Biology chapter 4
Photosynthesis

What is photosynthesis?

- Photosynthesis is the process where plant use energy from the light to make their food and oxygen from carbon dioxide and water
- It can happen in the chloroplast of Green plant cells
- chloroplast contain chlorophyll
- chlorophyll is a green pigment that absorbs light energy
- photosynthesis is an endothermic reaction which means it takes in energy from the environment

Photosynthesis equations

word equation

carbon dioxide + water = glucose+ oxygen
in the presence of light

Symbol equation

$6CO_2+6H_2O = C_2H_{12}O_6 + 6O_2$

What plants do with glucose?

- Plants use glucose made in photosynthesis in 5 main ways
- For respiration, to release energy for growth and other function

- To make cellulose, used for building strong cell walls
- to make amino acids, glucose combines with nitrate ions from soil to make amino acids which are used to make protein
- to store as oils or fats, for energy storage in seeds
- to store at as starch, f stored in roots stems leaves for later use
- Starch insoluble so it doesn't make cells swell up with the water

Meaning of photosynthesis

- photo means light
- synthesis means putting together so photosynthesis means putting together using light

Rate of photosynthesis

rate of photosynthesis depend up

- light intensity
- Carbon dioxide concentration
- temperature

Limiting factors

Light

- Needed for the energy
- increasing light increases the rate but only until another factor like carbon dioxide and temperature becomes limiting

Carbon dioxide

- Needed to make glucose
- increasing carbon dioxide increases the rate of photosynthesis but only up to a point

Temperature

- it effects enzyme that control photosynthesis
- to cold temperature, then enzyme will work very slowly
- to hot temperature, then enzyme get damage and photosynthesis will stop

Chlorophyll

- Diseases like tobacco mosaic virus or lack of nutrient can reduce chlorophyll
- Less chlorophyll means less light absorbed and slower photosynthesis

Examples of limiting factors

- At night, light is the limiting factor
- in winter, temperature is the limiting factor
- on warm day, on bright day Carbon dioxide is the limiting factor

Graphs of photosynthesis

- when you see graphs
- light or Carbon dioxide increases photosynthesis rate increases then after some time decrease
- temperature too low or too high rate of photosynthesis decreases

- Sometime graph shows two factors like light and temperature together
- the higher the temperature or Carbon dioxide gives higher rate of photosynthesis

The Inverse Square Law

Light and distance

- as distance increases , Light intensity decreases
- light intensity is inversely proportional to square of the distance
- Inversely proportional means if one thing is increasing the other will decrease

Formula

- light intensity= 1/ distance square
- if you half the distance light intensity becomes four times greater
- if you double the distance light intensity becomes 4 times smaller

Ideal conditions for photosynthesis

greenhouse help plants grow better

- it is hard to grow plants outdoors because weather and conditions cannot be controlled
- farmers can create the best conditions for photosynthesis by growing plants in green houses

Temperature control

- greenhouse traps the sun's heat keeping the plants warm
- in winter farmers may use heaters to keep the temperature ideal
- in summers they may use Shades or ventilation to stop plants getting too much temperature
- this help the temperature not becoming a limiting factor for the photosynthesis

Light control

- plants need light for photosynthesis
- farmers use artificial lights when sunlight is not enough or after sunset
- this helps plant to photosynthesis for longer hours

Carbon dioxide control

- plants need carbon dioxide to make glucose
- Farmers can increase carbon dioxide inside the greenhouse
- a paraffin heater is often used when it burns if release carbon dioxide as a by product

Protection and nutrition

- greenhouse health keeps best and diseases away

- farmers can add fertilizers to the soil to give plants the minerals they need for healthy growth

Costs and benefits

- setting up and maintaining green houses cost money
- but when conditions are just right plants grow faster and larger giving better crops that can be sold for profit
- give the right amount of light heat and carbon dioxide not too much because that would waste money