Animals need to respond to changes in their external and internal environment.

What are some responses?

Temperature

Water and solute

Glucose etc

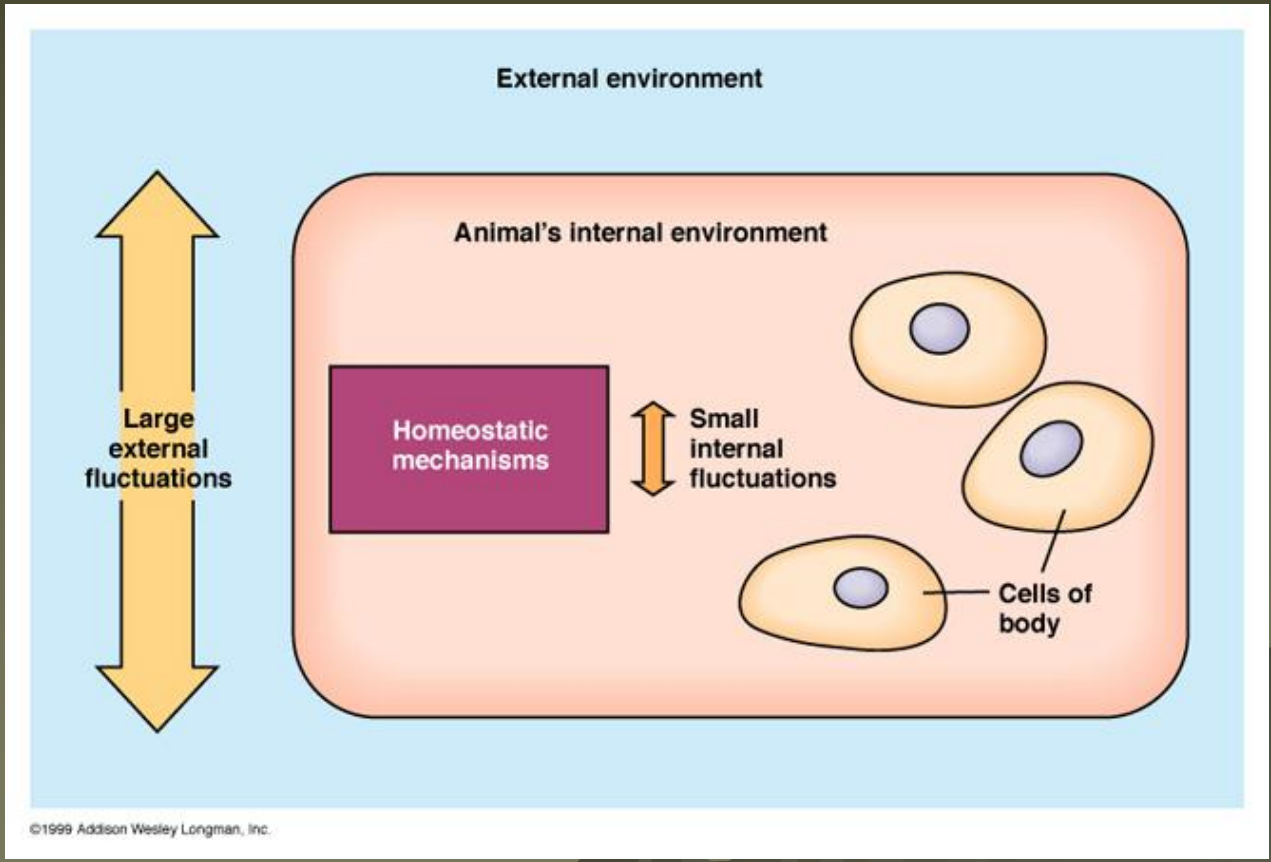
Oxygen, CO_2

These responses ensure that various internal factors stay within ***tolerance limits.***

Homeostasis

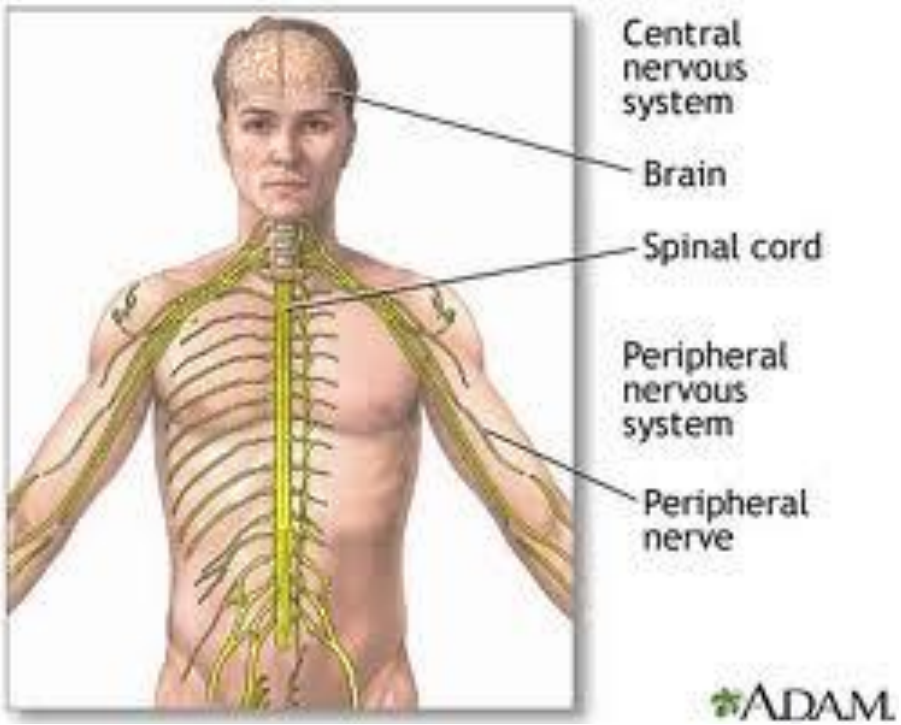
Homeostasis is the maintenance of a constant internal environment..

That is the tissue fluid around the cells needs to remain in a relatively constant state.



Nervous System

Central Nervous System consists of the brain and spinal cord



Peripheral Nervous System delivers information to the CNS and carries messages from the CNS to other organs through communication lines called nerves.

Hormones

Hormones are compounds produced by plants/animals that bring about a specific response in certain tissues.

What are some animal (human) hormones that you produce?

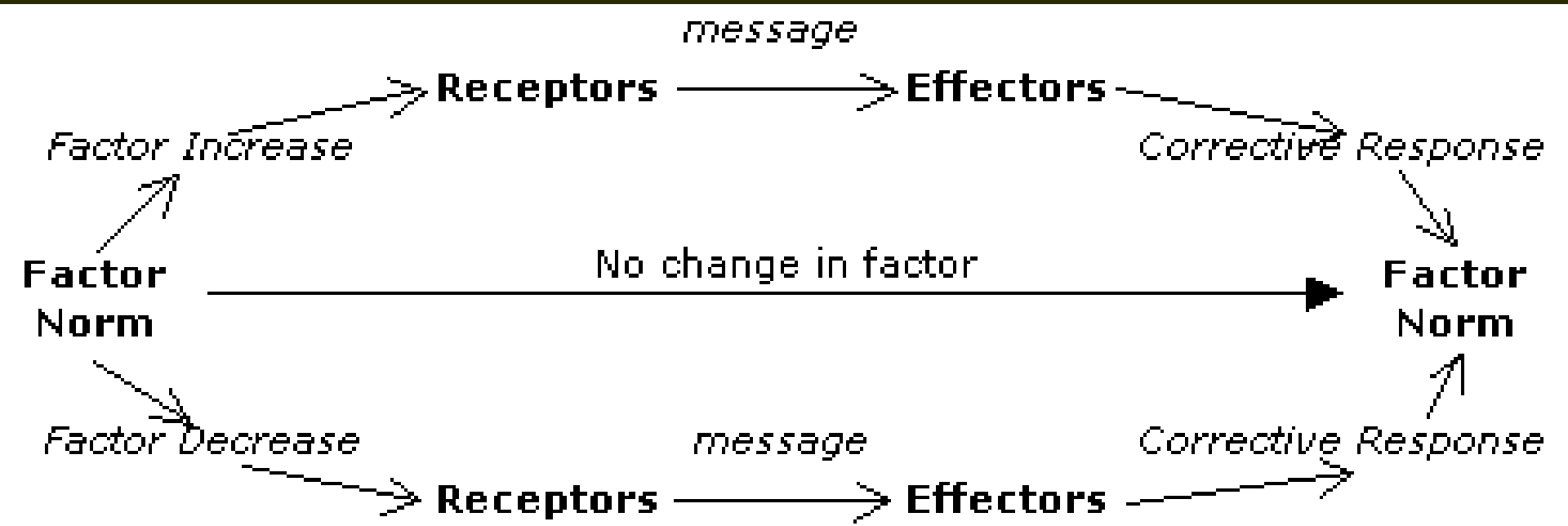
Animal Hormones

- Oestrogen
- Testosterone
- FSH (follicle stimulating hormone)
- Insulin
- Adrenaline
- ADH (anti-diuretic hormone)

What are some Plant Hormones?

In animals such as ourselves, the internal environment of our bodies must have certain conditions within tolerable limits to continue the healthy functioning of us.

This is done by a process called negative feedback control, where various receptors and effectors bring about a reaction to ensure that such conditions remain favourable.



So how do plats regulate their behaviour?

- http://www.youtube.com/watch?v=pCFstSMvAMI

Plant Hormones

- Auxins
- Cytokinin
- Gibberellins
- Abscisic Acid
- Ethylene

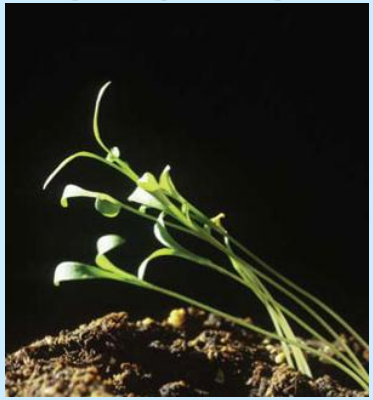
How is a plant's environment different to an animal's environment?

Plant growth responds to environmental cues...

http://www.youtube.com/watch?v=rDN0yAFcQok&feature=related

Some environmental cues plants respond to are....

Light



Gravity

Temperature

What is happening here?

- http://www.youtube.com/watch?v=aNjR4rVA8to&list=QL&playnext=2

Class Practical Investigation

Set up prac plants to test the for effects light (phototropism) or gravity (gravitropism or geotropism) have on plant germination or growth.

Submit a copy of your hypothesis and a brief overview on what you intend to do. Also list resources you will require.

- We will look at the roots and the new shoots.
- You will be given seeds, containers and dirt.
- Carefully design your investigation. Identify your hypothesis. Remember only one variable should be made per group. Identify:
  - Controlled variables
  - Dependent Variable
  - Independent variables
  - No. of trials

http://vce-unit1and2biology.wikispaces.com/Class+Investigation

Hormones in plants are…

- relatively simple compared to the endocrine system in animals.
- not organised into glands as in animals.
- produced by the cell receiving the appropriate environmental stimulus.
- very specific i.e. when daylight increases many plant are stimulated to produce flowers.
- Generally slower to produce effects than nervous responses.

How hormones travel in plants

- Hormones travel using the plants vascular system.

Tropism

- A growth is directed by an environmental factor.
- When the direction of the growth or turning movement is related to the direction the stimulus the response is called a tropism
- Growth towards a stimulus it is called a positive tropism.
- Growth away from a stimulus it is called a negative tropism.

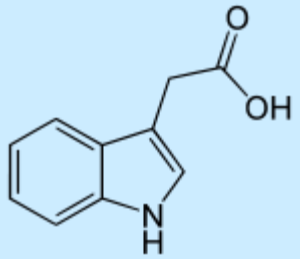
Hormones in plants are responsible for…

- ***Phototropism***
- ***Geotropism*** or gravitropism
- ***Apical dominance*** – inhibition of lateral branches
- ***Ripening of fruit*** – conversion of starches to sugars
- ***Abcission*** – shedding of leaves and flowers

Examples of Plant Hormones

1. Auxins (Indole Acetic Acid or IAA)
2. Cytokinins
3. Gibberellins
4. Abscisic Acid (inhibitor)
5. Ethylene
6. Florigen ????? A bit like the loch ness monster!

Auxins



Also called indole-3-acetic acid (IAA)

Auxins have an essential role in coordination of many growth and behavioral processes in the plant life cycle.

Some Effects:

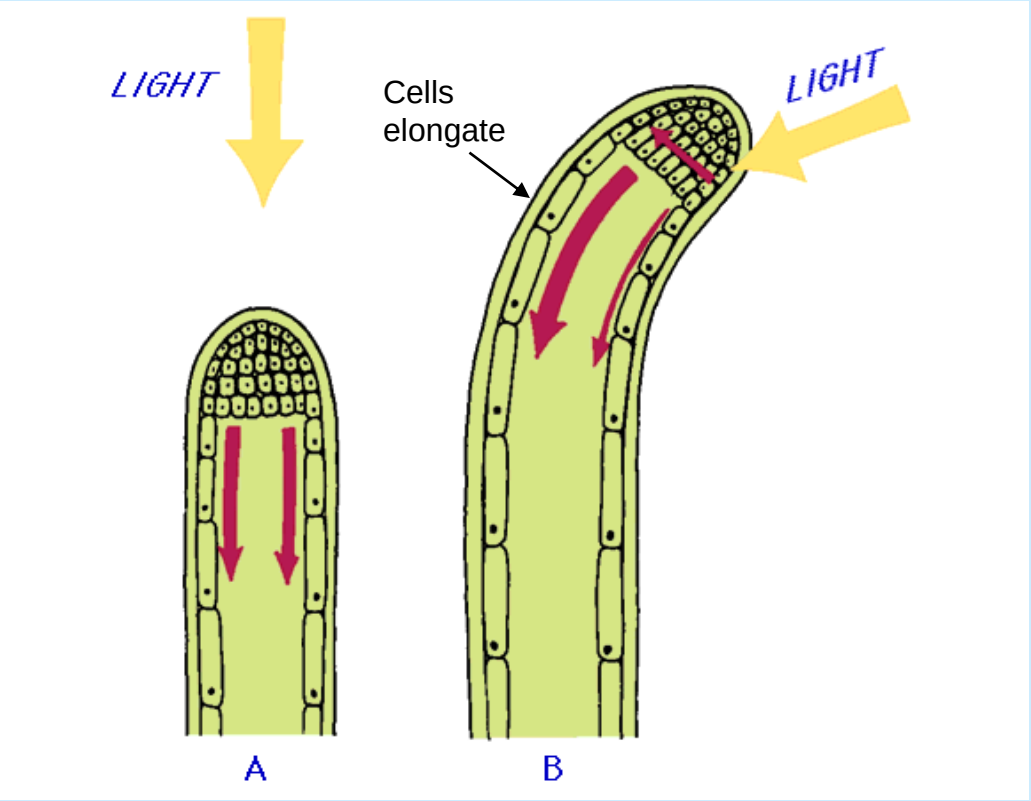
1. Cell elongation in stems
2. Stimulation of cell division
3. Responsible for tropisms (phototropism, geotropism)
4. Promotes Apical Dominance

Positive Phototropism

•Plants grow towards a source of light.

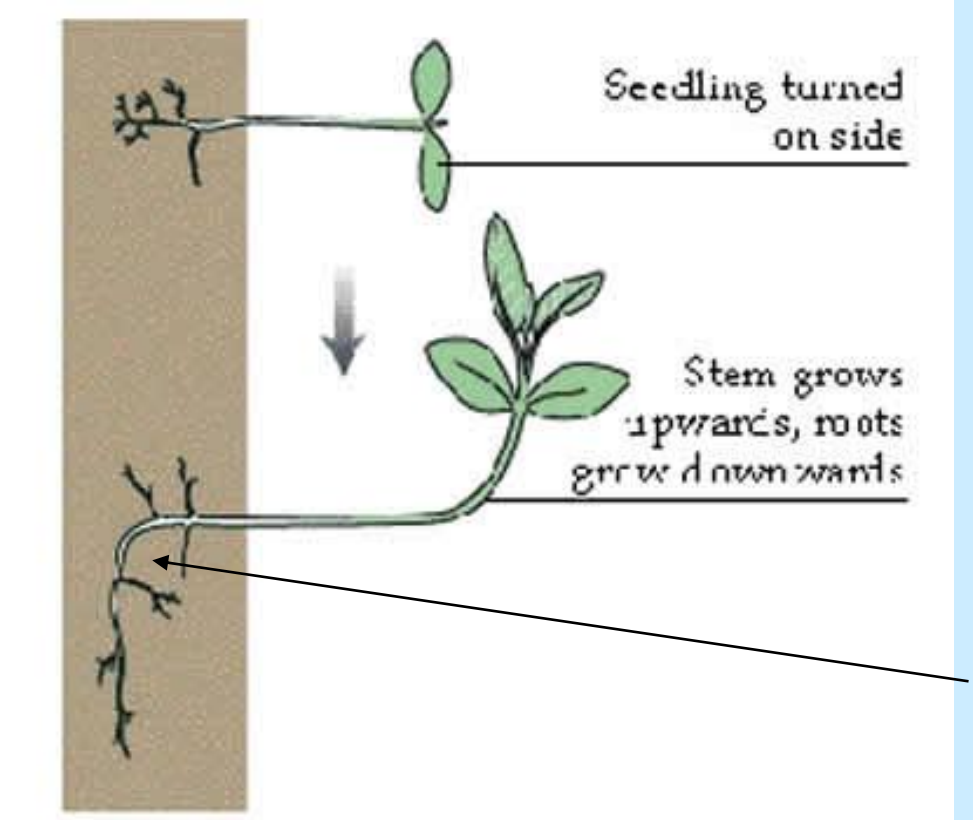
•Auxins promote cell elongation.

•Higher concentrations found on dark side of plant suggesting auxin diffuses to dark side and promotes cell elongation on this side.



Complete p251 Biozone

Phototropism and Geotropism (gravitropism)



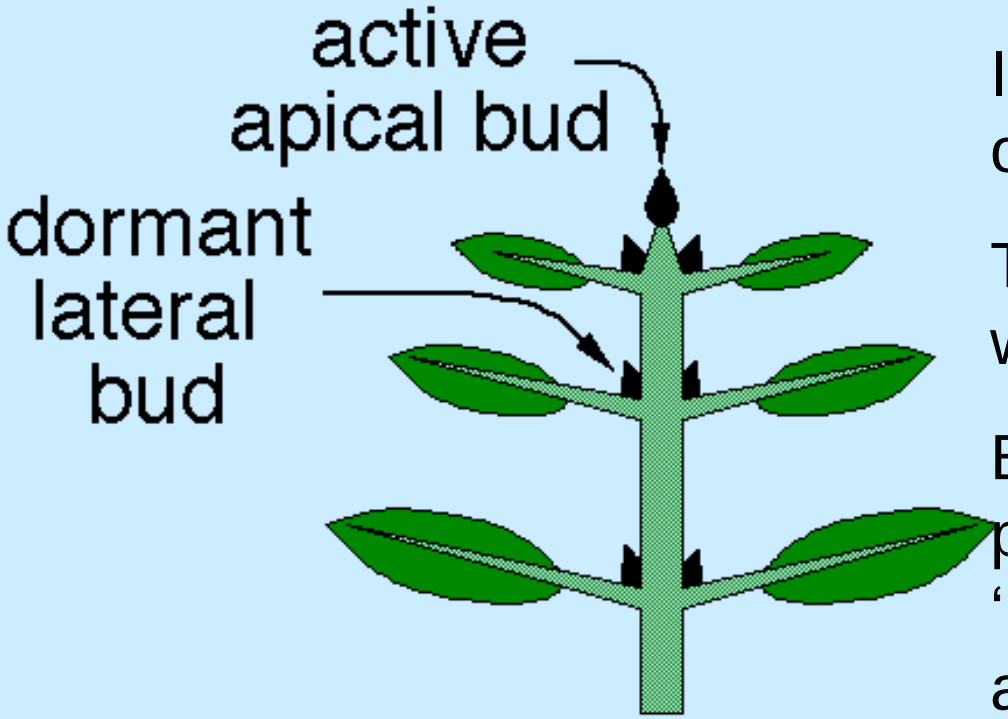
Geotropism is response of plant to gravity.

Auxins play a role in **negative geotropism** in the **stem** - tendency to grow away from force of gravity. In the horizontal shoot the concentration of auxin is greater on the lower side, causing the tip to grow upwards.

In **roots, auxins** play a part in **positive geotropism** accumulating at the bottom and inhibiting groth so that top part is elongated.

Negative Geotropism

Apical Dominance



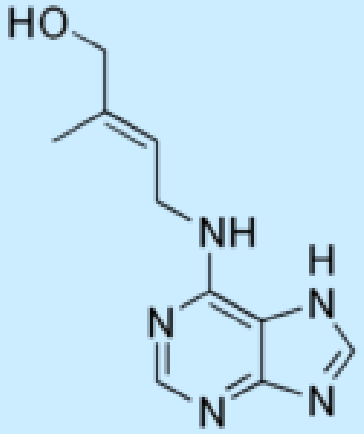
Auxin is produced in tip and moves down a stem

It inhibits the development of lateral buds

The result is a taller plant with fewer buds

Bushiness can be promoted in plants by ‘nipping out ‘ the apical tip allowing the lateral branches to grow in the temporary aabsence of auxin

Cytokinins

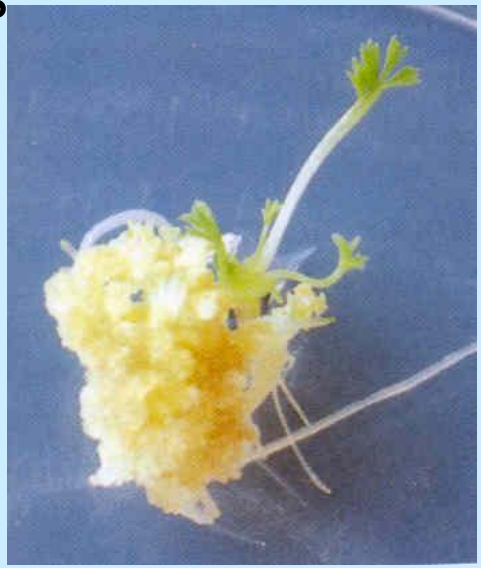


- Produced in the roots

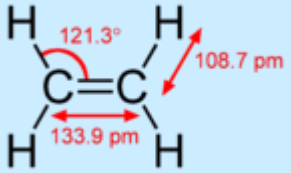
Some Effects:

1. Promote cell division (cytokinesis) and cell differentiation.
2. **Stems** and **leaves** develop when there is more cytokinin then auxin
3. Can stimulate growth of lateral buds

Can promote growth of callus - type of tumour growth



Ethylene (Ethene)

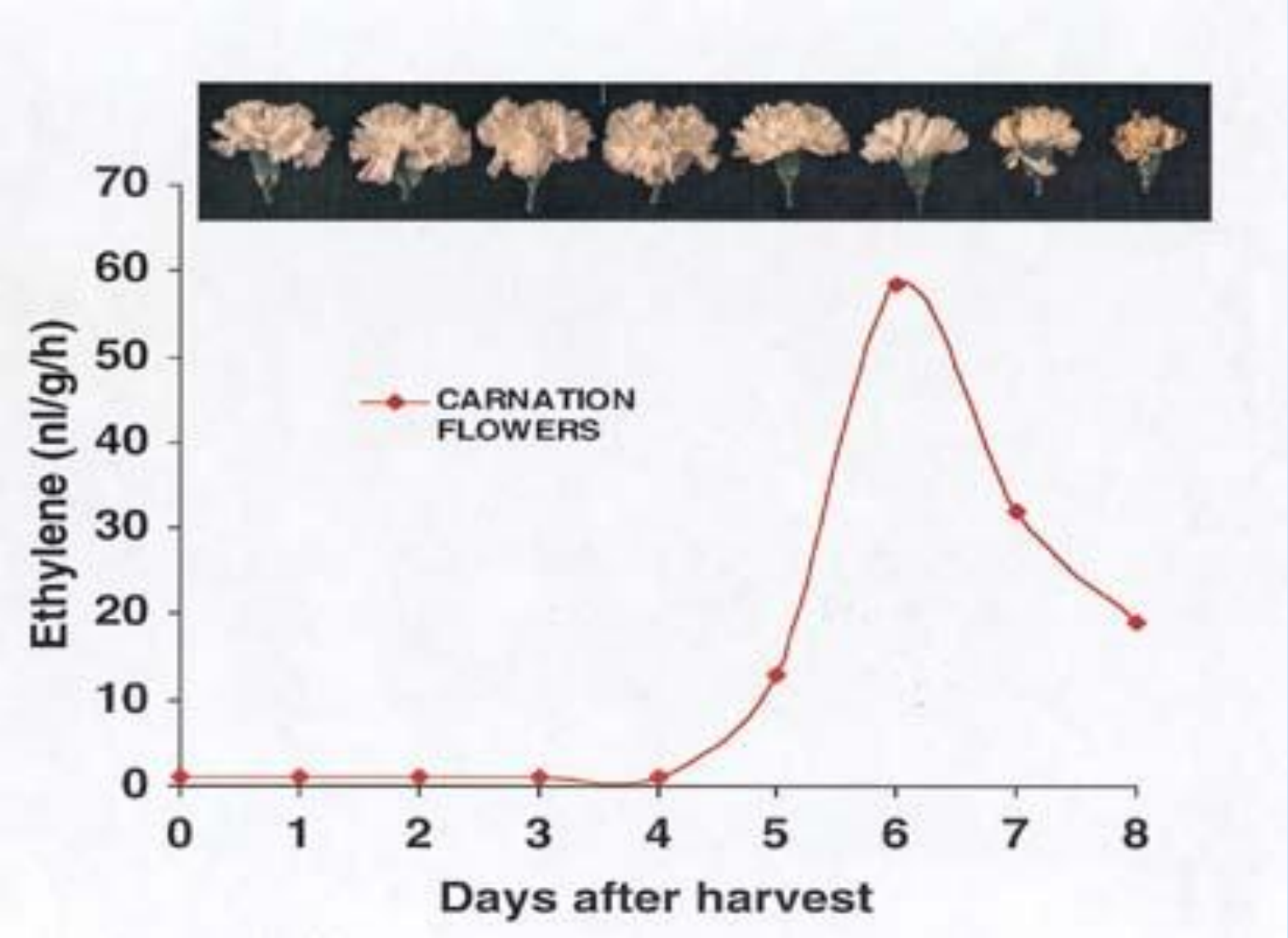


Ethylene is the only gaseous hormone found in plants.

Some Effects:

1. Ripening of fruit.
2. Stimulates flower and leaf senescence

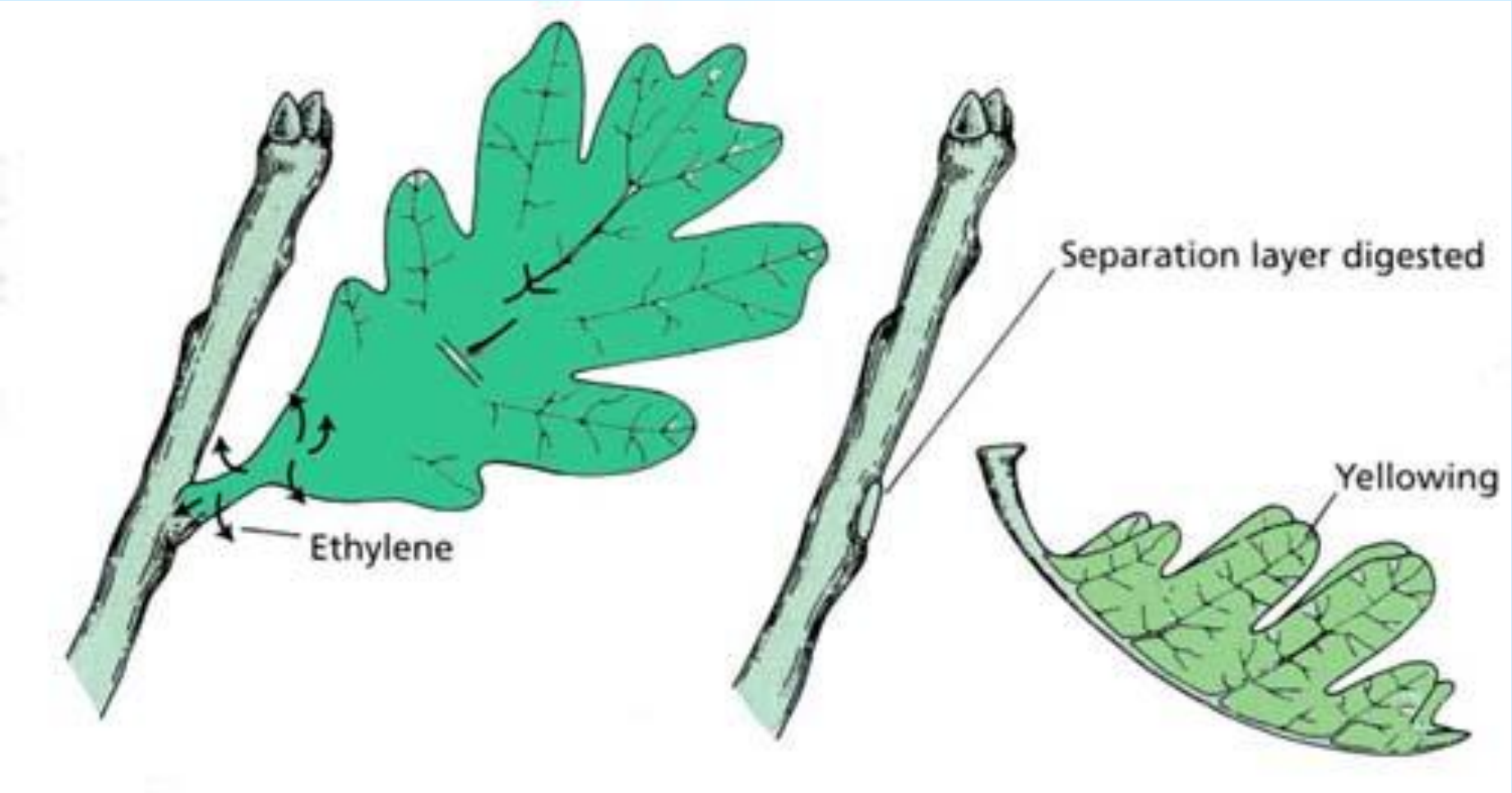
Ethylene Production in Cut Flowers



What's going on here????

and here….????

Ethylene and leaf fall



Gibberellins
Gibberellic Acid (GAs)

Some Effects:

1. Causes rapid growth of plant - Stimulates stem elongation (growth) by stimulating cell division and elongation.

Gibberellin and its effect on stem growth

Lettuce bolting to seed is caused by gibberelins

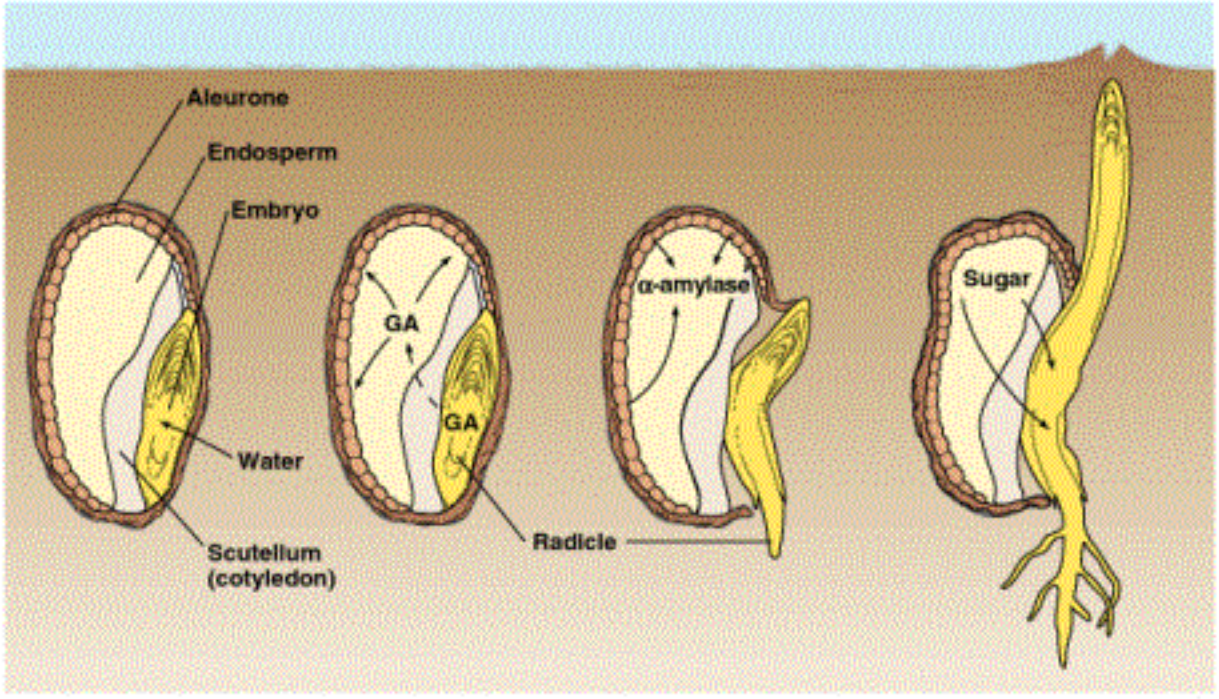
Some Effects (continued)

2. Breaks seed dormancy in some plants(i.e. induces seed germination)

Giberellin (GA) and its role in Seed Germination

As a seed absorbs water, the embryonic plant produces gibberellin. This causes the production of amylase (protein) which is secreted into the endosperm (stored starch). Amylase breaks down starch to glucose which diffuses to the embryo and is used for the early stages of plant growth.

Role of Gibberellin in Seed Germination



1. Water uptake induces GA synthesis by embryo
2. GA stimulates α-amylase production by aleurone
3. Amylase breaks down starch reserves in endosperm
4. Sugars fuel growth of embryo

Abscisic Acid

Growth-inhibiting hormone have effects opposite to those of auxins, giberrellins and cytokinins.

Assist plants to tolerate adverse conditions such as drought, salinity and low temperatures.

Abscisic Acid is the best known of these and regarded as a plant hormone associated with stress, such as drought etc.

Produced in chloroplasts.

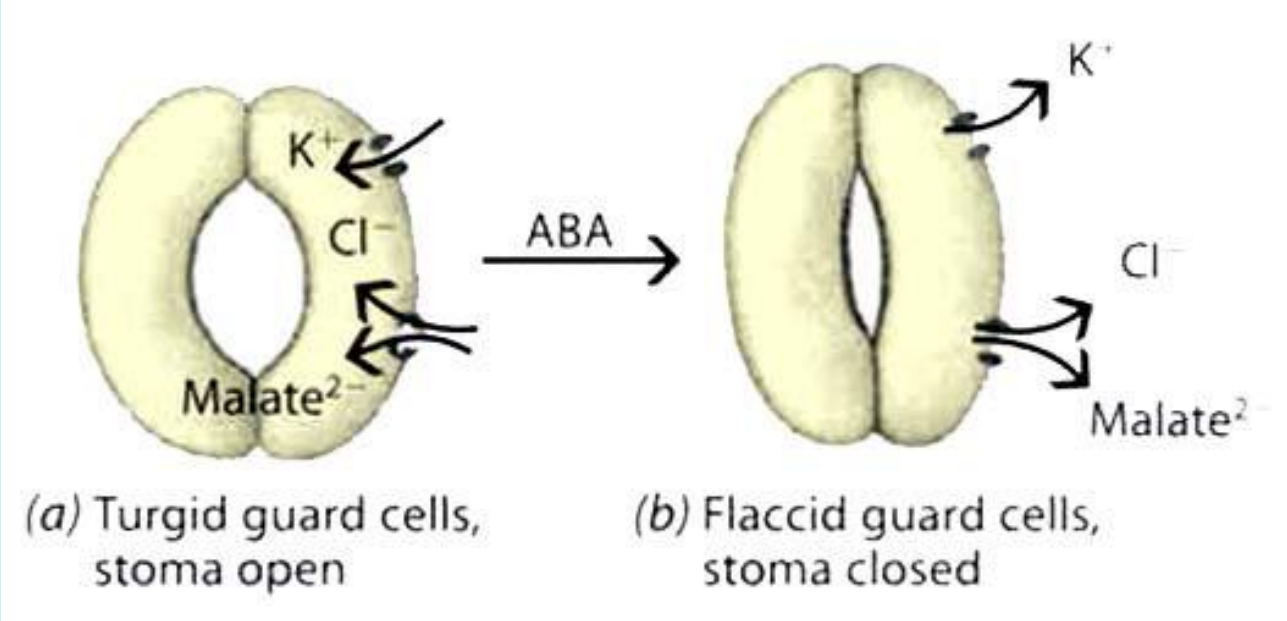
Some effects:

1. Stimulates the closure of stomata when plant is water stressed.

2. Induces growth inhibition (dormancy).

Closure of Stomata

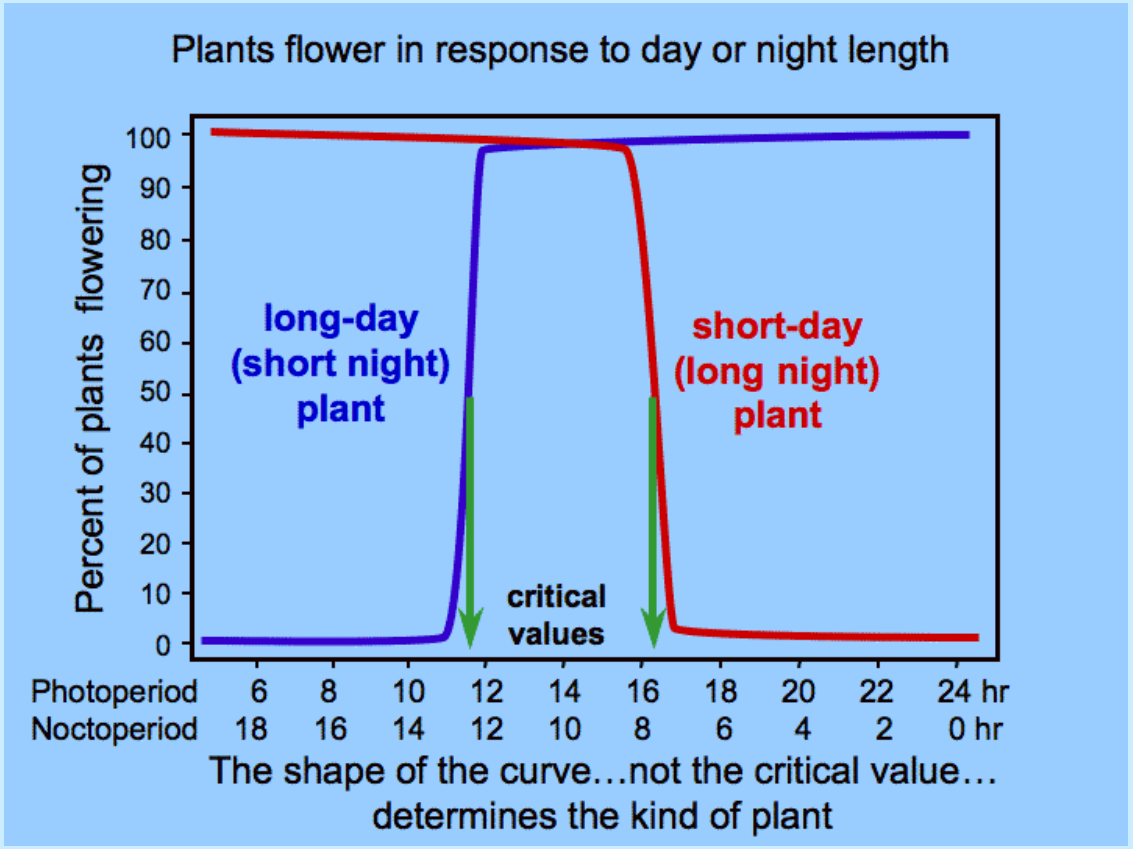
Abscisic acid also has short term effects , including control of stomatal movement. When plants begin to lose too much water , abscisic ccid carries a message that causes guard cells to close.



The concentration of abscisic acid increases under stressed conditions such as drought, high temperature and water logging.

Photoperiodism is the physiological reaction of organisms to the length of day (light period) or night (dark period).

Photoperiodic effects relate directly to the timing of both the light and dark periods.



Photoperiodism

In 1920, W. W. Garner and H. A. Allard published their discoveries on photoperiodism and felt it was the length of daylight that was critical, but it was later discovered that ***the length of the night*** was the controlling factor.

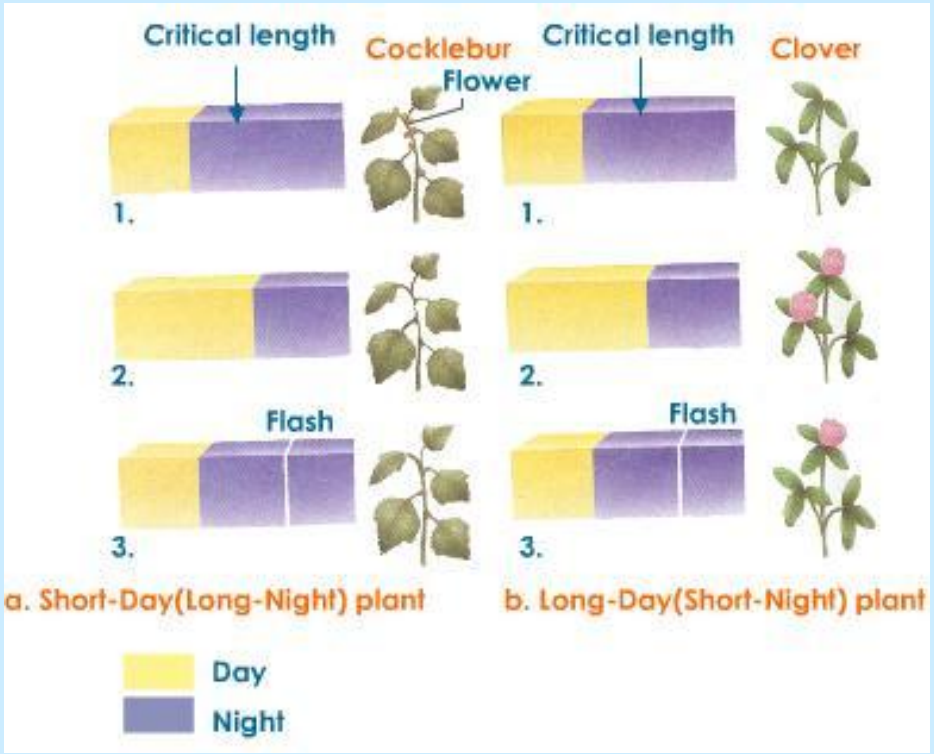
Photoperiodic flowering plants are classified as *long-day plants* or *short-day plants*, even though night is the critical factor, because of the initial misunderstanding about daylight being the controlling factor.

Each plant has a different length critical photoperiod, or critical night length.

Long Day Plants

Long-day plants flower when the day length exceeds their critical photoperiod. These plants typically flower in the late spring or early summer as days are getting longer.

Examples carnation, rye grass, clover,



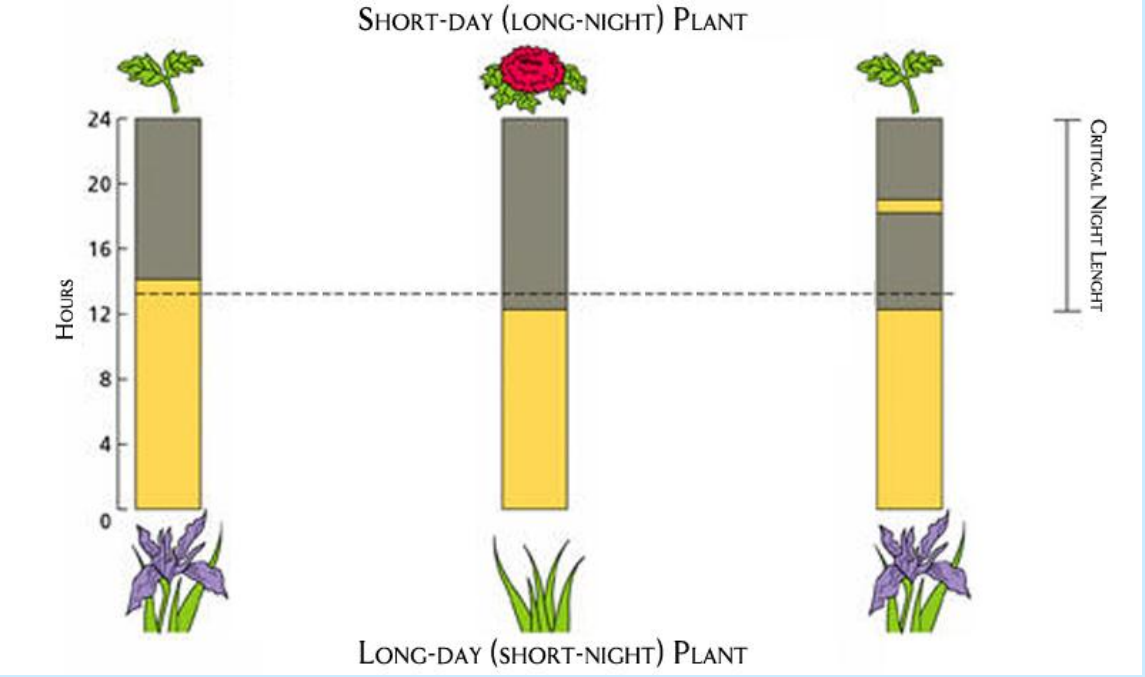
Short Day Plants

Short-day plants flower when the day lengths are less than their critical photoperiod.

They cannot flower under long days or if a pulse of artificial light is shone on the plant for several minutes during the middle of the night. They require a consolidated period of darkness before floral development can begin.

Natural night time light, such as moonlight or lightning, is not of sufficient brightness or duration to interrupt flowering.

Examples Cotton, Rice, Hemp, Sugar cane



Day- neutral Plants

Day-neutral plants, such as cucumbers, roses and tomatoes, do not initiate flowering based on photoperiodism at all. They flower regardless of the night length.

They may initiate flowering after attaining a certain overall developmental stage or age, or in response to alternative environmental stimuli, such as a period of low temperature, rather than in response to photoperiod.