysis.

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

State that the oxygen produced in photolysis is a waste product of photosynthesis.

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

**2.9.U5 Energy is needed to produce carbohydrates and other carbon compounds from carbon dioxide.**

State the energy conversion that occurs during photosynthesis.

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

**2.9.U6 Temperature, light intensity and carbon dioxide concentration are possible limiting factors on the rate photosynthesis.**

Define “limiting factor.”

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

Explain how the following factors limit the rate of photosynthesis:

Temperature

Light intensity

CO2 concentration

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

**2.9.A1 Changes to the Earth’s atmosphere, oceans and rock deposition due to photosynthesis.**

State that (some) prokaryotes, algae and plants carry out photosynthesis.

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

Define and state evidence for the “Great Oxidation Event.”

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

**2.9.S1 Drawing an absorption spectrum for chlorophyll and an action spectrum for photosynthesis.**

Distinguish between an action spectrum and an absorption spectrum.

(**Distinguish** Make clear the differences between two or more concepts or items.)

Describe the shape of the curve for an absorption spectrum.

(**Describe** Give a detailed account or picture of a situation, event, pattern or process.)

Describe the shape of the curve for an action spectrum.

(**Describe** Give a detailed account or picture of a situation, event, pattern or process.)

**2.9.S2 Design an experiment to investigate limiting factors on photosynthesis.**

​List mechanism for measuring the rate of photosynthesis.

**(List:** Give a sequence of brief answers with no explanation).

**2.9.S3 Separation of photosynthetic pigments by chromatograph. (Practical 4)**

Outline the process of separating pigments using chromatography

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

Calculate the Rf value for pigments using pigment chromatography.

(**Calculate:** Obtain a numerical answer showing the relevant stages in the working.)

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**2.9.NOS Experimental design- controlling relevant variables in photosynthesis experiments is essential.**

Define independent variable, controlled variable and responding variable.

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

**Key Terms**

Photosynthesis

Absorption

light intensity

visible light

​ATP

​action spectrum

chemical energy

photolysis

temperature

visible spectrum

ADP

absorption spectrum

wavelengths

biomass

carbon dioxide

​chloroplasts

​limiting factors

​chromatography

chlorophyll

light-dependent reaction

light independent reaction

​carbohydrates

​rock deposition

Rf value

Pigment

Photometer

​Glucose

​Great Oxidation Event