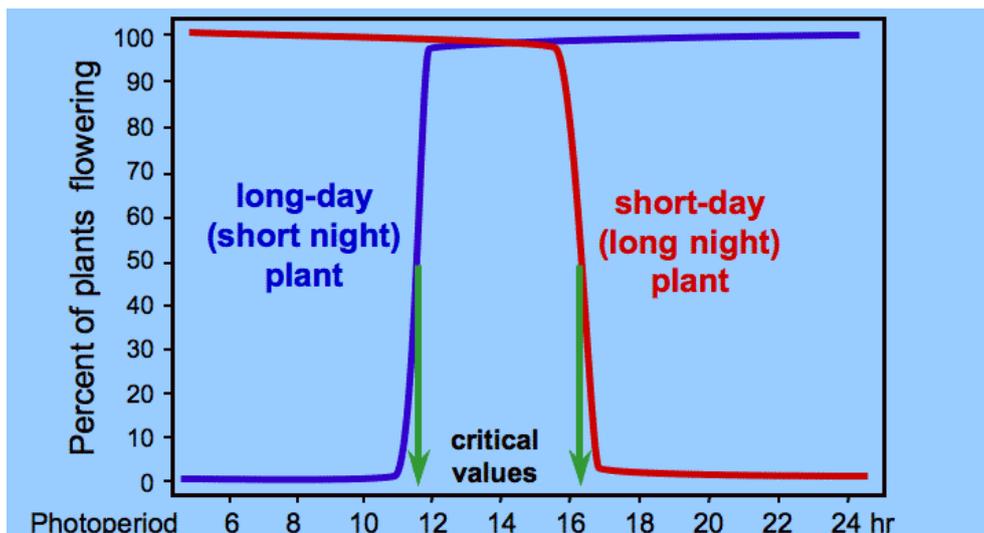


### Photoperiodism in Plants

- This is a response in plants to the changing length of night.
- Many plants exhibit photoperiodism especially in flowering and loss of leaves.
- We know that certain plants flower at certain times of year e.g. sunflowers flower in summer etc.
- Plants must be able to sense the length of darkness and use this to tell what season they are in.
- Plants can be either:
  - Short-day plants: require short days and long nights (flower when the photoperiod is less than the critical length – 10 hours daylight and 14 hours darkness). These plants flower in winter e.g. chrysanthemums.
  - Long-day plants: require long days and short nights (flower when the photoperiod is greater than the critical length – 14 hours daylight and 10 hours darkness). These plants flower in summer e.g. sunflowers.
  - Day-neutral plants: these plants are relatively unaffected by the amount of light per day and will flower at any time of the year e.g. tomatoes.

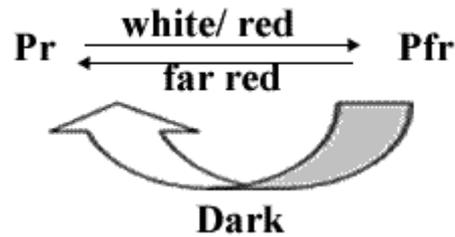


- NOTE: it is the length of **darkness** which is important.

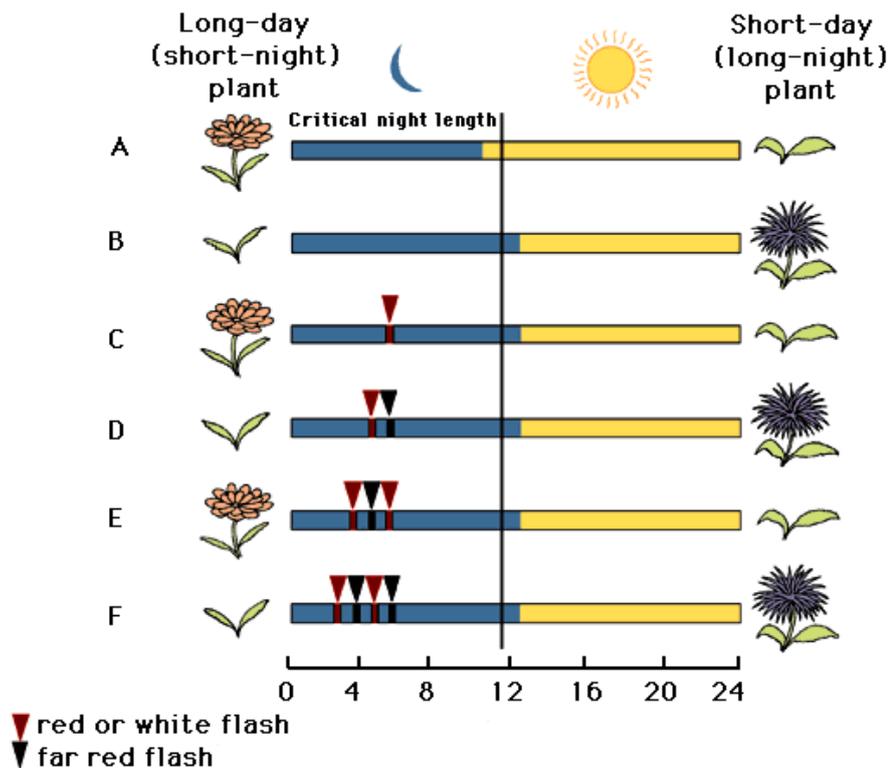
### The Phytochrome System

- The ability of plants to activate the photoperiod response is controlled by a pigment called phytochrome.
- This pigment exists in two forms:
  - $P_r$  also called  $P_{665}$  or  $P_{red}$
  - $P_{fr}$  also called  $P_{725}$  or  $P_{Far Red}$
- Daylight is made up of mainly red light with the wavelength of about 665 nm.
- At night mainly far red light is present with a wavelength of about 725 nm.

- The pigment phytochrome absorbs red light during the day and converts  $P_r$  into  $P_{fr}$ .
- At night  $P_{fr}$  is slowly converted back into  $P_r$ .



- The length of darkness determines whether a plant will flower, as the amount / concentration of each form of phytochrome acts as a type of hourglass.
- If the day is long enough  $P_{fr}$  accumulates and a long-day plant will flower as there isn't enough  $P_r$ .
- If the day is short and nights long  $P_r$  accumulates and a short-day plant will flower.



- Plants being able to keep time is important because:
  - It means seeds germinate at the time of year when they have the highest chance of surviving.
  - Seed masting (dropping of seeds all at about the same time) can occur which increases the plants chance of survival as not all seeds will be eaten.
  - The plants flower at about the same time of year when their pollinators are active and have the highest number of flowers to cross pollinate therefore increasing genetic variation and helping the species to survive.