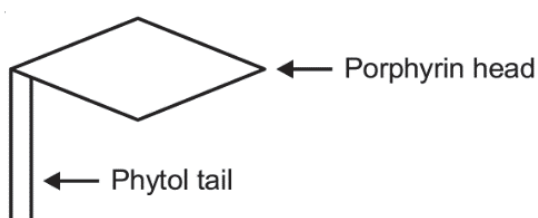


## HOW MANY TYPES OF PIGMENTS ARE INVOLVED IN PHOTOSYNTHESIS?

In the kaleidoscopic realm of photosynthesis, pigments emerge as the unsung heroes, endowed with the unique ability to absorb light at specific wavelengths. When subjected to chromatographic separation, the intricate palette of leaf colors unravels, spotlighting four key pigments:

- **Chlorophyll a:** Radiating a vibrant blue-green hue in the chromatogram, chlorophyll a reigns supreme as the primary photosynthetic pigment.
- **Chlorophyll b:** Cast in a yellow-green tint, chlorophyll b complements its counterpart, contributing to the leaf's chromatic symphony.
- **Xanthophylls:** Bathed in yellow brilliance, xanthophylls infuse the spectrum with their distinct golden hue.
- **Carotene:** From yellow to yellow-orange, carotene adds its warm tones to the botanical canvas.

The structural configuration of chlorophyll mirrors a tadpole, comprising a porphyrin head and a phytol tail.



### Porphyrin Head:

- Exhibiting a complex ring structure akin to porphyrin-like groups in haemoglobin and cytochromes.
- The site of electron rearrangements when stimulated by light, encapsulating a cyclic tetrapyrrolic structure with a non-ionic magnesium atom.

### Phytol Tail:

- A lengthy hydrocarbon tail consistently attached to the ring structure.
- Functions as an anchor, securing chlorophyll to the hydrophobic segment of the thylakoids.

Major chlorophyll types encompass chlorophyll a, b, c, d, e, bacteriochlorophyll a, and b.

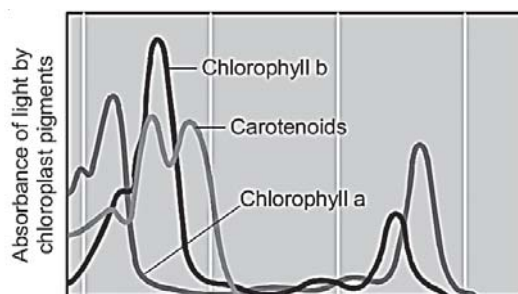
## Accessory Pigments: The Supportive Ensemble

Any pigment beyond chlorophyll a falls under the category of accessory pigments, playing dual roles in photosynthesis:

- **Antenna Molecules:** Absorbing light at diverse wavelengths and channeling the energy to chlorophyll molecules, expanding the range of usable light for photosynthesis. Chlorophyll b, constituting approximately one-fourth of the total chlorophyll content, contributes significantly.
- **Shield Pigments (Carotenoids):** Safeguarding plants from excessive heat and thwarting photo-oxidation, the destructive impact of light on chlorophyll pigments.

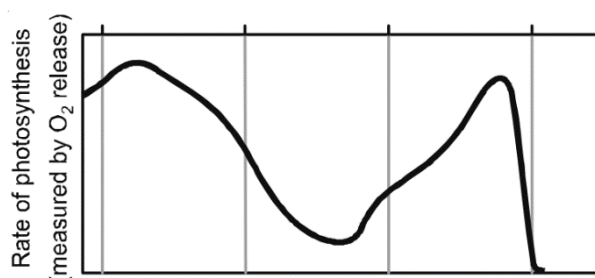
A captivating interplay unfolds through absorption and action spectra:

- **Absorption Spectrum:** A graphical curve illustrating the energy absorption at various light wavelengths by a substance or pigment.



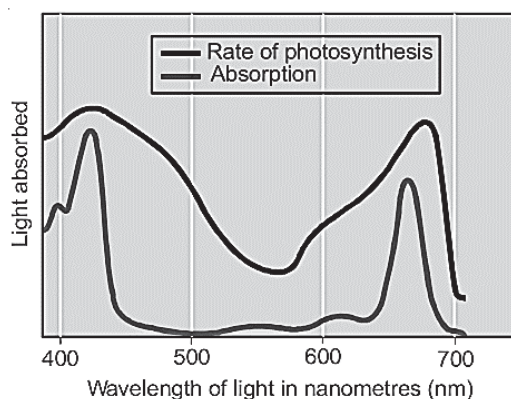
**Fig. :** Graph showing the absorption spectrum of chlorophyll a, b and the carotenoids

- **Action Spectrum:** A graphical representation showcasing the relative rates of photosynthesis at different light wavelengths.



**Fig. :** Graph showing action spectrum of photosynthesis

- The closely aligned action spectrum of photosynthesis with the absorption spectra of chlorophyll a underscores the paramount role of chlorophyll a in the photosynthetic symphony. While the blue and red realms of the spectrum witness the zenith of photosynthesis, other visible spectrum wavelengths contribute to this orchestration. These visualizations collectively affirm that the pinnacle of photosynthesis occurs where chlorophyll a exhibits maximal absorption—within the realms of blue and red light.



**Fig. :** Graph showing action spectrum of photosynthesis superimposed on absorption spectrum of chlorophyll a