Photosynthetic reaction:

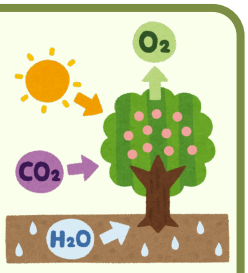
Equation:

_____ _____ + _____ $\xrightarrow{\text{_____}}$ _____ + _____

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

Photosynthesis is an _____ reaction.

Energy transfers from the _____ to the _____ by light.



B4.1 Photosynthesis

Glucose produced by photosynthesis can be used in a variety of ways

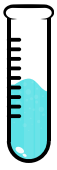
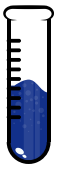
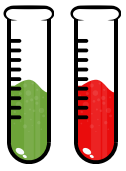
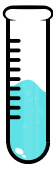
Uses of glucose

- Used in _____ to release energy
- Produce _____to strengthen cell _____
- Stored as ___ or oil
- Converted into _____ starch for storage
- Produce _____ _____ for protein synthesis
- _____ ions from the soil are combined with _____ to produce amino acids

Food tests:

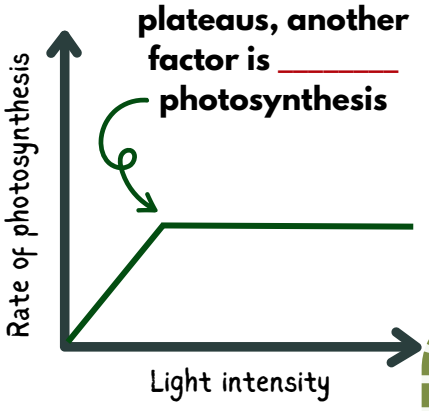
Leaves or foods may be tested for:

- glucose
- starch
- protein

Test	Positive	Negative
Protein _____ solution	 Purple	 Blue
Starch _____ reagent	 Blue / Black	 Orange / Brown
Glucose _____ reagent	 Green to red	 Blue

Rate of photosynthesis:

The rate of photosynthesis is affected by a number of factors



1. Light intensity

- Generally, as light intensity increases, the rate of photosynthesis _____

2. Carbon dioxide concentration

- As carbon dioxide concentration increases, the rate of photosynthesis _____, as carbon dioxide is a _____

3. Temperature

- As temperature increases, the rate of photosynthesis _____, until a point.
- As the reaction is controlled by enzymes, they _____ at high temperatures and the rate will _____.

4. Amount of chlorophyll

- Due to chlorophyll _____ light energy, a reduction in chlorophyll will _____ the rate of photosynthesis.

Investigating the effect of light intensity on photosynthesis

Aquatic plants like _____ can be used to investigate the rate of photosynthesis under different _____.

- Pondweed is placed in a ___ ___ of sodium hydrogen carbonate.
- A lamp is set at a range of _____ from the test tube.
- Light intensity is _____ to distance
- Bubbles of _____ are produced and counted over a set period of time.

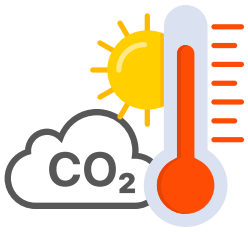
_____ can be controlled using a water bath or beaker

Rate of photosynthesis continued:

Limiting factors:

Factors do not work separately, they can _____, with any one being the limiting factor.

Temperature and carbon dioxide can interact with the effect of light intensity



- Photosynthesis increases, then factors become limiting
- Increasing carbon dioxide concentration, further _____ the rate of photosynthesis, until another factor becomes _____
- Increasing temperature further _____ photosynthesis, until another factor becomes limiting
- At point A, _____ is limiting photosynthesis

B4.1 Photosynthesis continued

Importance of limiting factors

When factors limit photosynthesis, they reduce crop _____.

Farmers can enhance conditions in _____, to achieve _____ photosynthesis.

The cost _____ of conditions must be considered to also maintain _____.

How to enhance factors:

Light	• _____ lighting system • Glass greenhouse maxises _____ transmission • Position plants for _____ absorption
Carbon dioxide	• _____ heaters • Apply liquid carbon dioxide • ____ fungi
Temperature	• _____ greenhouse increases temperature • Shades and _____ for cooling
Water	• _____ systems • Hydroponics - grow plants in _____

Inverse proportions:

Distance and light intensity are _____ _____ to each other.
This is because as one increases, the other _____.

Inverse square law:
Light intensity actually decreases in proportion to the _____ of distance.

$$\text{Light intensity} \propto \frac{1}{\text{distance}^2}$$

Use this formula to calculate light intensity when investigating photosynthesis with pondweed.

This means when a lamp is moved 2 metres from the plant, its light intensity is ___ the original intensity.