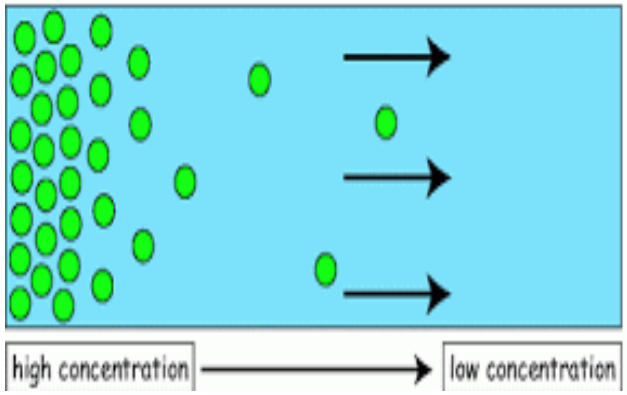
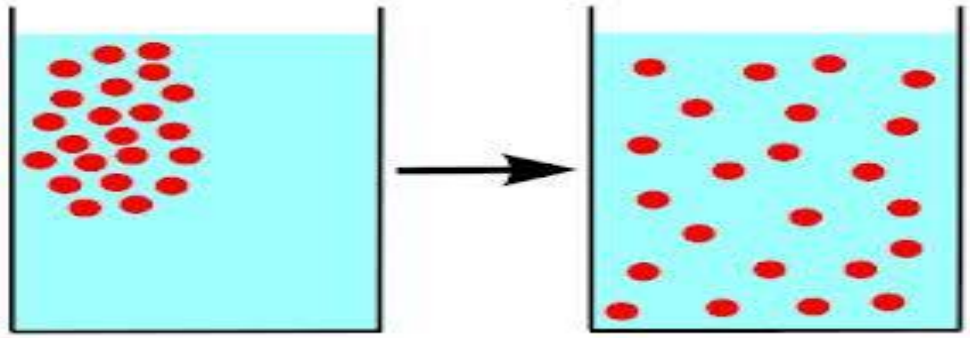
Lab 1,2
Diffusion, Osmosis, Imbibition

Diffusion: is the movement of molecules from an area of higher concentration to an area of lower concentration.

*** This difference in the concentration of molecules called a concentration gradient.**

***diffusion will continue until the concentrations in all regions are the same.**





Factors affecting of diffusion:

*The size and mass of solute.

*The temperature.

*Concentration gradient.

*The nature of the diffusion medium

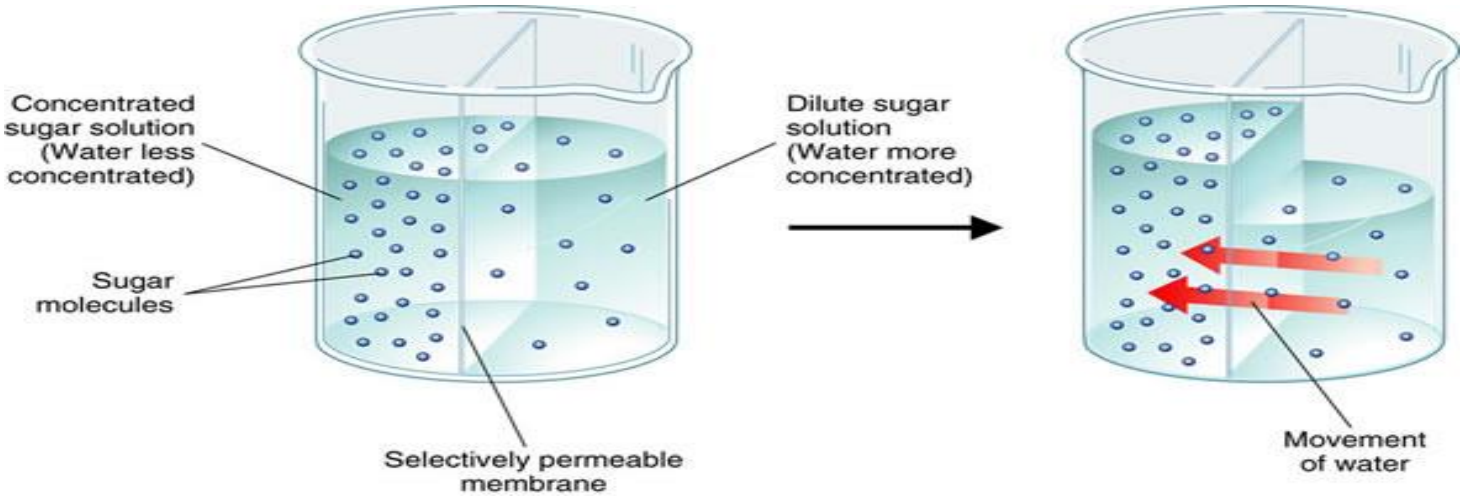
Importance of diffusion in plants:

*It is an essential step in exchange of gases during respiration & photosynthesis.

*Transmission of water, salts and other solute from the soil to the plant through the root group.

Osmosis

The ability of water and solutes to diffuse across membranes. The cytoplasm of a cell contains ions and molecules such as sugars and amino acids, dissolved in water. Water is the solvent and the substances dissolved in the water are solutes.



Importance of osmosis in plants:

*Large amount of water are absorbed by roots from the soil by osmosis.

*Cell to cell movement of water and other substances dissolved in it involves this process.

*Opening and closing of stomata.

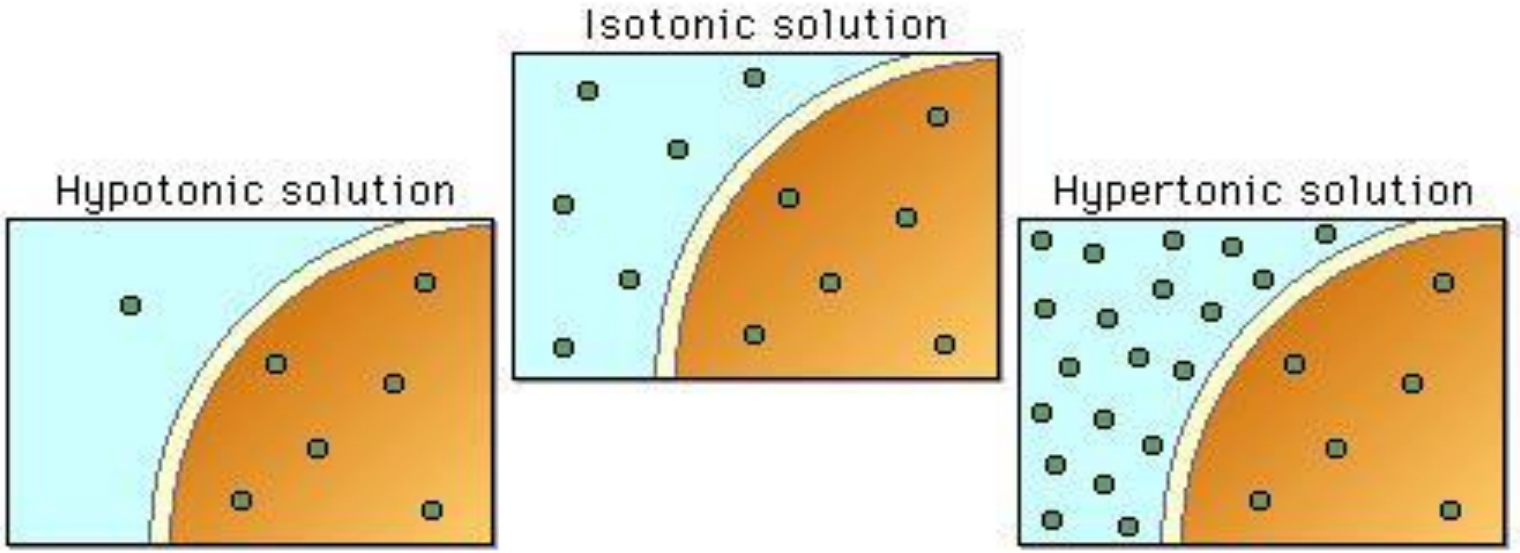
*simplify exit seeding out of the soil.

Types of solutions based on solute concentration:

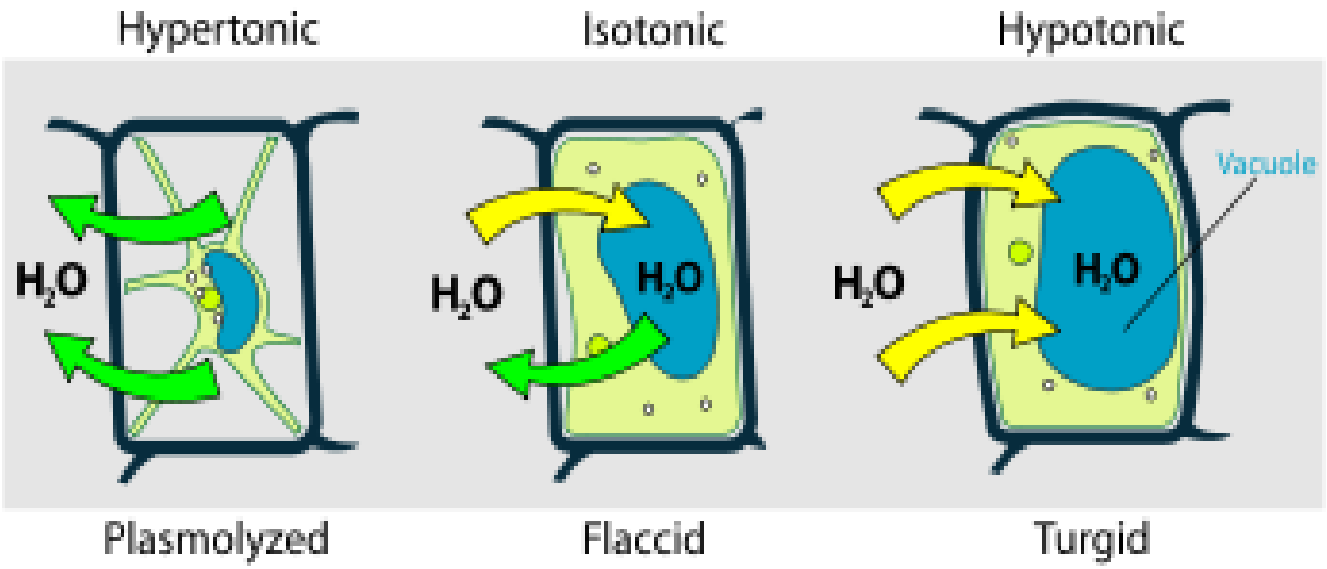
***Hypotonic solution: lower solute concentration.**

*** Hypertonic solution: higher solute concentration.**

*** Isotonic solution: equal in solute concentrations.**



- **Plasmolysis: is the process in which cells lose water in a hypertonic solution (shrinkage or flaccid).**
- **Cytolysis: is the process of flow the water into the cell in a hypotonic solution (turgid).**



Imbibiton

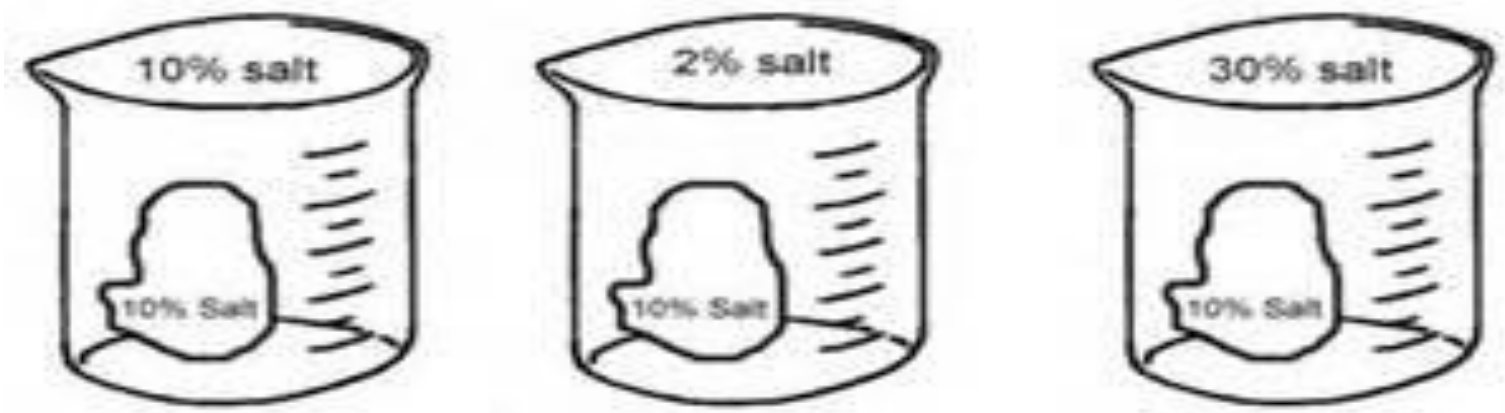
Imbibition is a special type of diffusion when water is absorbed by solids-colloids causing increase in volume. Examples include the absorption of water by seeds and dry wood.

Imbibition's water= Final weight –Initial weight

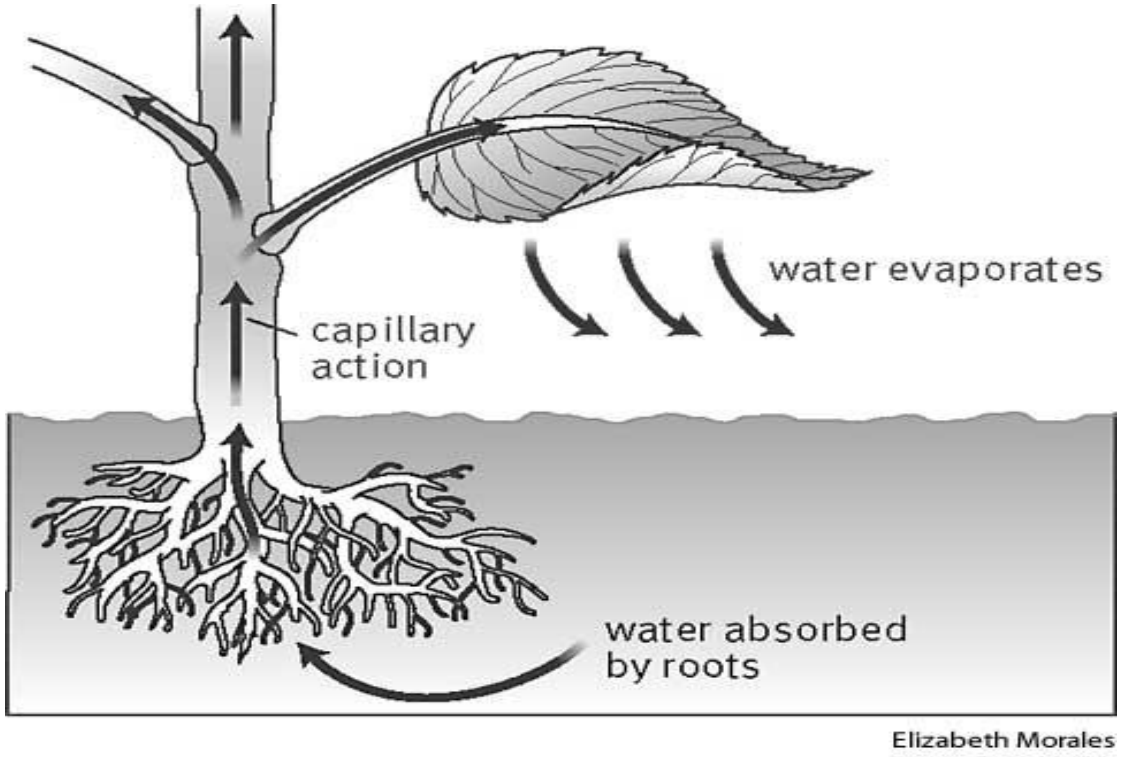
Q) Calculate the imbibition's water, if you know: initiate weight is 4.6 g and final weight is 10.7g?

Q) Compare between incipient plasmolysis and permanent plasmolysis?

Q) List the types of following solutions?



Lab (3 , 4)
Transpiration



The excess of water is lost from the aerial parts of plants in the from of water vapors through the stomata . Transpiration uses about 90% of the water that enters the plant.

Kinds of transpiration :

1. **Stomatal transpiration: most of the transpiration takes place through stomata.**
2. **Cuticular transpiration: still some water may by lost through it.**
3. **Lenticular transpiration: some water may be lost by woody stems through lenticels.**

Factors affecting rats of transpiration :

1. **External factors :**
   - a. Humidity
   - b. Temperature
   - c. Wind
   - d. Light
   - e. CO_2 concentration
2. **Internal factors:**
   - a. Internal water condition.
   - b. Installation of the leaf.

What is the purpose of transpiration:

1. Absorption of mineral salts.
2. Cooling system.
3. Gases exchange.

Other processes involved to the loss of water from plants :

1. **Secretion: loss of water in the glands or nectary.**
2. **Bleeding : Is the loss of water from wounds.**
3. **Guttation: The loss of extra water in liquid drops from margins of leaves of herbal plants when root pressure is high and transpiration is low. Occurs through specialized pores called hydathodes present near the vein endings.**

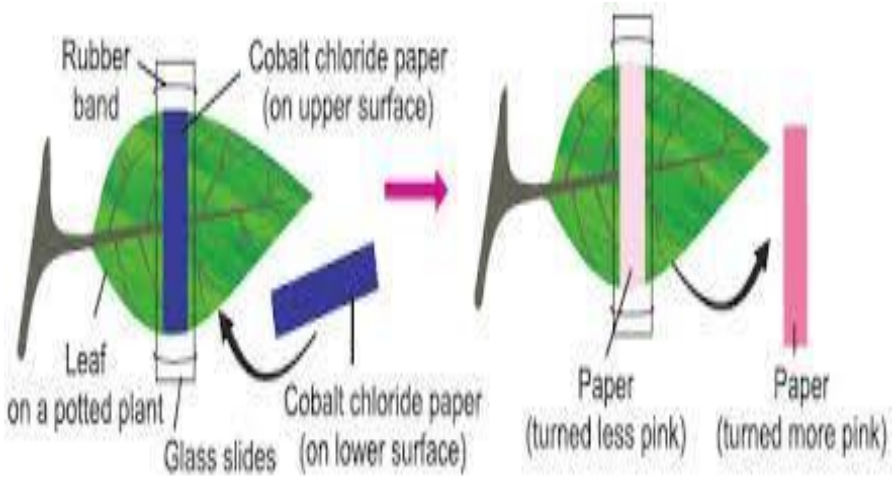
Transpiration	Guttation
1. It occurs through stomata, cuticle and lenticels.	1. It occurs through hydathodes in the leaves.
2. Water is lost in the form of water vapor.	2. It is exuded in the form of liquid.
3. It occurs only in day.	3. In the morning or during the night.
4. Water is pure.	4. Water is not pure, inorganic and organic substances.

Stomata	Hydathodes
1.Found in epidermis by leaves, young stem.	1. Found on the tips of the leaves at the vein end.
2. They are surrounded by pair of guard cells.	2. Guard cells absent.
3. Stomata surrounded by subsidiary cells.	3. Absent.
4. with transpiration.	4. With guttation.

Methods of measuring transpiration:

1.Using the device potometer.

2. With cobalt chlorids sheets.



Compare the rate of transpiration from upper and lower surfaces of a leaf by using cobalt chloride paper.

The required materials:

1.Well watered plant 3% solution of cobalt chloride 2.filter 3.paper 4. slides 5.clips and Vaseline.

Procedure:

1.Soak two small equal discs of white filter paper in 3% solution of cobalt chloride, Remove the excess of cobalt chloride solution. The soaked filter paper turns pink. It now is called cobalt chloride paper.

2.Dry the cobalt chloride paper with a hair drier. They turn blue.

3.Place one such cobalt chloride on the upper epidermis of a leaf of plants and one cobalt chloride paper on the lower epidermis opposite to each other.

4.Press these filter paper pieces with clean glass slides. Clip the two slides together with two separate clips and smear little wax around the glass slides to keep the set up air tight.

5.Compare the time taken for the blue colored filter paper to change into pink.

Result: turns filter paper kept on the lower surface turns pink faster than one kept on the upper surface.

Lab 5
Dormancy

Dormancy

(True dormancy) is mechanism to inhibit germination of certain seeds under environmental factors that are normally suitable for the germination.

quiescence

when a seed fails to germinate because the external environmental not normally for germination, but the seed will germinate if suitable environmental conditions happen.

Dormancy divided into major groups based on what part of seed produces :
1. Exogenous dormancy : is caused by conditions outside the embryo.
2. Endogenous dormancy: is caused by conditions within the embryo itself

Exogenous dormancy	Endogenous dormancy
1. Physical dormancy.	1. Physiological dormancy
2. Mechanical dormancy	2. Morphological dormancy
3. Chemical dormancy	3.Combined dormancy (Morphophysiological)

Types of Exogenous dormancy	Reason	Treatment
1. Physical dormancy.	impermeable layers for water	broken by high temperatures , fire or freezing .
2. Mechanical dormancy	seeds coat permeable for water but too hard	broken by puncture the seed coat with needle.
3. Chemical dormancy	chemical inhibitors in the covering around the embryo	broken by washing or soaking the seed in hot water.

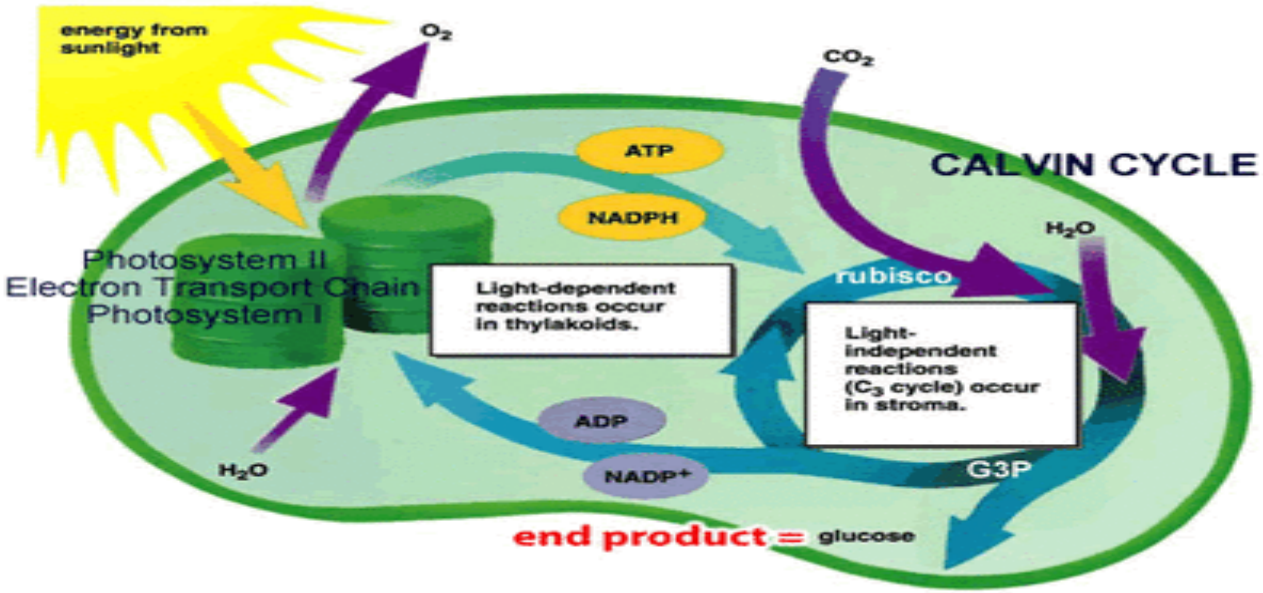
Types of endogenous dormancy	Reason	Treatment
1. Physiological dormancy	presence of inhibit with embryo	cool moist conditions, or light that effect on Abscisic acid is usually the growth inhibitor within seeds.
2. Morphological dormancy	embryo undifferentiated or immature embryo	a few weeks to a few months.
3. Combined dormancy seeds have both morphological and physiological dormancy Morphophysiological dormancy.		

Seed dormancy known to have the following advantage for plants:

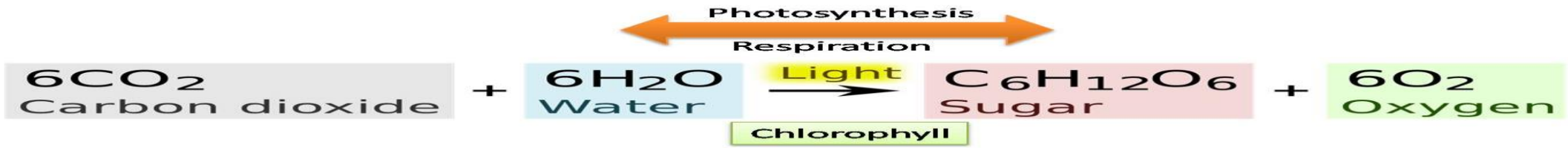
1. **Avoid of cold weather and snow.**
2. **Help the plants to live and survival.**

Lab 6
PLANT PIGMENT

Photosynthesis:



Equation of photosynthesis:



Pigment: is any substance that has the ability to absorb light.

The pigment of plant are:

Chlorophylls

1.Chlorophyll a: greenish blue in color with chemical formula $C_{55}H_{72}O_5N_4Mg$.

2. Chlorophyll b: greenish yellow with chemical formula $C_{55}H_{70}O_6N_4Mg$.

3.Chlorophyll c.

4.Chlorophyll d.

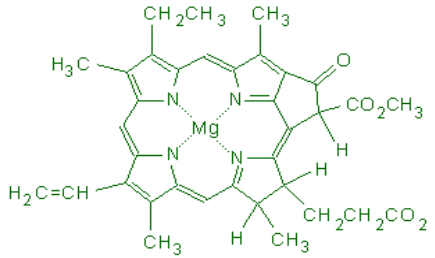
Carotenoids
1.Carotenes: orange in color
2.Carotenoids: red in color
Xanthophyll: yellow in color
Phycobilines
1.Phycoberythrin : red in color
2.Phycocyanin: blue in color

Carotenoids and phycobilins involved indirectly in photosynthesis Through:
1.Protect the leaves from absorbed sunlight.
2.Increase the adsorption of light.

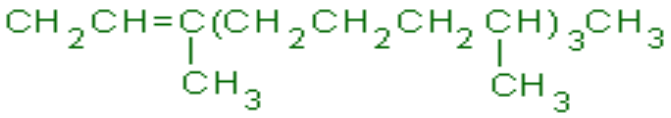
Chlorophyll a	Chlorophyll b
Chemical from $C_{55}H_{72}O_5N_4mg$	Chemical from $C_{55}H_{70}O_6N_4Mg$
Greenish blue	Greenish yellow
The chemical structure contains CH_3 group	The chemical structure contains CHO group
Appeared after chlorophyll b on paper chromatography	Appeared after chlorophyll a on paper chromatography

The chlorophyll pigment composed of two parts:

1.Body (porphyrin): contains Mg atom in the center of the body which is surrounded by 4 nitrogen atom.



2. Tail (phytol); consists of long chain of carbon atoms which have been attached by H and O atoms.



Compare and Contrast Photosynthesis and Cellular Respiration

	Photosynthesis	Cellular Respiration
Function	Capture energy and store it in sugars	Release energy that was stored in sugars
Location	Light rxn: thyalokid of Chloroplasts Calvin Cycle: stroma of Chloroplasts	Glycolysis: cytoplasm Krebs Cycle & Electron transport: mitochondria
Reactants	Water and Carbon dioxide	Oxygen and glucose
Products	Oxygen and glucose	Water and Carbon dioxide
Equation	$6CO_2 + 6H_2O \xrightarrow{\text{light}} C_6H_{12}O_6 + 6O_2$	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Energy}$
Type of Cell	Plant cells	BOTH Plant and Animal Cells

Lab 7

Plant hormones

Plant hormones

(also known as phytohormones) are signal molecules, produced within plants, that occur in extremely low concentrations. Plant hormones control all aspects of plant growth and development, from embryogenesis, the regulation of organ size, pathogen defence, stress tolerance and through to reproductive development.

the hormones move localized or from one part of the plant to another.

❖ **Different hormones can be sorted into different classes, depending on their chemical structures. Within each class of hormone, chemical structures can vary, but all members of the same class have similar physiological effects.**

plant hormones identified five major classes:

1. **abscisic acid**
2. **auxins**
3. **cytokinins**
4. **ethylene**
5. **gibberellins.**

Abscisic acid
(also called ABA) is one of the most important plant growth inhibitors.

- **ABA exists in all parts of the plant**
- **Function:**

1.plays a role in leaf and seed dormancy by inhibiting growth.
2.plays a role in closing the stomata.

Auxin

the most common auxin found in plants is indole-3-acetic acid (IAA).

❖**Function:**

1.influence cell enlargement.

2.bud formation.

3.root initiation.

4.promote the production of other hormones.

5.control the growth of stems, roots, and fruits.

6.convert stems into flowers.

Cytokinins or CKs are a group of chemicals

❖ Cytokinins and auxins often work together

❖ **Function:**

1.influence cell division and shoot formation.

2.help delay senescence of tissues.

Ethylene

is a gas and a very simple organic compound, consisting of just six atoms. It forms through the breakdown of methionine, an amino acid which is in all cells

Ethylene is produced in rapidly growing and dividing cells.

❖ **Function:**

1.Ethylene affects cell growth and cell shape.

2.Ethylene also affects fruit ripening.

Gibberellin (GA)

❖ **Produced or found in plant:**

meristems of apical buds.

embryo

❖ **Function:**

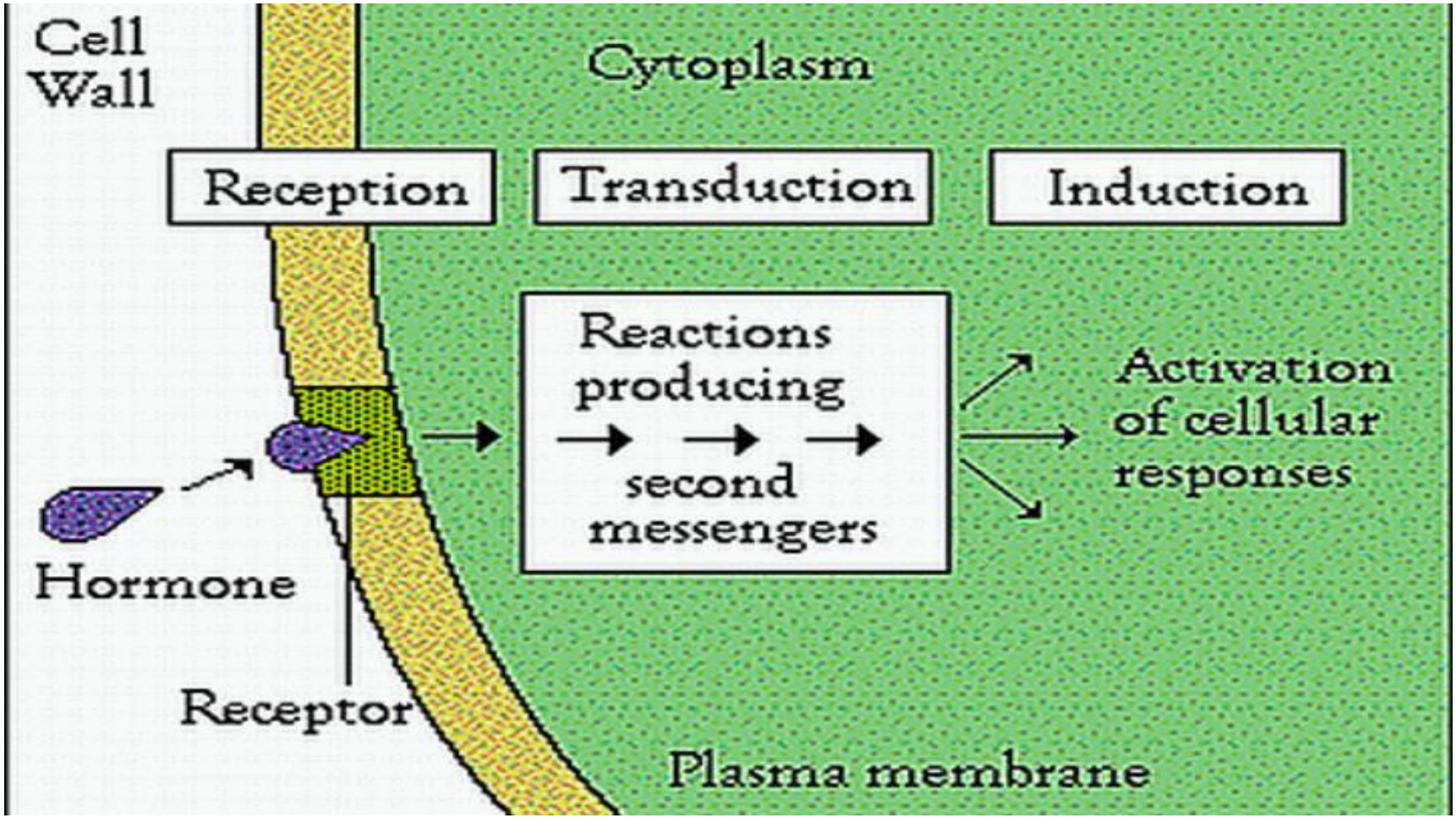
1.stimulate cell elongation.

2.promote the transition between vegetative and reproductive growth.

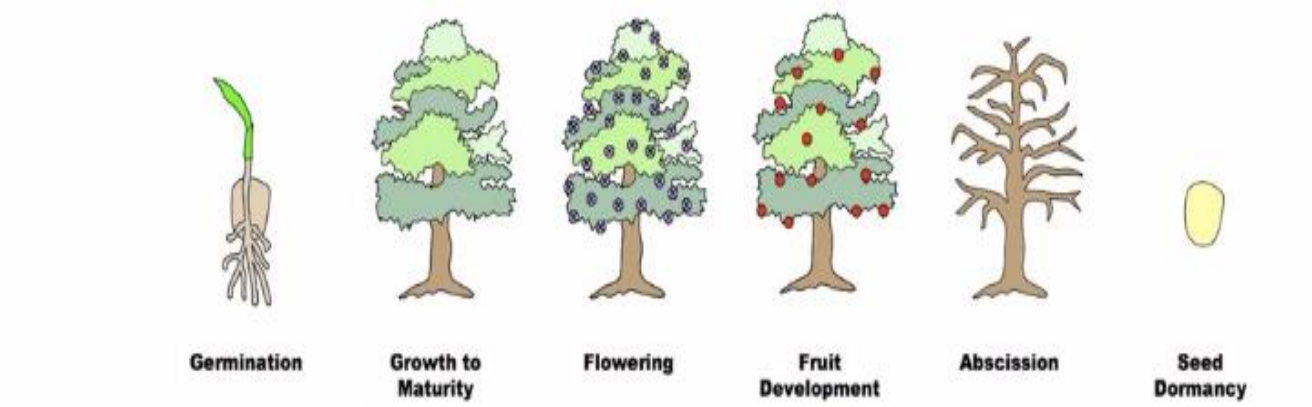
3.stimulate seedless fruits.

4.cause seed germination by breaking the seed's dormancy.

Mechanical work hormone:



The role of hormones in the stages of plant growth



Gibberellin							
Auxin							
Cytokinins							
Ethylene							
ABA							