Photosynthesis:

Chloroplasts = site of photosynthesis, chlorophyll = green pigment absorbs Sunlight, endothermic reaction

$$\underset{\text{Carbon dioxide}}{6CO_2} + \underset{\text{Water}}{6H_2O} \xrightarrow{\text{Light}} \underset{\text{Sugar}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2}$$

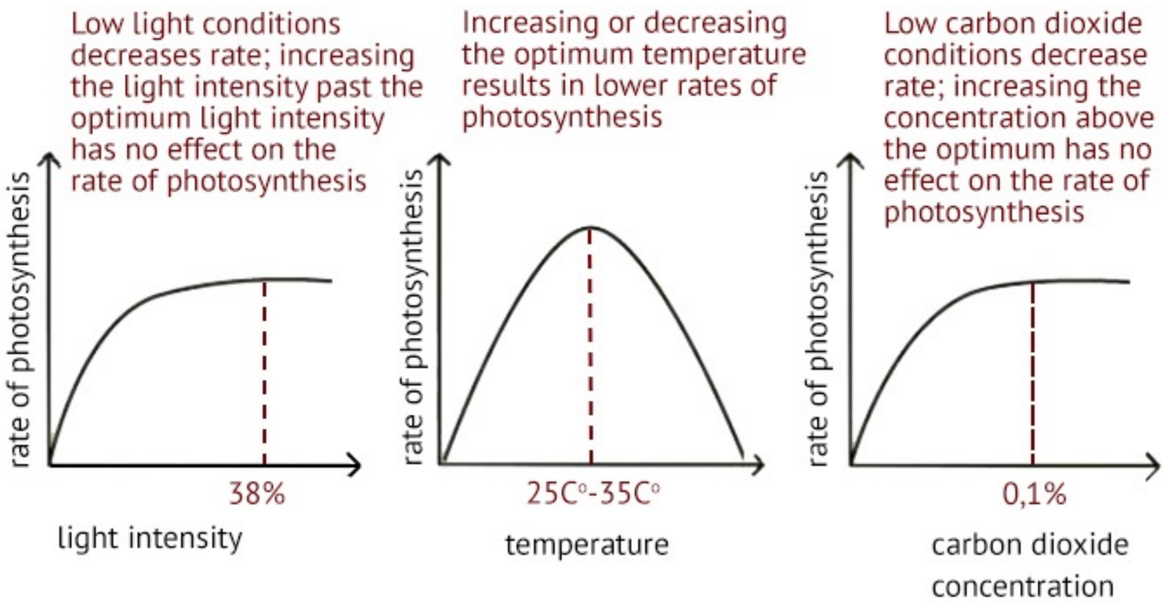
Uses of glucose:

Respiration: transfers energy from glucose in the 1st place
Cellulose synthesis: strengthens plant cell walls
Animo acid synthesis: glucose + nitrate ions -> amino acids -> proteins
Storage as oil & fat: glucose -> lipids + fats in seeds
Storage as starch: in roots, stems & leaves, starch = insoluble (prevents cell swelling up) for use in winter (when photosynthesis isn't happening)

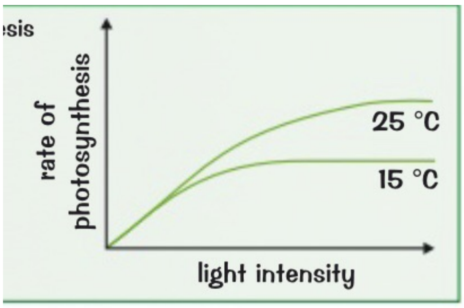
Limiting factors (when in short supply reduce rate of reaction):

At night, Light
In winter, Temperature
In warmth, CO2
TMV virus stops chlorophyll synthesis in chloroplasts so cannot absorb Sunlight

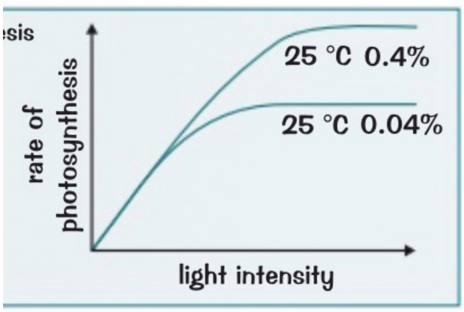
Rate of photosynthesis:



If temperature is too high (approx 45 degrees cel) enzyme's active site denatures so no collisions with substrate = rate of reaction drops



As light intensity increases, so does reaction rate until lines level off. Temp is limiting factor at 15 degrees as it levels off lower than at 25 degrees cel.



Lines level off when light is not limiting factor, carbon dioxide concentration is limiting factor as 0.04% levels off quicker than at 0.4% CO_2.

Inverse square law:

Light intensity decreases in proportion to the square of the distance (of a light source)

$$\text{LIGHT INTENSITY} = \frac{1}{(\text{DISTANCE})^2}$$

Greenhouses artificially created optimal conditions for plant growth:

They:
Trap Sunlight (light isn't limiting factor), heaters used in winter, shades used to ventilate in summer

Paraffin heaters produce CO2 as a by-product (CO2 isn't the limiting factor)

Enclose plants= stops pests & diseases, fertilisers aid in growth

Cost-benefit analysis done to decide if economically viable to invest in a greenhouse, to increase crop yield (good harvests more often) 2 raise profit

Respiration:

Transferring energy from glucose in cells, exothermic reaction

Uses of respiration:

Make big molecules from smaller ones e.g. protein from amino acids
Muscle contraction for movement
Mammals & birds to maintain body temp

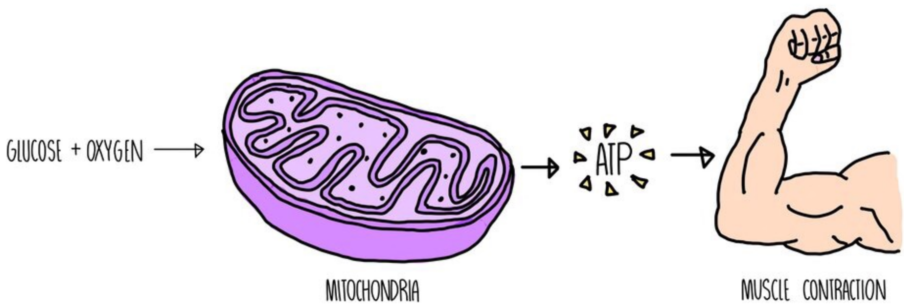
Metabolism:

Sum of all chemical reactions in the body

Large molecules made from smaller ones:
Glucose -> starch
Glucose -> glycogen
4 storage
Glucose -> cellulose
& to strengthen plant cell walls

Glycerol + 3 fatty acids -> lipids
Glucose + nitrate ions -> amino acids -> proteins

Large molecules broken down into smaller ones:
Glucose broken down in respiration
Excess protein -> urea for excretion via urine



Aerobic respiration:

WITH oxygen (efficient)
In mitochondria

GLUCOSE + OXYGEN → CARBON DIOXIDE + WATER

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$$

Anaerobic respiration:

WITHOUT oxygen
Incomplete breakdown of glucose = lactic acid
Occurs during vigorous exercise (body can't supply enough O2 to muscles)
Not efficient as glucose isn't fully oxidised

Lactic acid build up = cramps or lactic acidosis (lethal)
Can lead to O2 debt, lactic acid is transported to liver to be converted back into glucose/ pulse & breathing rate increases to get more O2 to heart after exercise

$$\underbrace{C_6H_{12}O_6}_{\text{glucose}} \rightarrow \underbrace{2C_3H_6O_3}_{\text{lactic acid}} + \underbrace{2ATP}_{\text{energy}}$$

Anaerobic respiration in plants & yeast:

GLUCOSE → CARBON DIOXIDE + ETHANOL

Yeast cells: fermentation 2 make alcohol in drink industry, CO2 from fermentation makes bread rise