**Plant Responses to**

**External and Internal Signals**

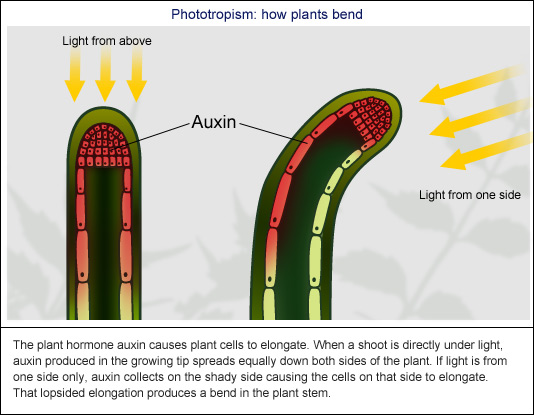
How do plants respond to the environment?

How do plants respond to internal signals?

**Plants have Hormones!**

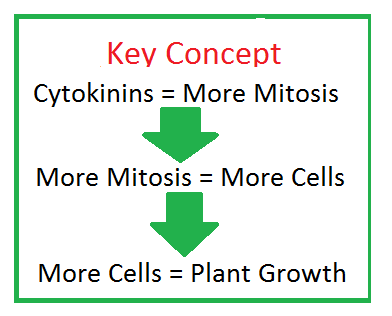
Hormones = long distance signaling molecules, coordinate the various parts of an organism

**5 Major Classes of Plant Hormones – Each has a specific function**

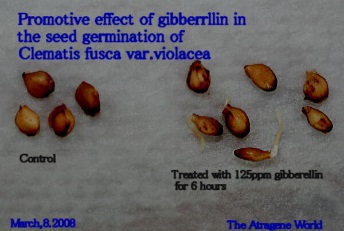
1. 

**1.Auxins**

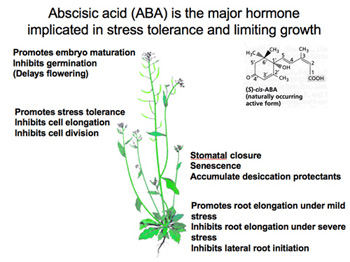
**2.Cytokinins**



**3.Gibberelins**

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**4.Ethylene**



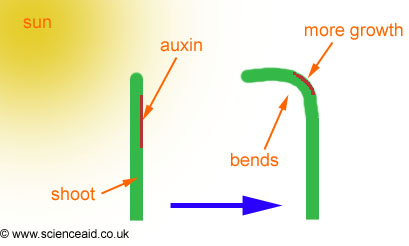
**5.Abscisic Acid**

**Plants also have specific GROWTH responses**

**Tropisms =**

**3 Major Stimuli that induce tropisms:**

1. Light (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
2. Gravity (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
3. Touch (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)



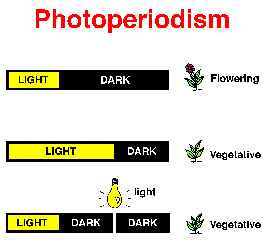
**Phototropism**

* Primarily due to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Auxin elongates on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ side
* **Plants and light LOVE each other**
  + **Phototropism**
  + **Photoperiodism**
    - **Circadian Rhythms**

Even without external, environmental cues, circadian rhythms persist in humans and in all eukaryotes (yes, plants!)

**Photoperiodism**

🡪 It’s actually the NIGHT that matters

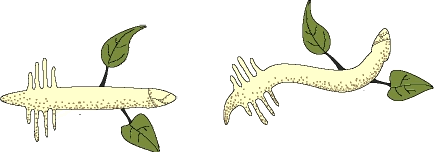
 Short, Long, and Neutral Plants

* + Short-day plants
    - Require a shorter light period
    - Flower in later summer/fall/winter
    - Example: poinsettias
  + Long-day plants
    - Require a longer light period
    - Flower in late spring/early summer
    - Example: spinach
  + Day-neutral plants
    - Are unaffected by photoperiod
    - Example: tomatoes

**Gravitropism**

* Roots demonstrate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gravitropism
* Shoots exhibit \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gravitropism.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ play a major role

Ensures that the root grows in the soil and that the shoot reaches sunlight regardless of how a seed happens to be oriented when it lands.



**Plant Defenses**

* a plant generally responds to environmental cues by adjusting its pattern of growth and development.
* At the cellular level, plants and all other eukaryotes are surprisingly similar in their signaling mechanisms.

**Plants have Cellular Receptors** – used to detect changes in their environment

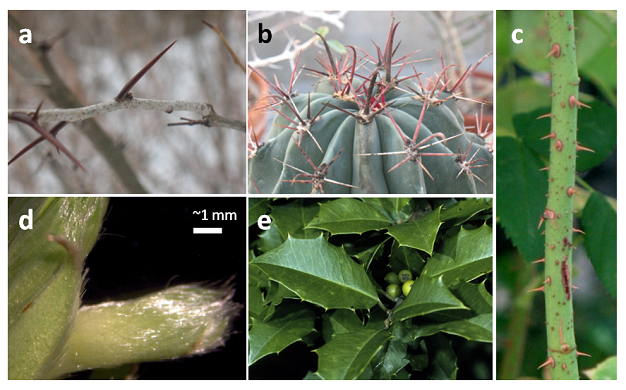
* Changes may be:

Example: Etiolation – growth response to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + Seedlings germinate in dark and grow underground
  + Once a shoot reaches the sunlight, morphology and biochemistry undergo changes, collectively called de-etiolation, or greening

**Defenses Against Herbivores**

Physical -



Chemical -