

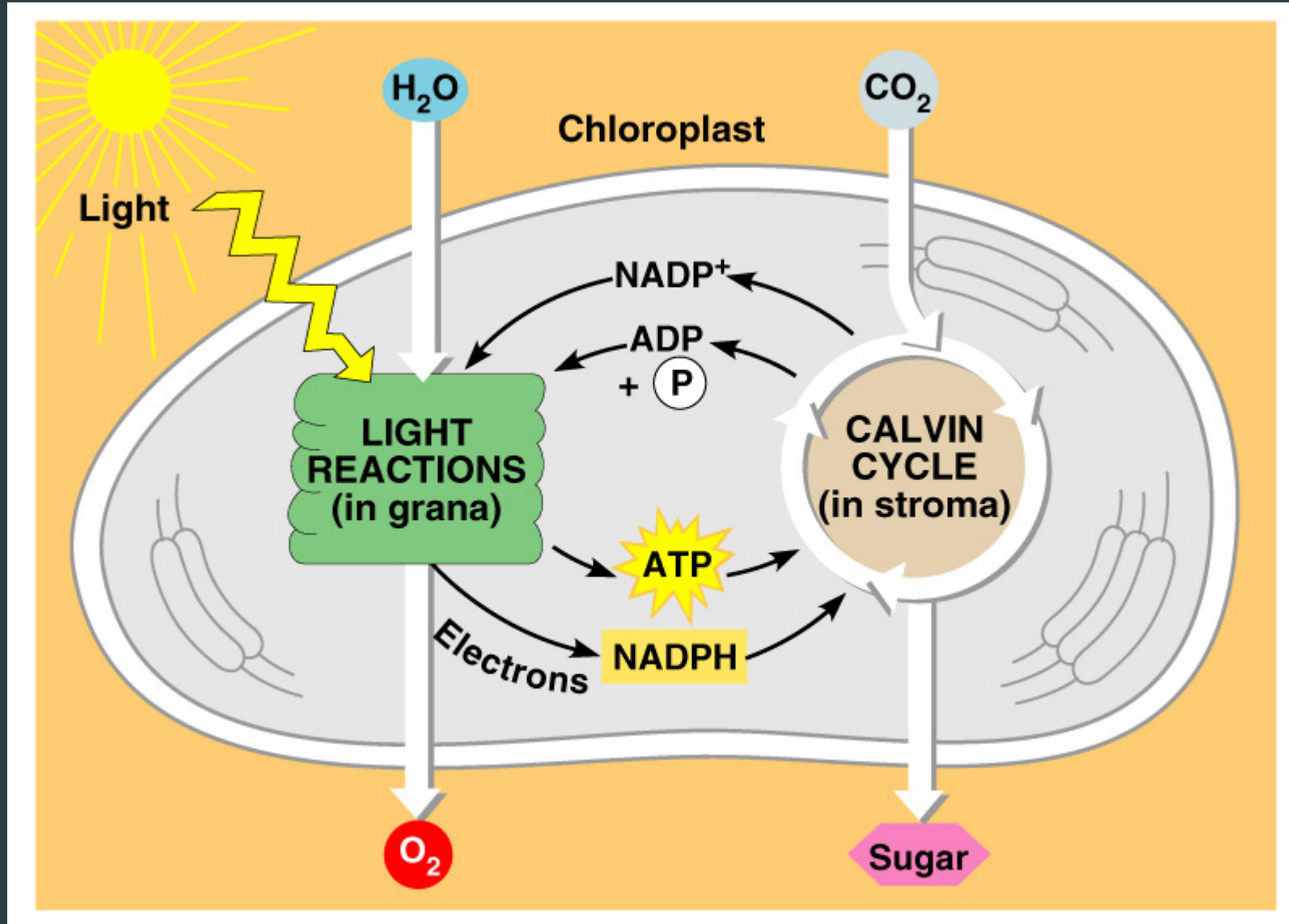
# Metabolismo Energético

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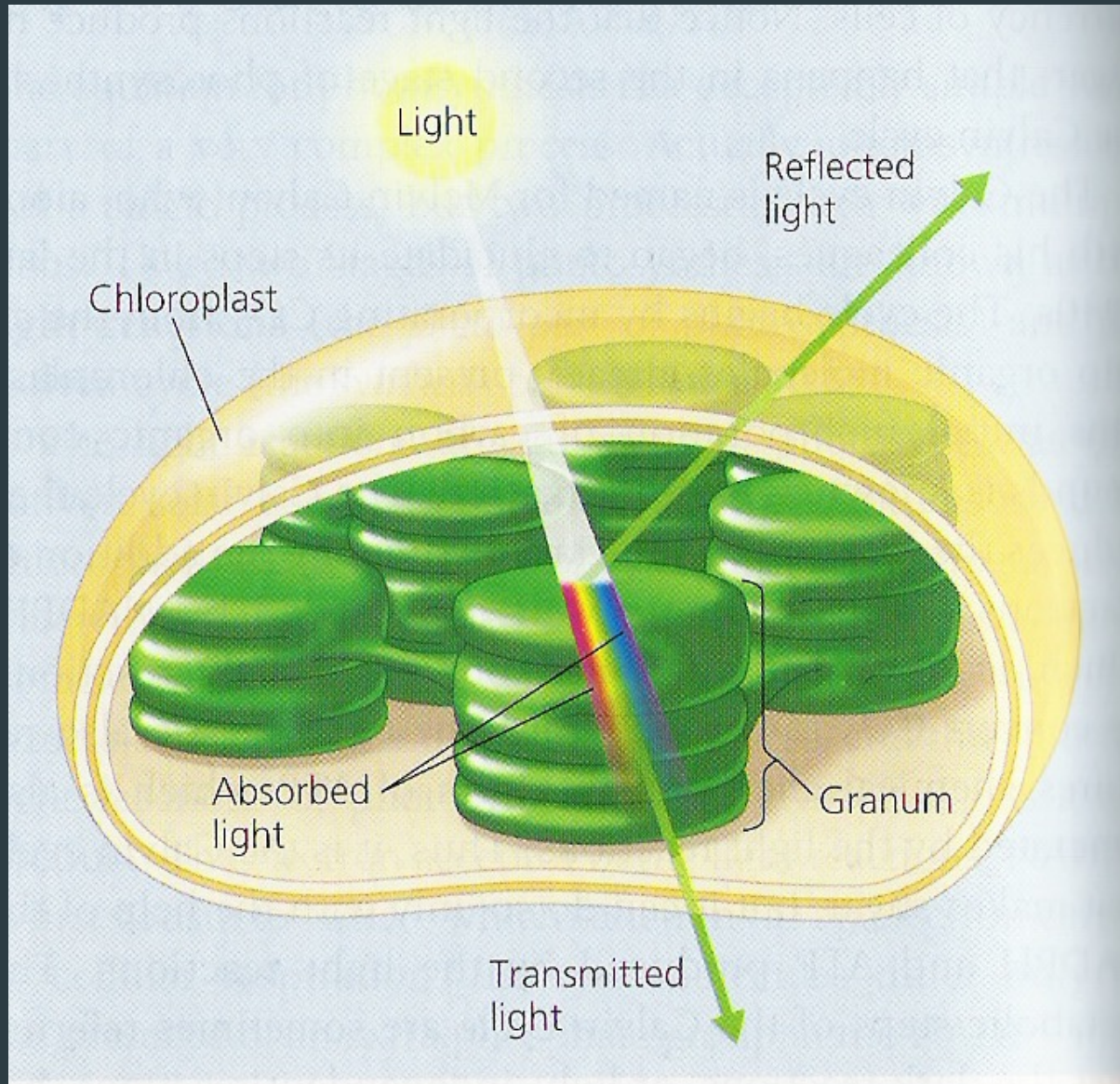
## Espectro de Ação da Fotossíntese

Bernardo Duarte ([baduarte@fc.ul.pt](mailto:baduarte@fc.ul.pt))

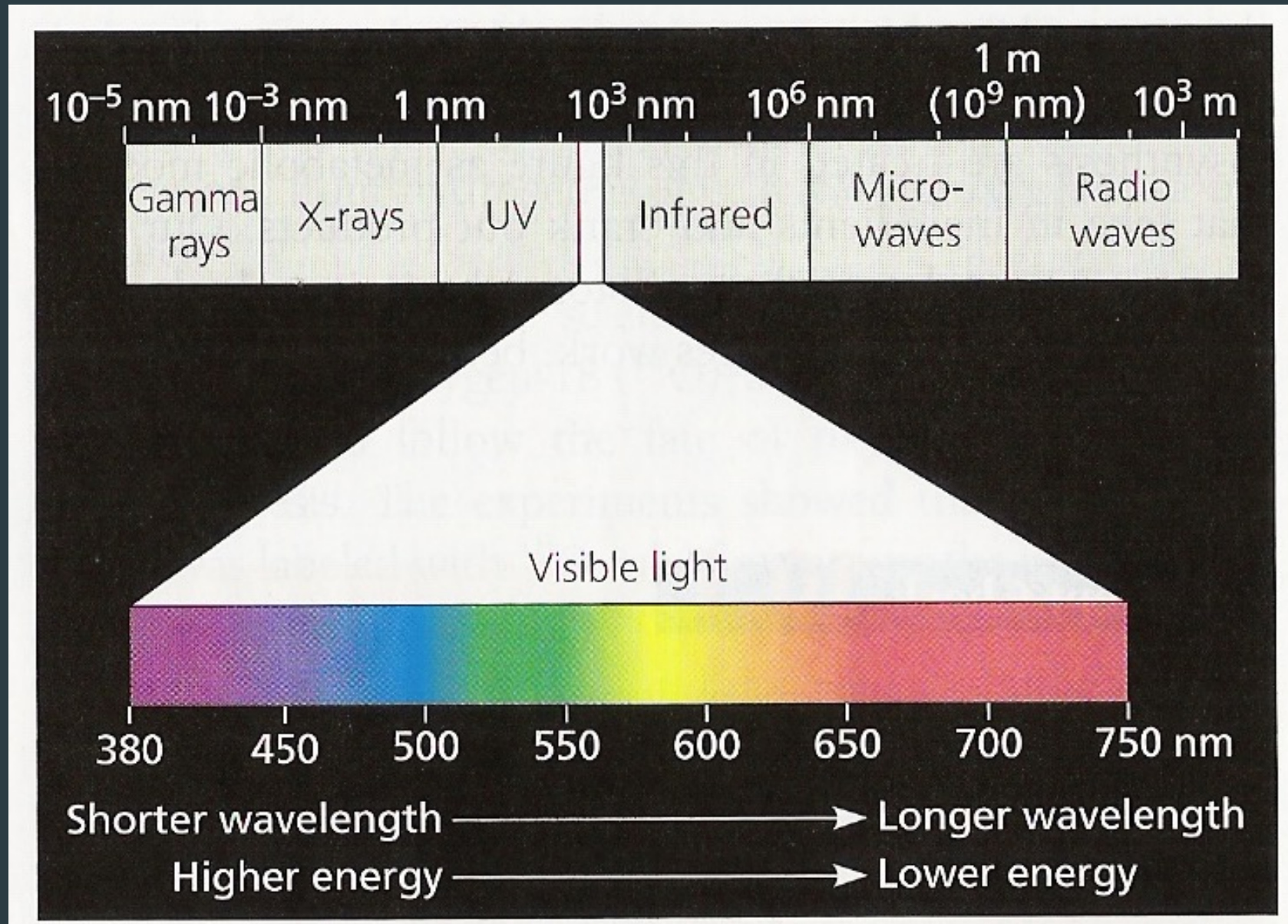
# Dois conjuntos de reações da fotossíntese



# Captura do espectro solar



# Espectro Visível



# Espectro de Absorção

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Pigmentos são moléculas coloridas com capacidade de absorção de energia luminosa.

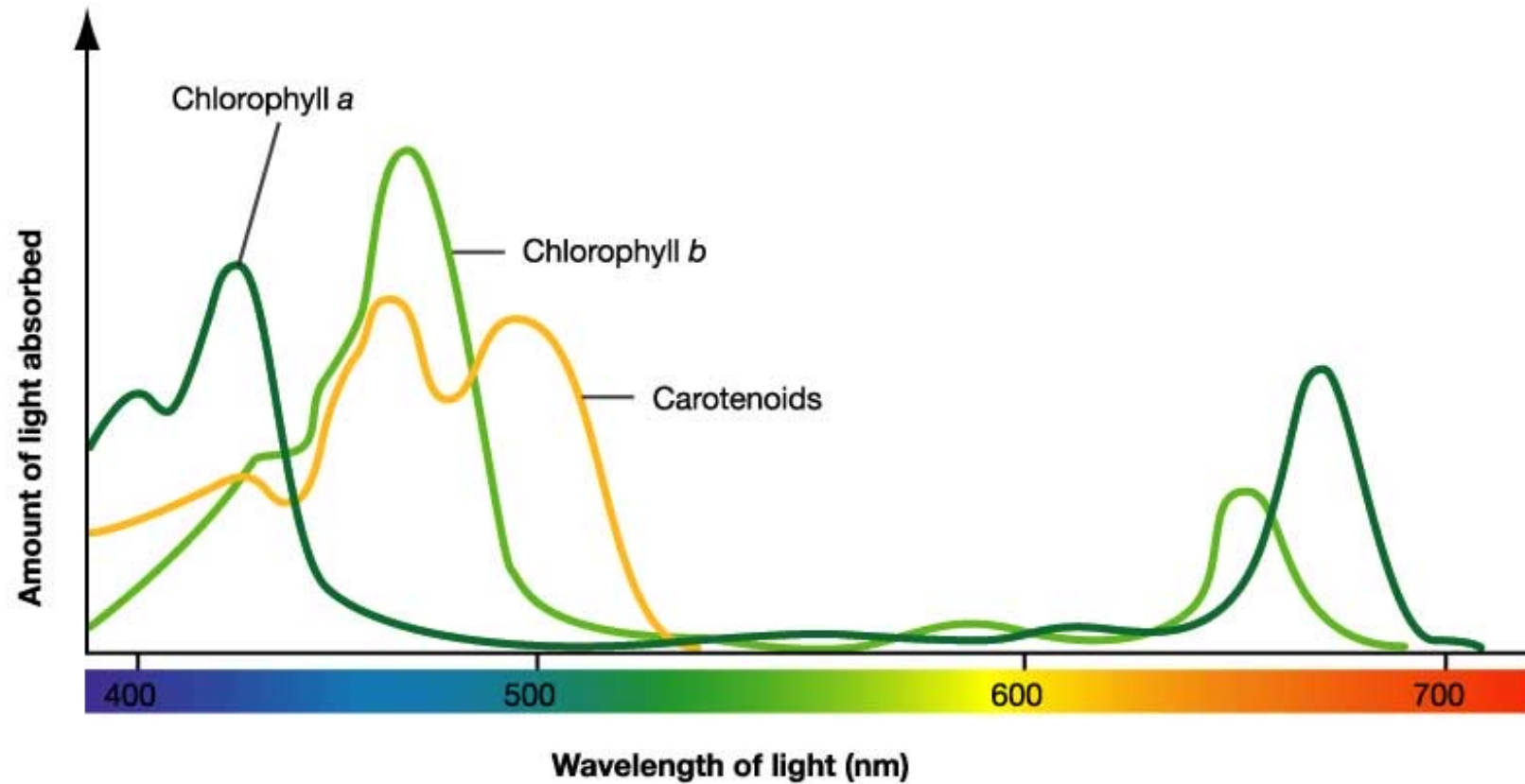
Pigmentos diferentes absorvem comprimentos de onda diferentes, sendo que as clorofila a é o pigmento principal com capacidade de utilizar directamente a energia luminosa.

Pigmentos acessórios permitem à planta maximizar as reações fotossintéticas, permitindo uma maior absorção de energia luminosa ou dissipando energia excessiva.

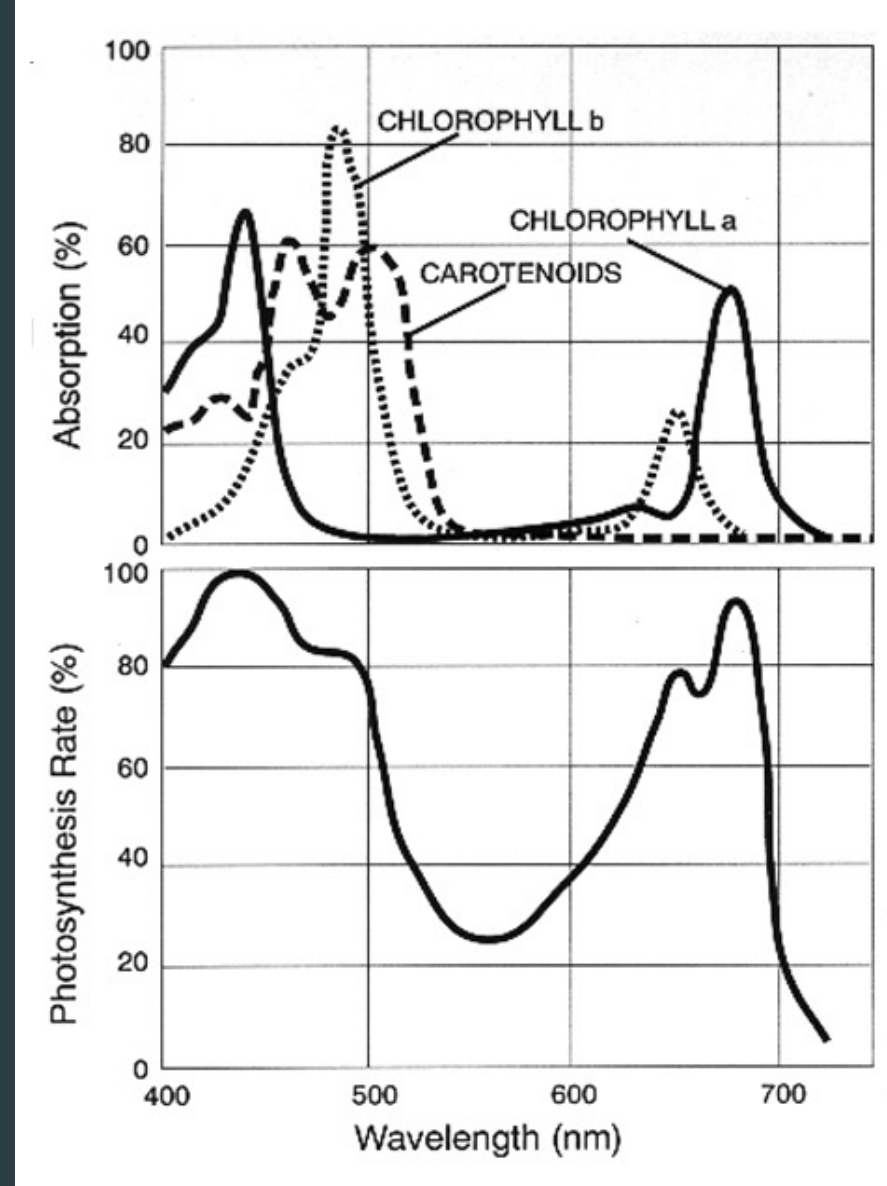
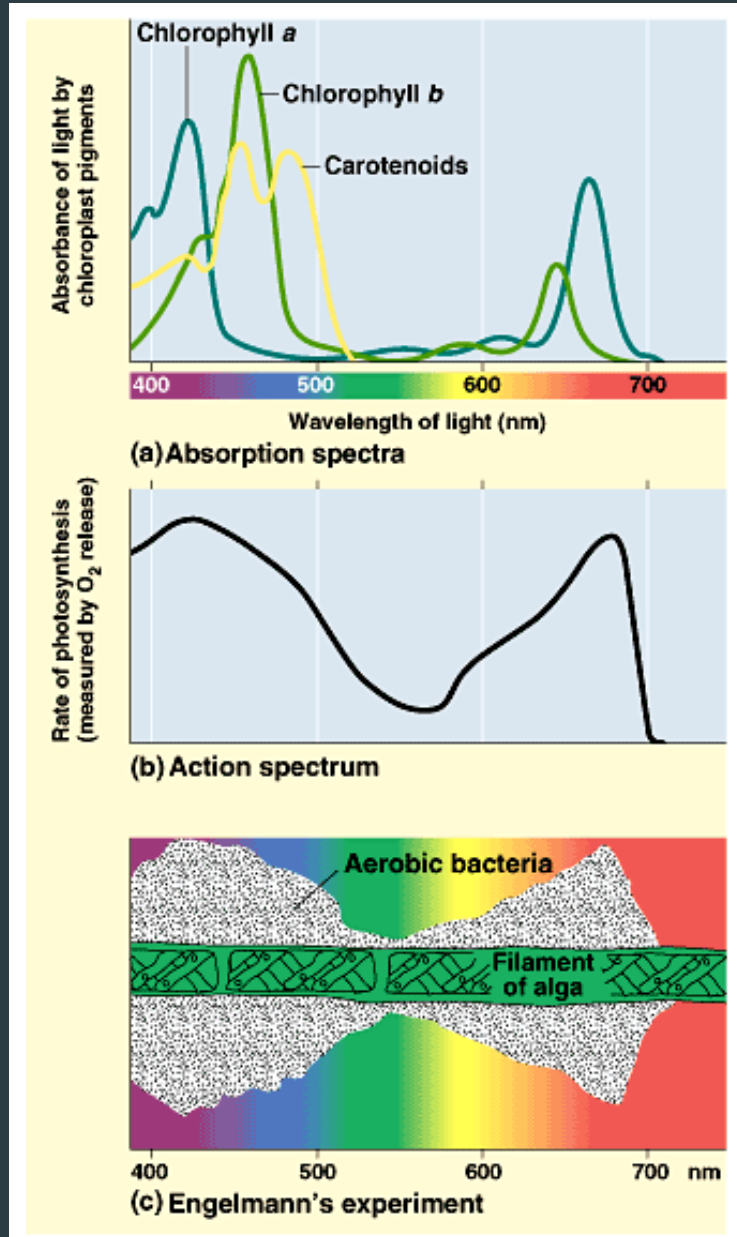
Carotenoides e Xantófilas

Antocianinas

# Espectro de Absorção

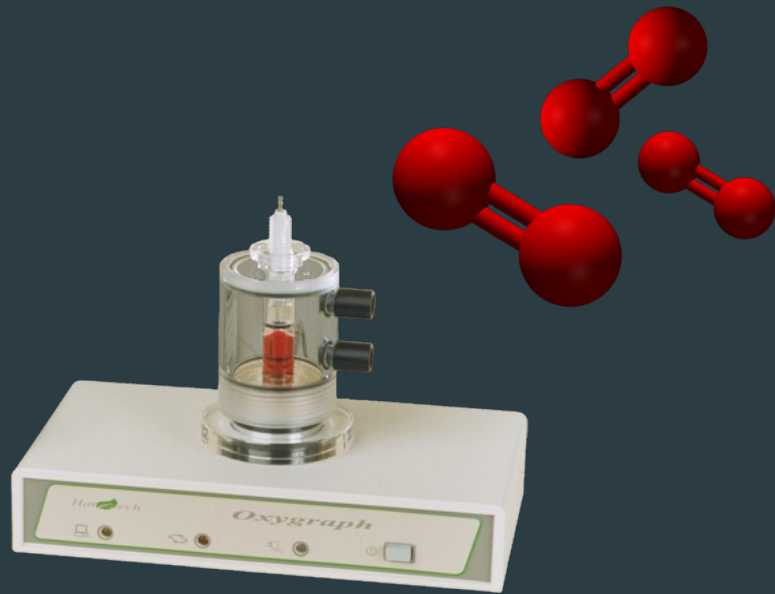


# Espectro de Ação



# Rendimento Quântico

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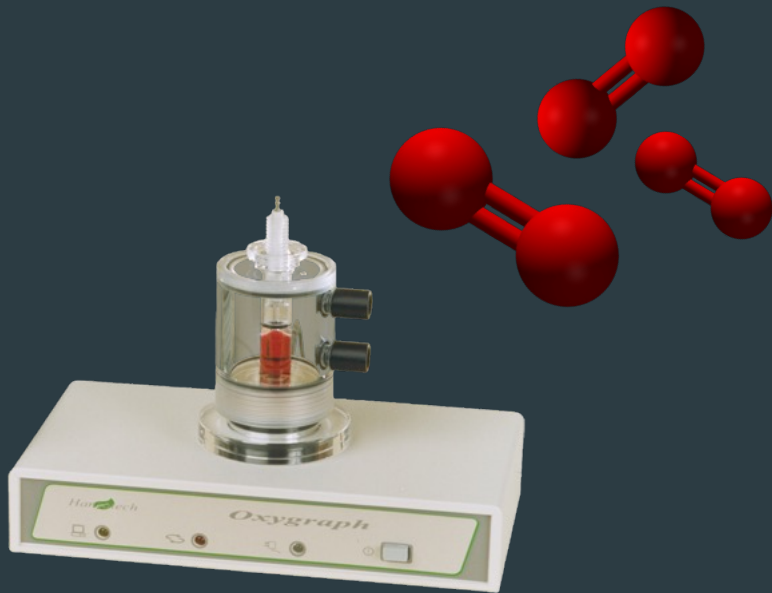
Rendimento Quântico Aparente =  $\mu\text{mol}$  Oxigénio produzido /  $\mu\text{m}$  fotões incidentes

Porque designamos este rendimento como aparente?



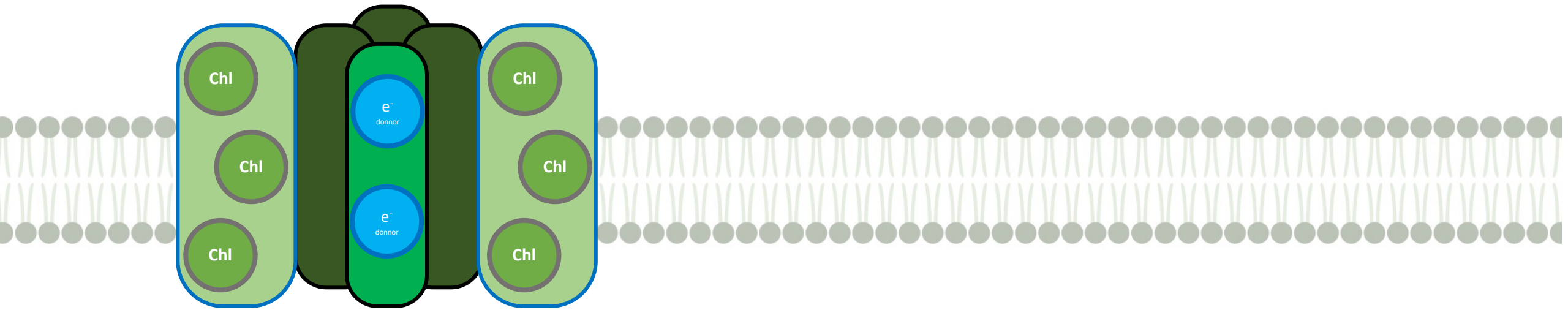
# Rendimento Quântico

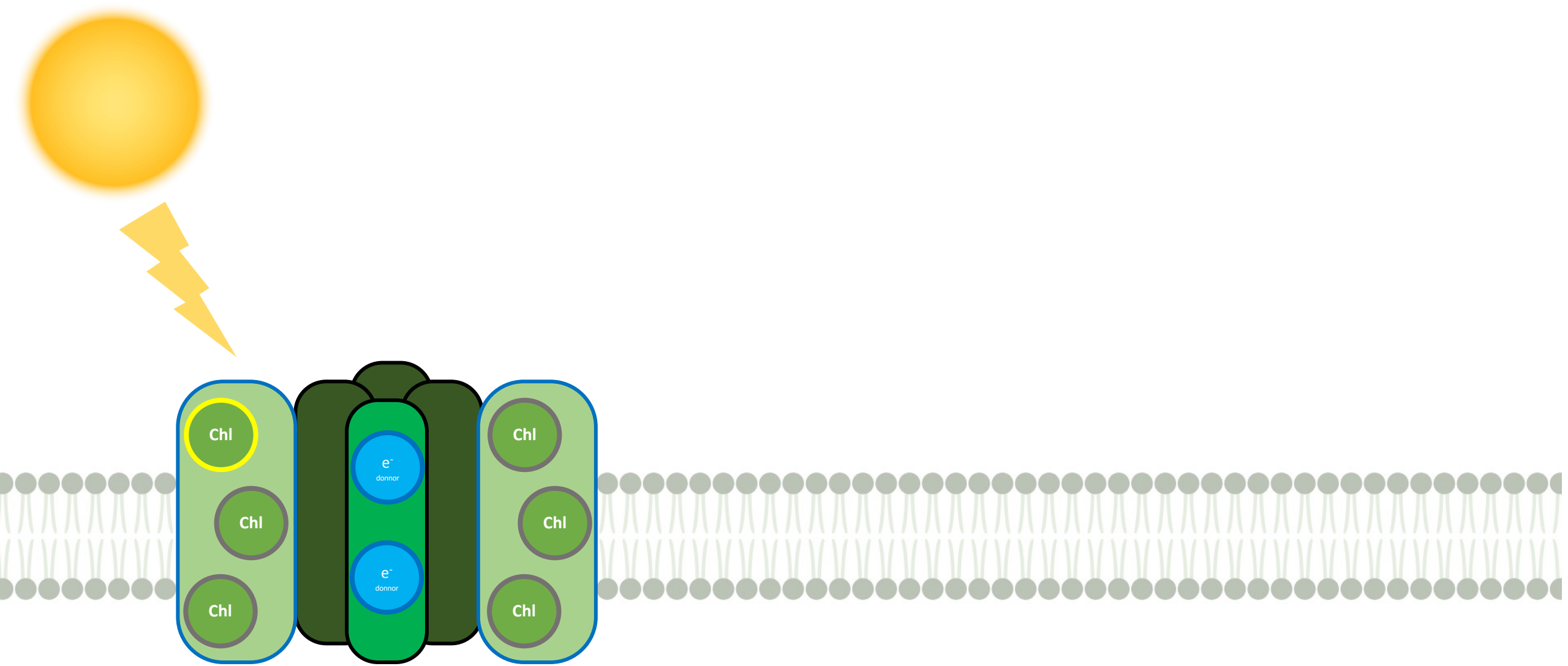
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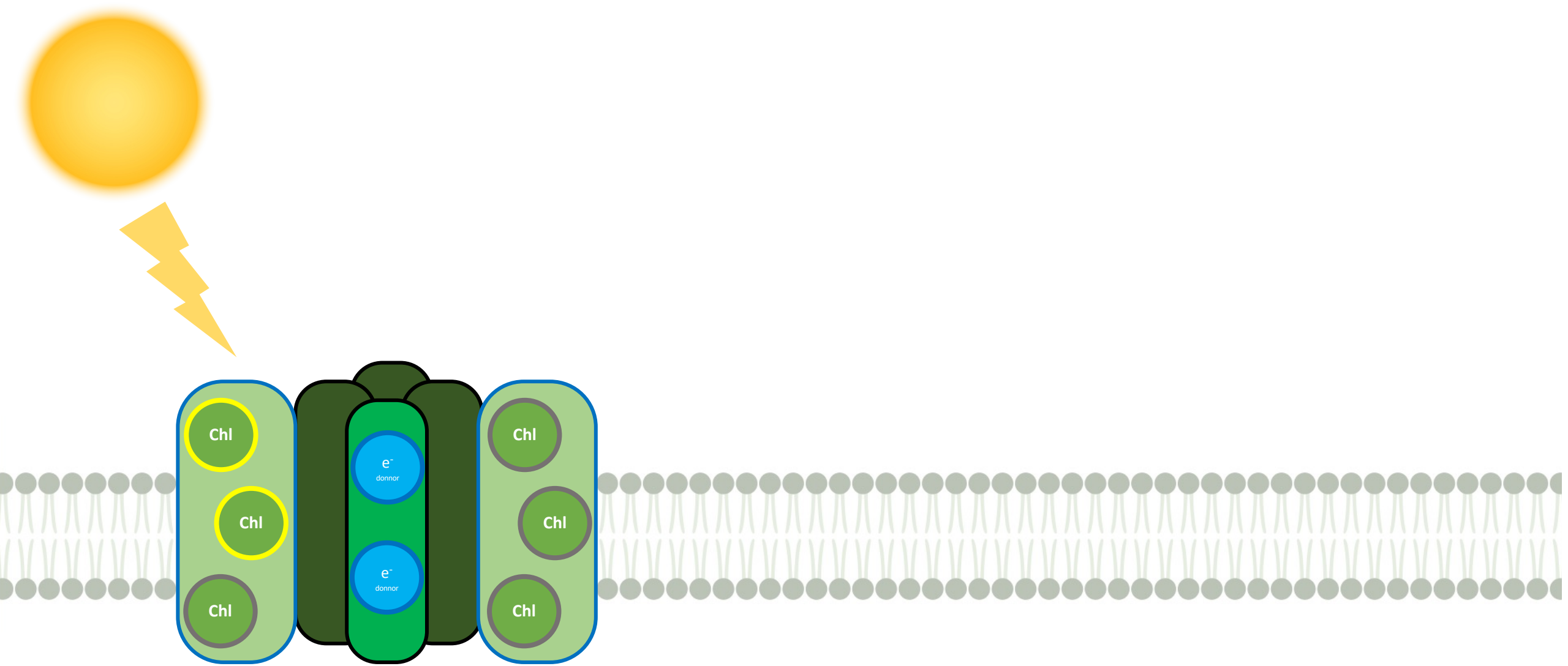


Qual o organismo com maior rendimento quântico aparente: Organismo A capaz de produzir 500  $\mu\text{mol O}_2$  quando exposto a 125  $\mu\text{mol}$  fótons vermelhos ou Organismo B capaz de produzir 280  $\mu\text{mol O}_2$  quando exposto a 70  $\mu\text{mol}$  fótons azuis?

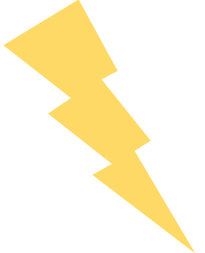




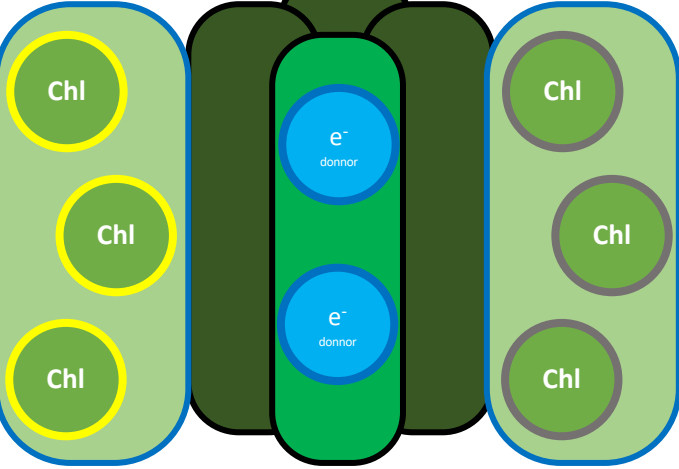




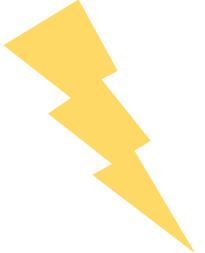
Absorbed Energy Flux (ABS/RC)



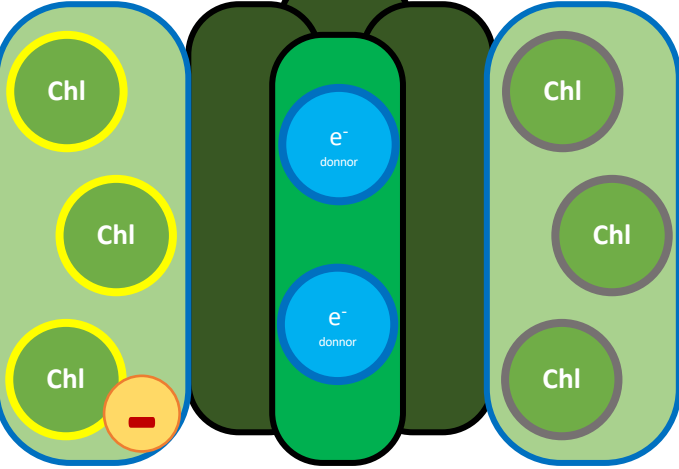
ABS/RC



Absorbed Energy Flux (ABS/RC)



ABS/RC



Chl

Chl

Chl

-

e<sup>-</sup>  
donnor

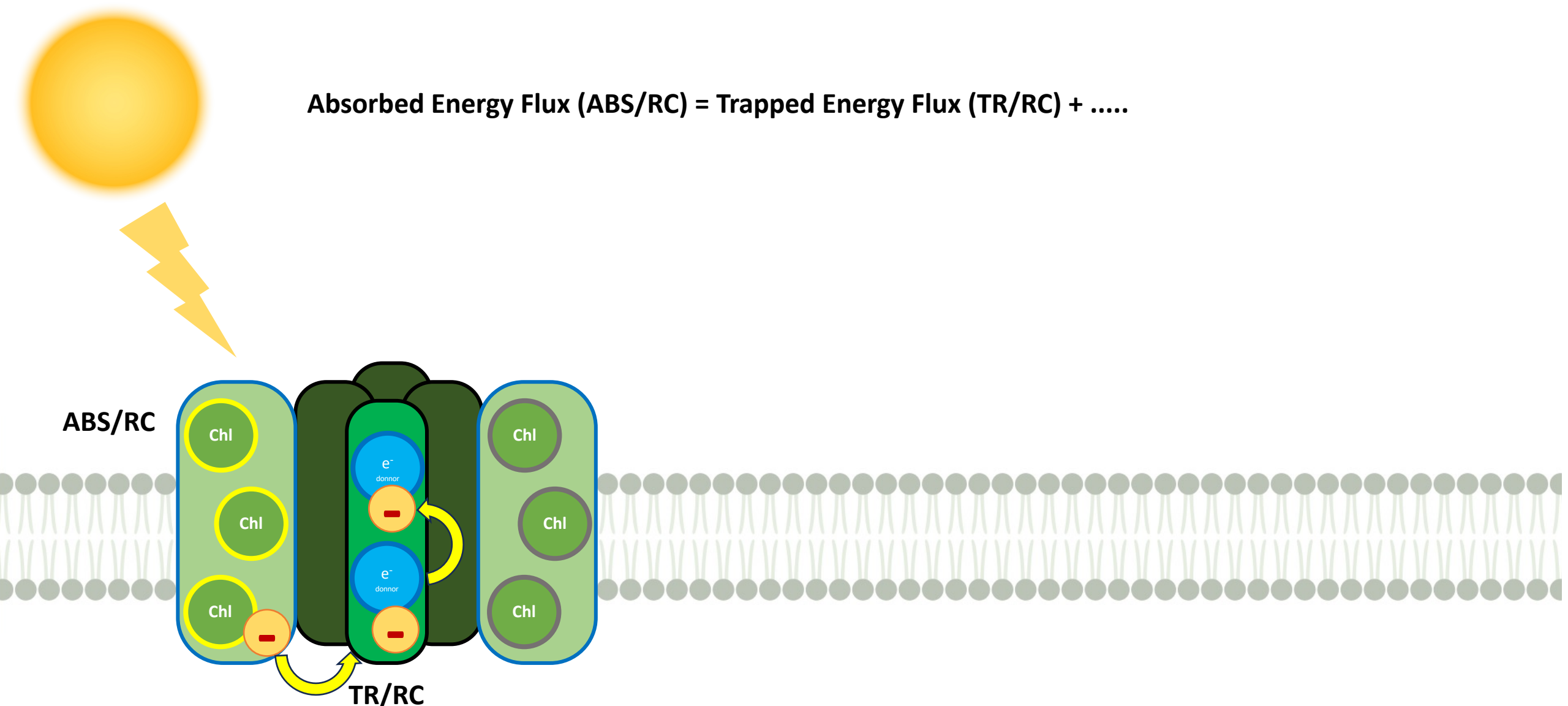
e<sup>-</sup>  
donnor

Chl

Chl

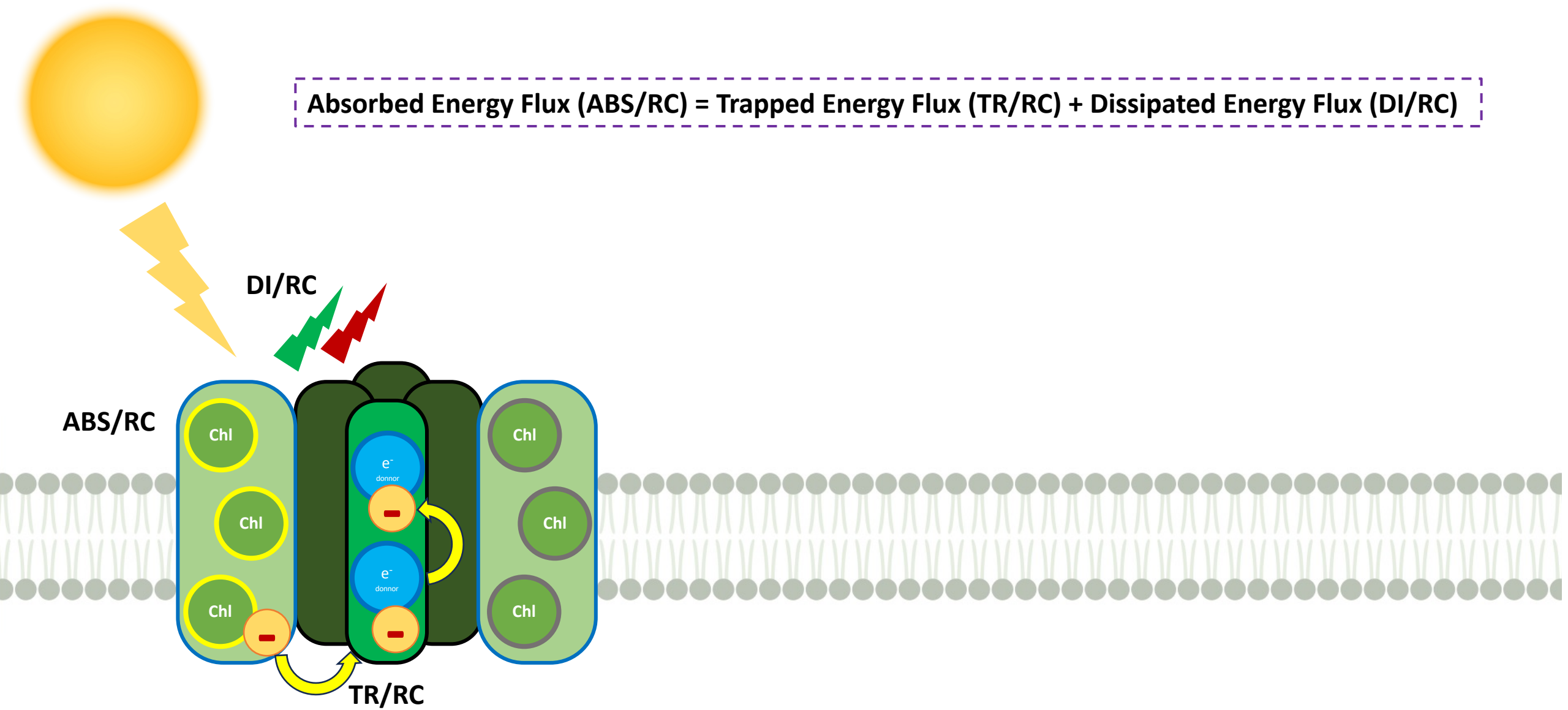
Chl

**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + .....**

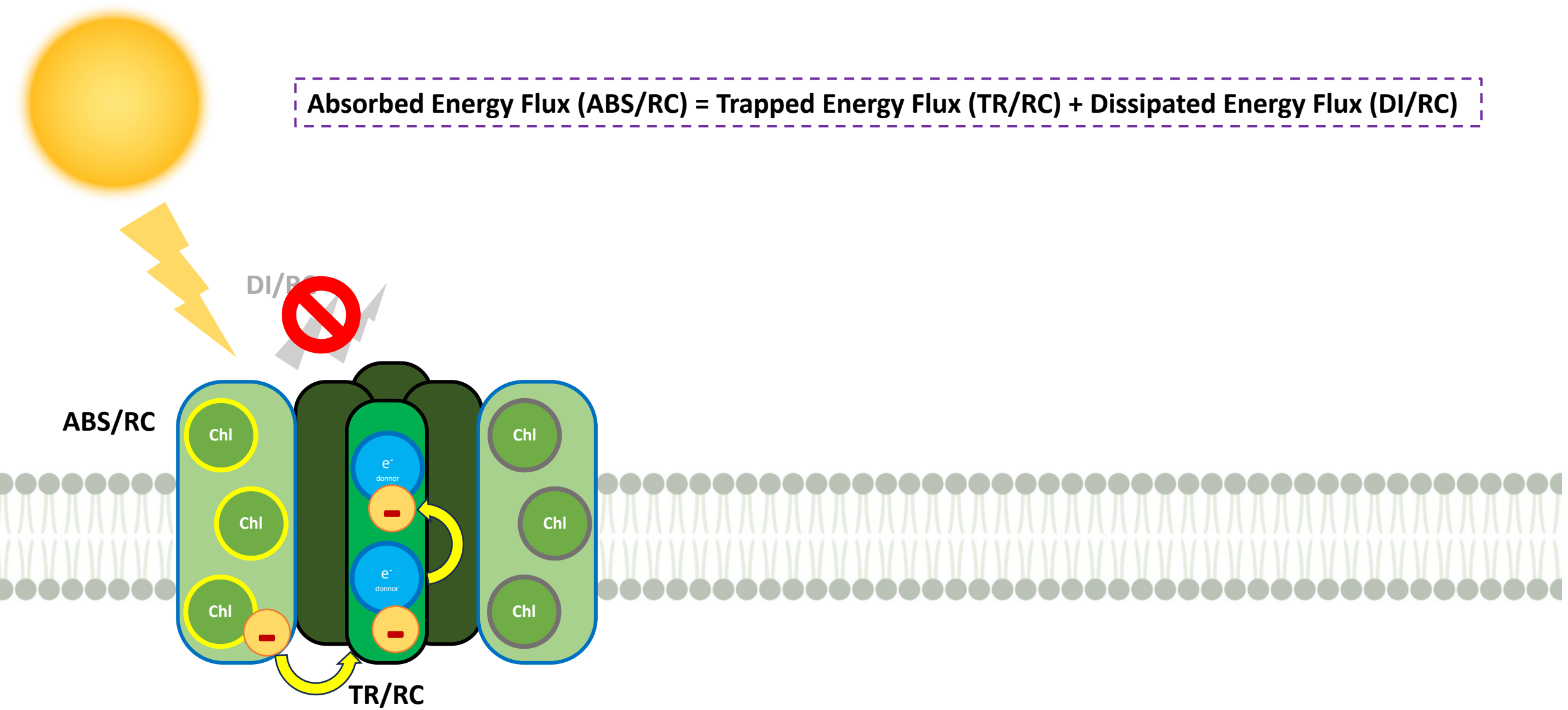




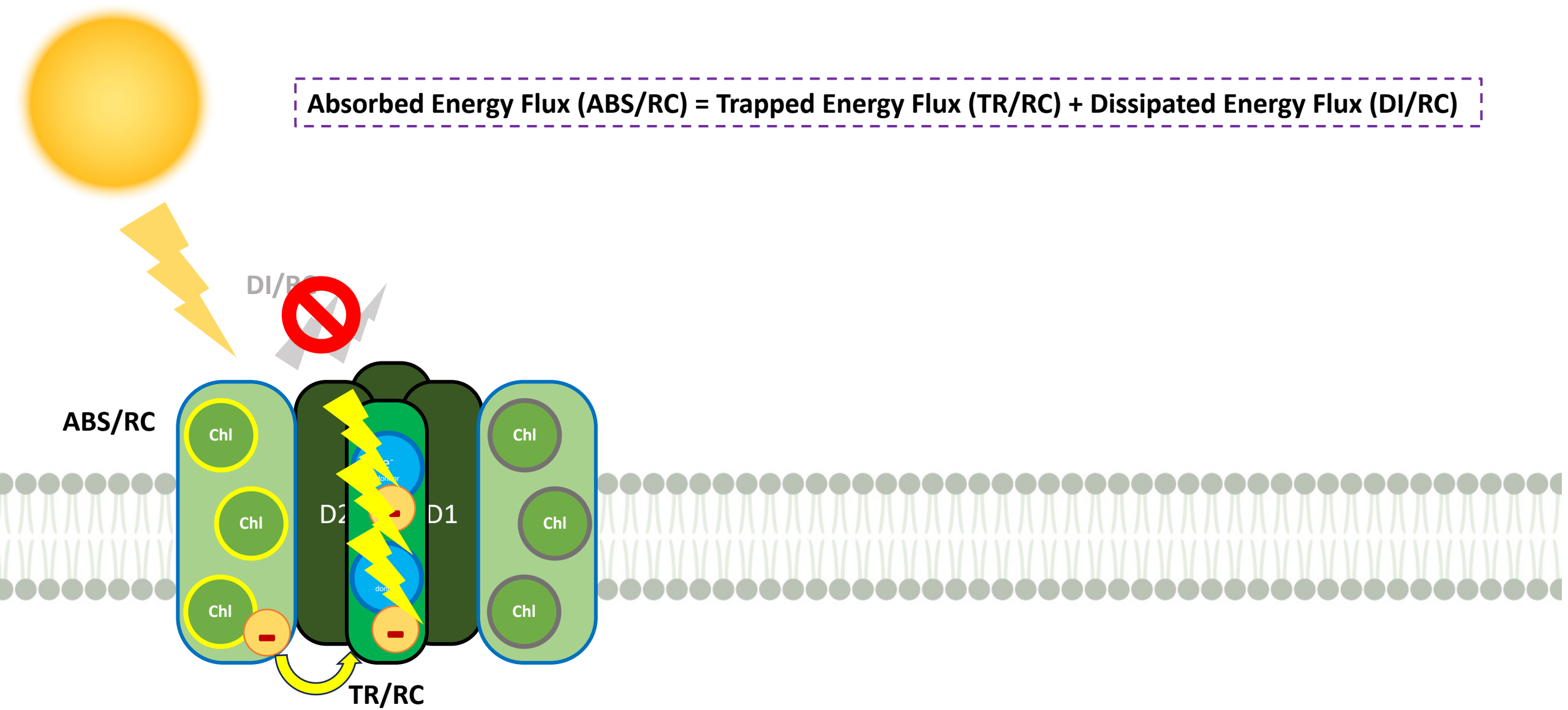
**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**



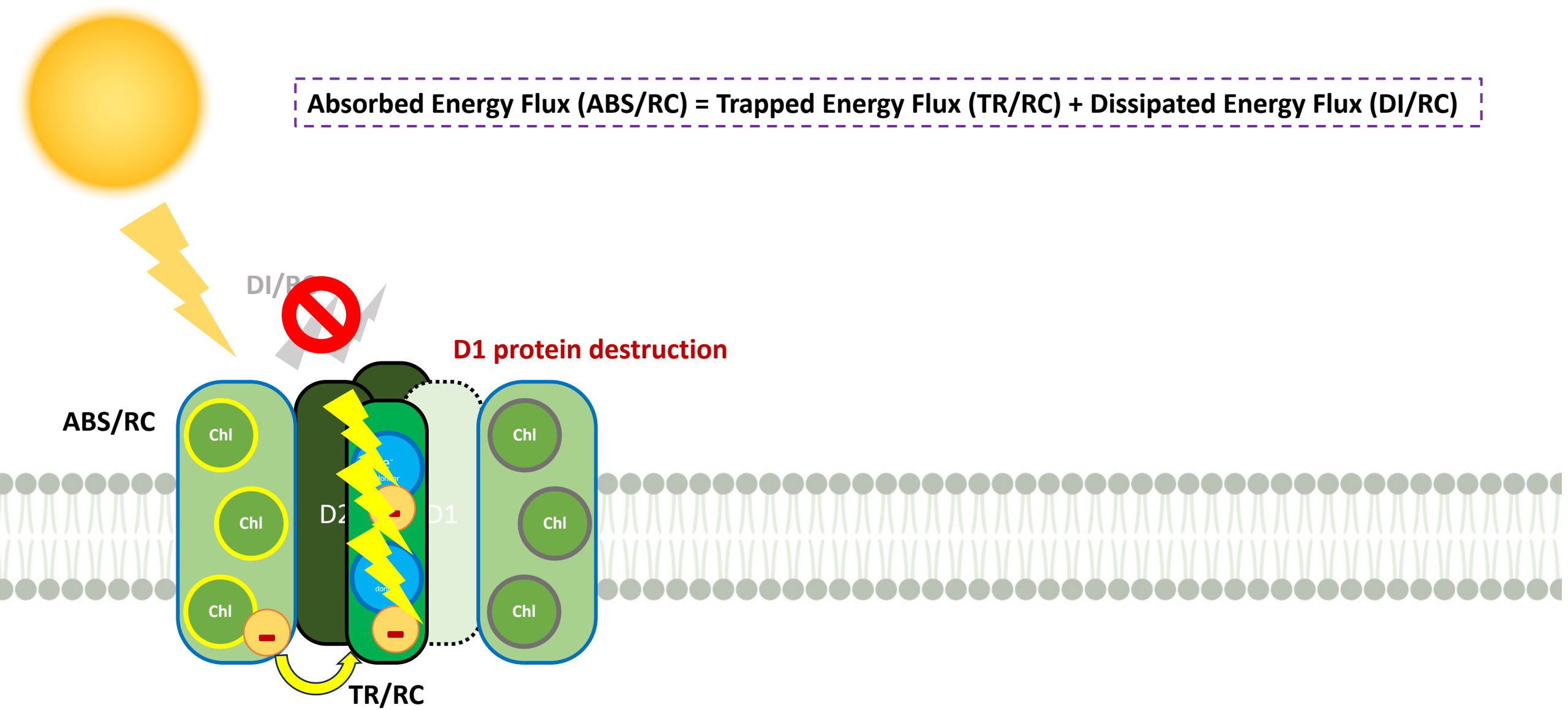
**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**



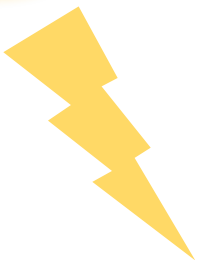
**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**



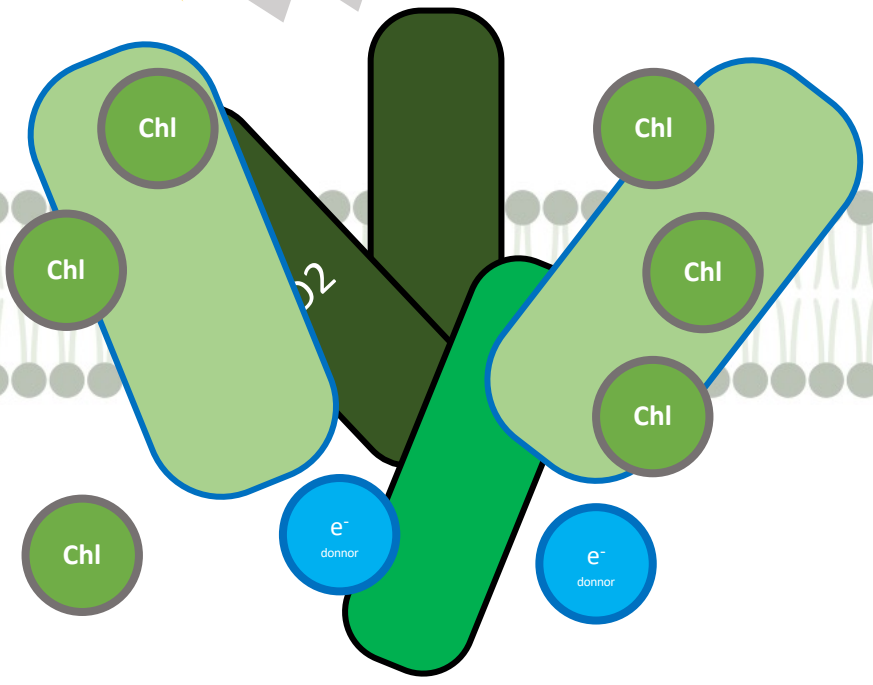
**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**



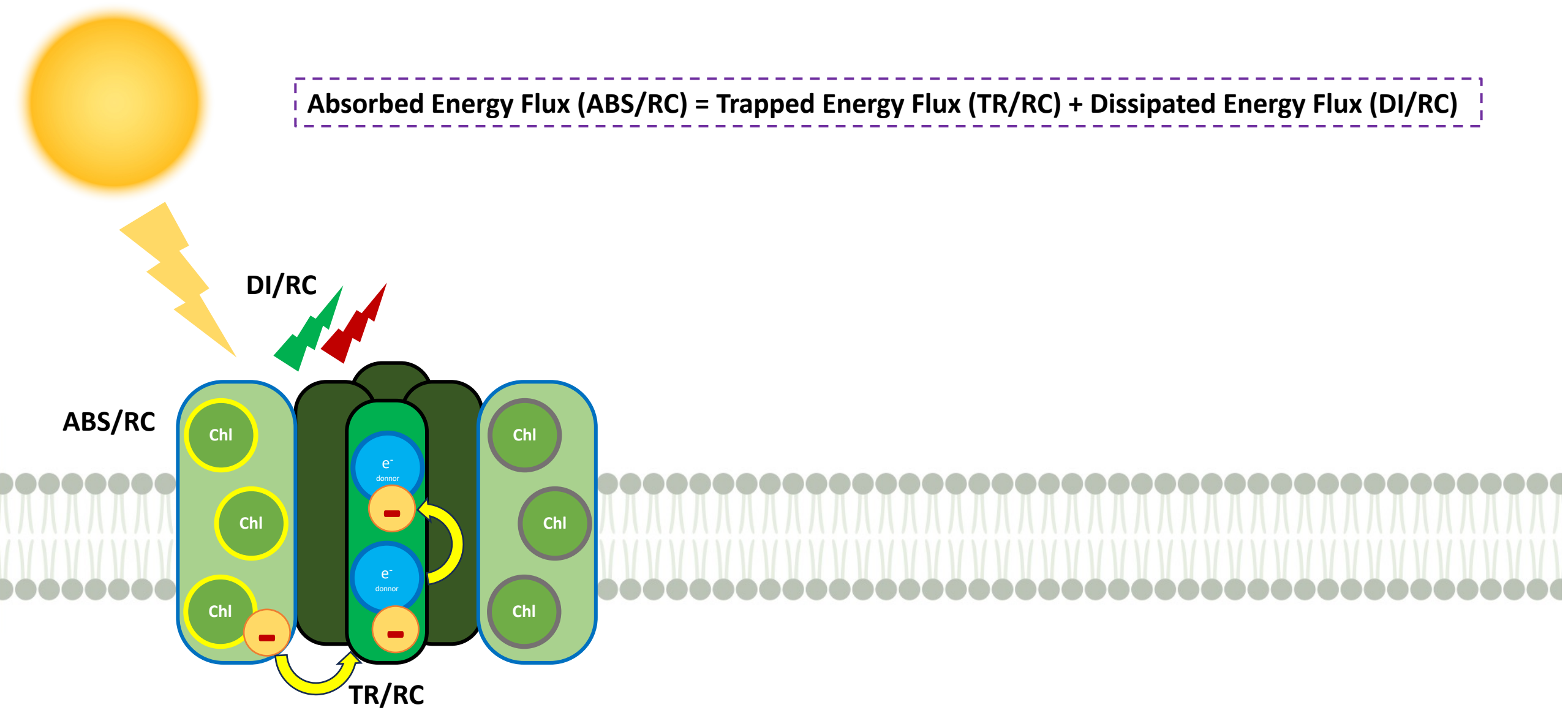
$$\text{Absorbed Energy Flux (ABS/RC)} = \text{Trapped Energy Flux (TR/RC)} + \text{Dissipated Energy Flux (DI/RC)}$$



# Photoinhibition



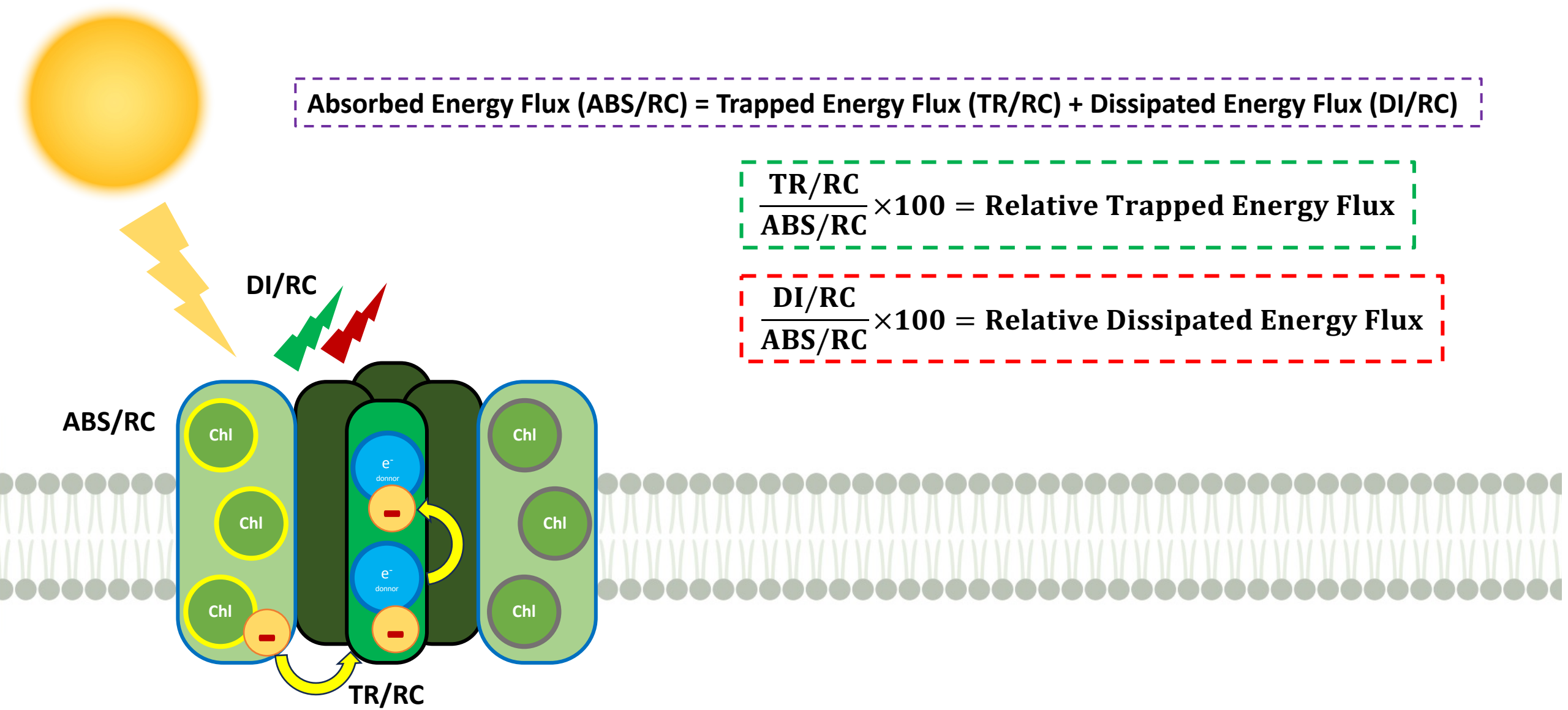
**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**



**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**

**$\frac{TR/RC}{ABS/RC} \times 100 = \text{Relative Trapped Energy Flux}$**

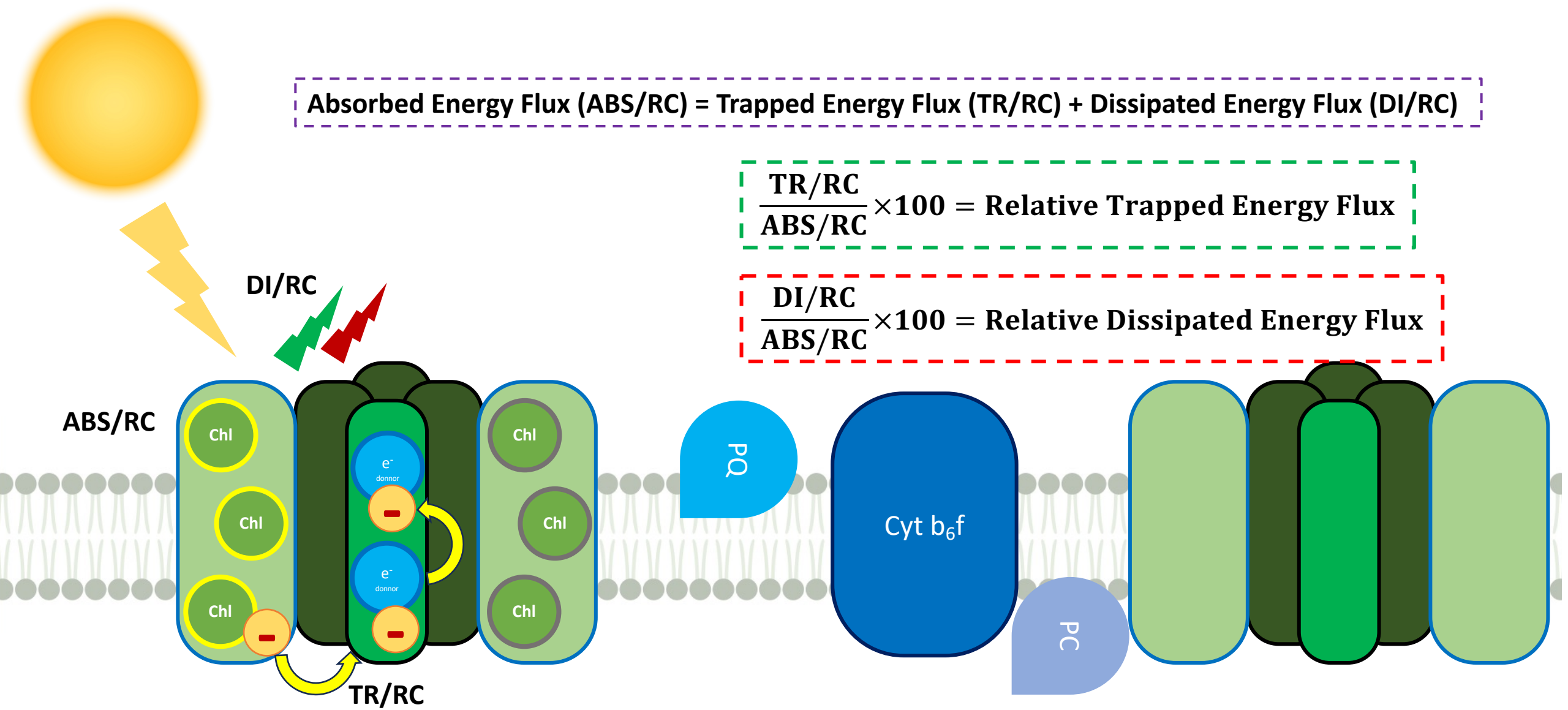
**$\frac{DI/RC}{ABS/RC} \times 100 = \text{Relative Dissipated Energy Flux}$**



**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**

**$\frac{TR/RC}{ABS/RC} \times 100 = \text{Relative Trapped Energy Flux}$**

**$\frac{DI/RC}{ABS/RC} \times 100 = \text{Relative Dissipated Energy Flux}$**

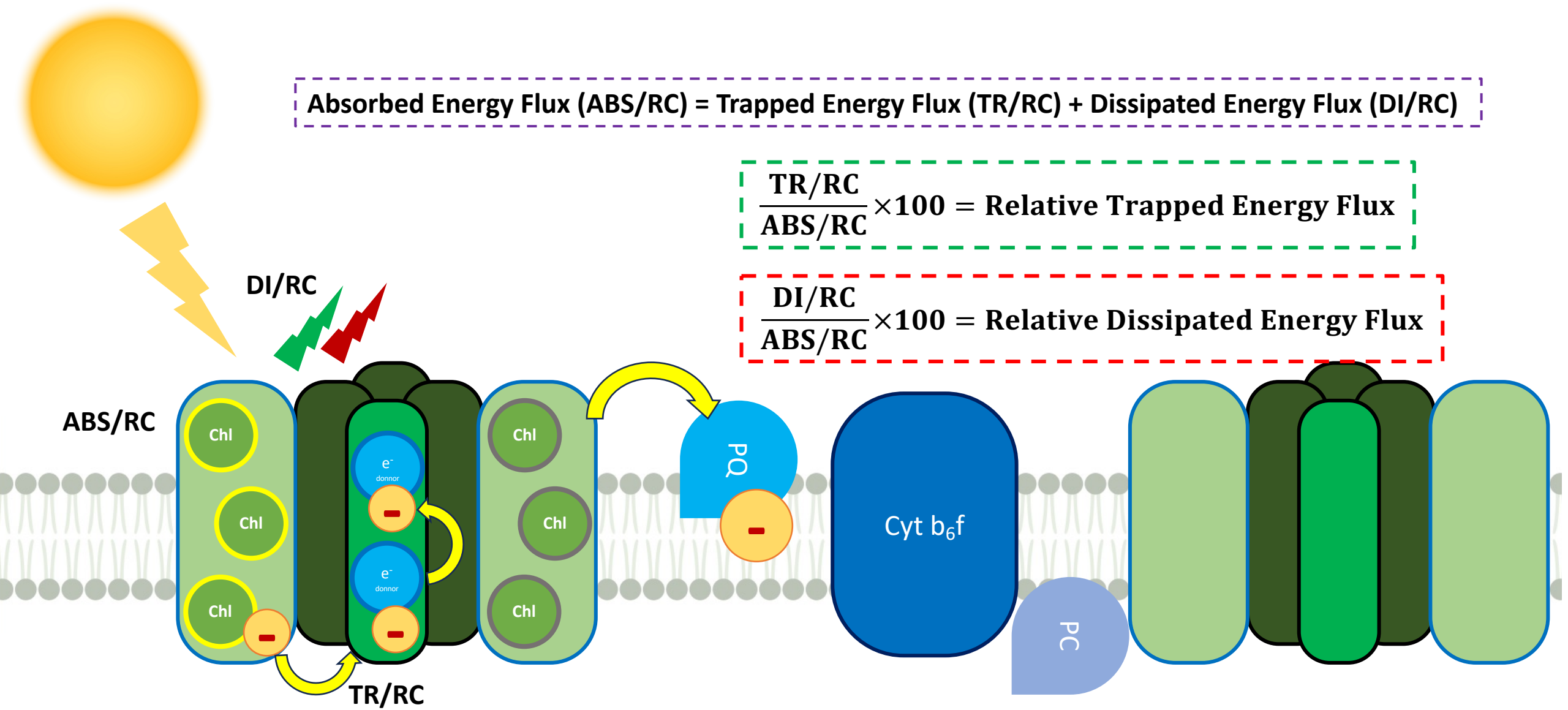




**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**

**$\frac{TR/RC}{ABS/RC} \times 100 = \text{Relative Trapped Energy Flux}$**

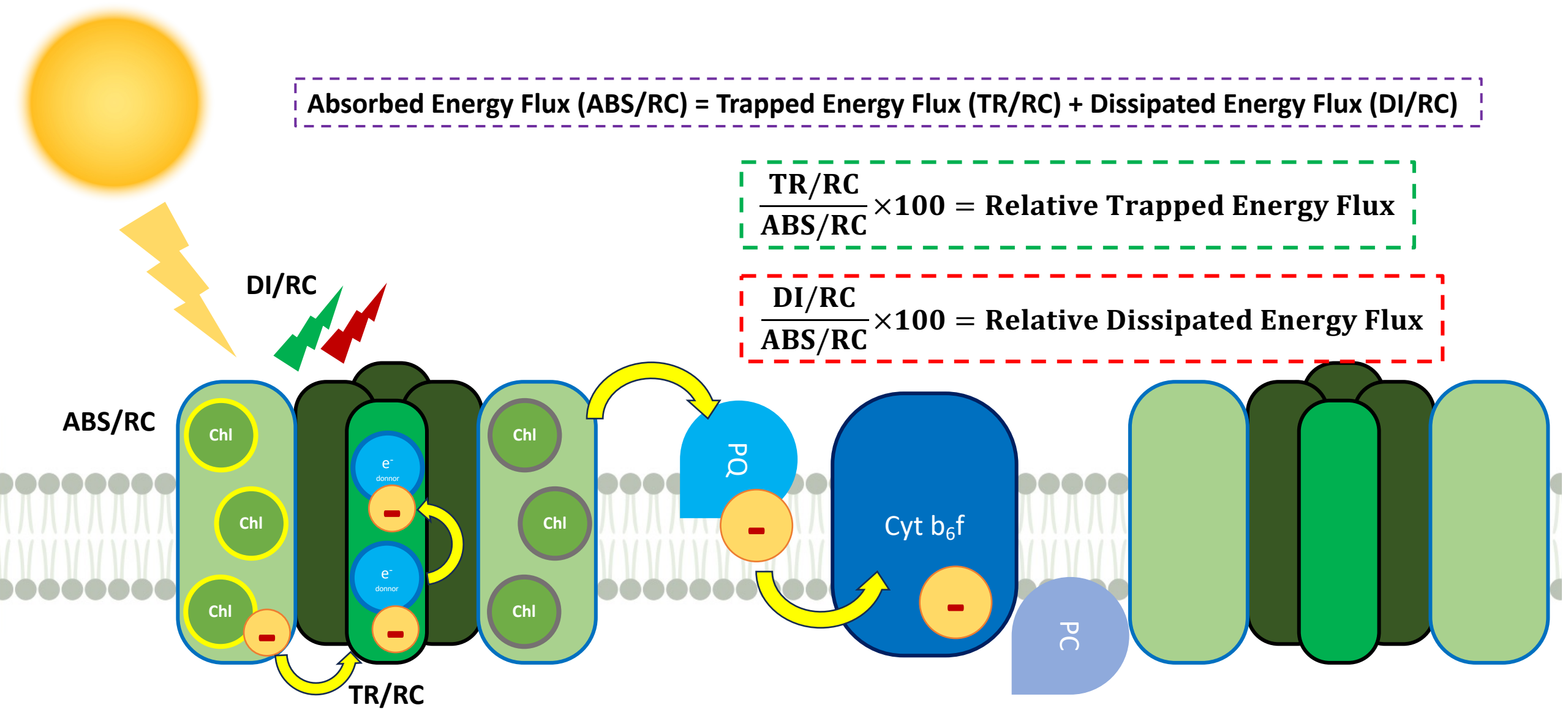
**$\frac{DI/RC}{ABS/RC} \times 100 = \text{Relative Dissipated Energy Flux}$**



**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**

**$\frac{TR/RC}{ABS/RC} \times 100 = \text{Relative Trapped Energy Flux}$**

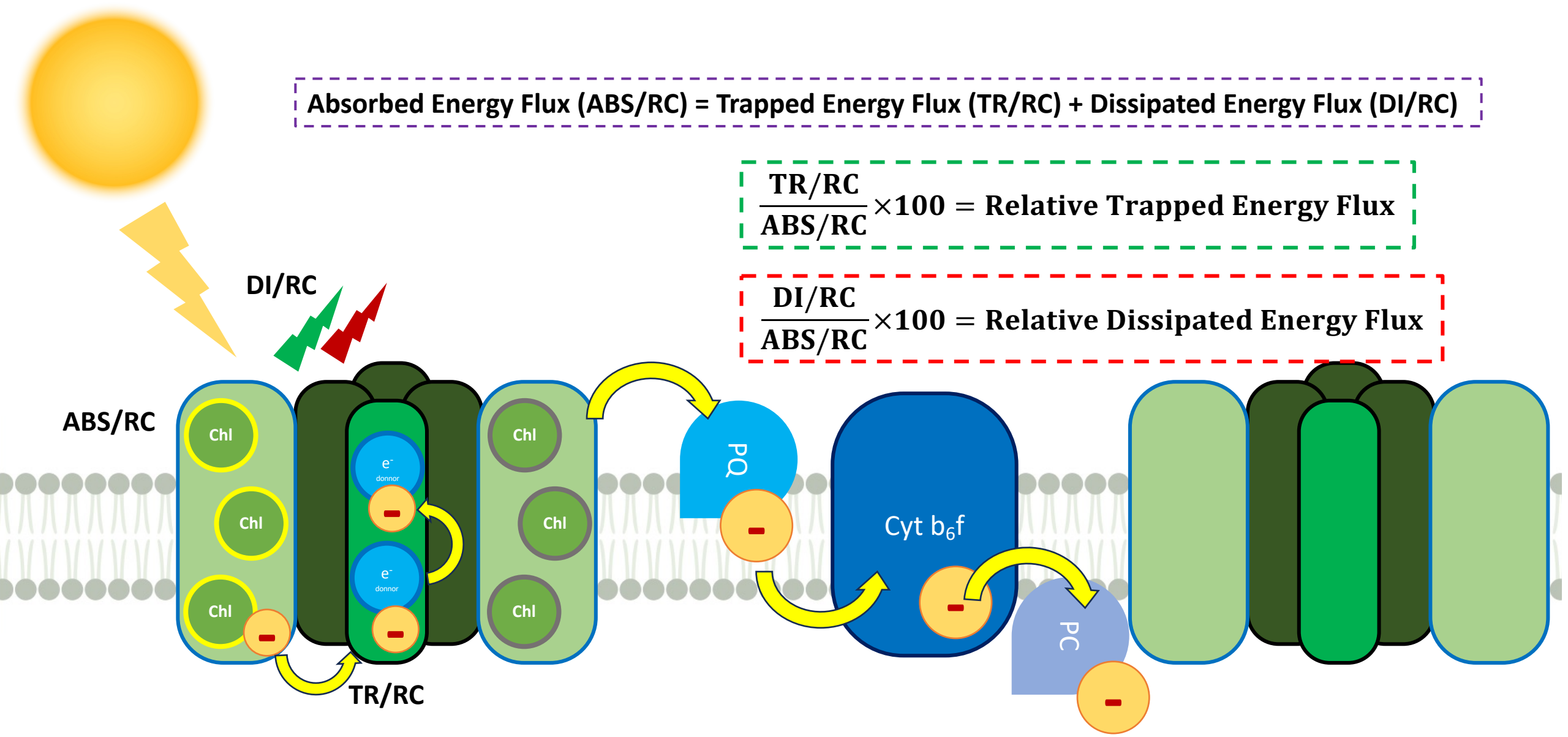
**$\frac{DI/RC}{ABS/RC} \times 100 = \text{Relative Dissipated Energy Flux}$**



**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**

**$\frac{TR/RC}{ABS/RC} \times 100 = \text{Relative Trapped Energy Flux}$**

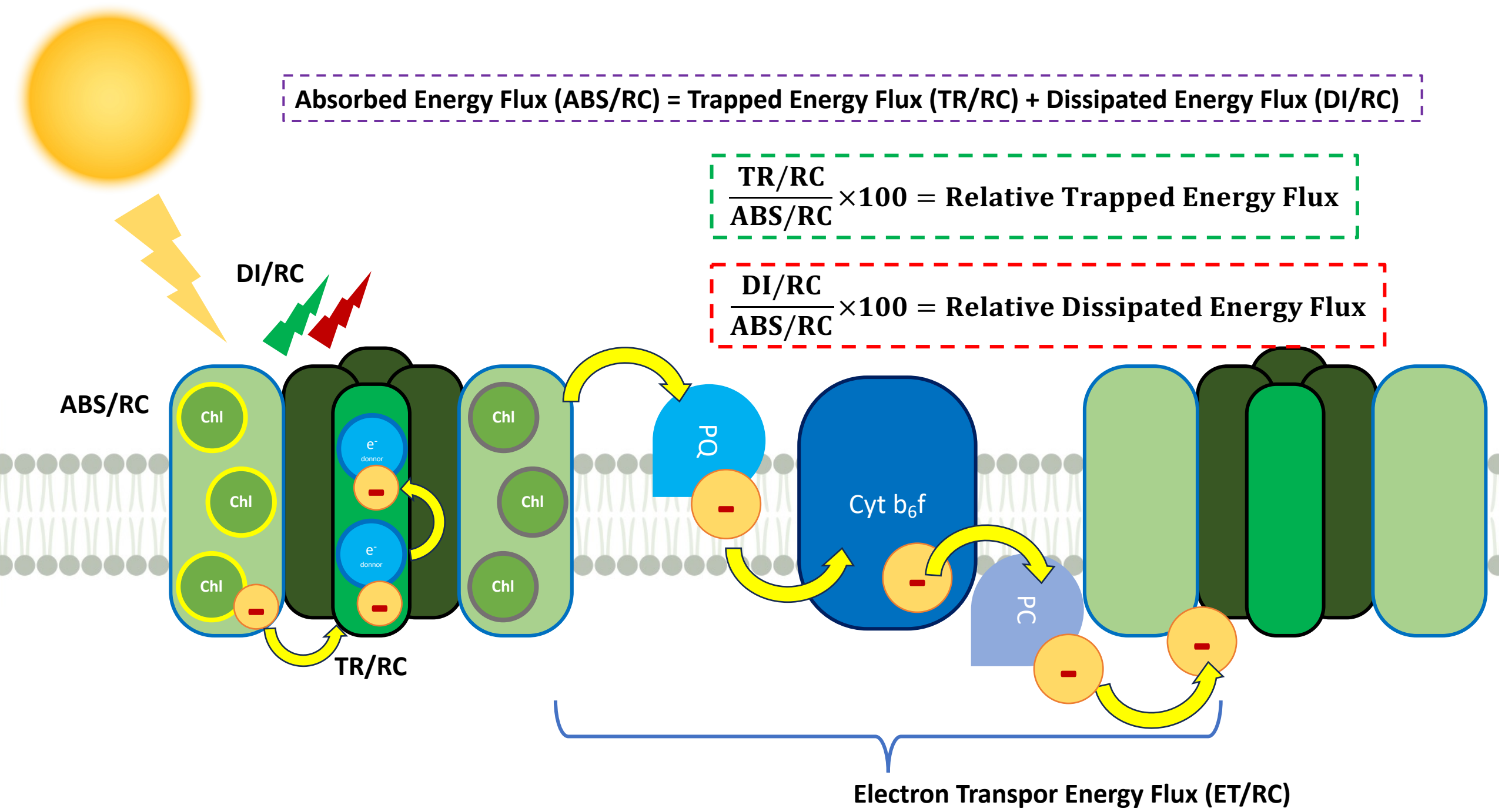
**$\frac{DI/RC}{ABS/RC} \times 100 = \text{Relative Dissipated Energy Flux}$**



**Absorbed Energy Flux (ABS/RC) = Trapped Energy Flux (TR/RC) + Dissipated Energy Flux (DI/RC)**

**$\frac{TR/RC}{ABS/RC} \times 100 = \text{Relative Trapped Energy Flux}$**

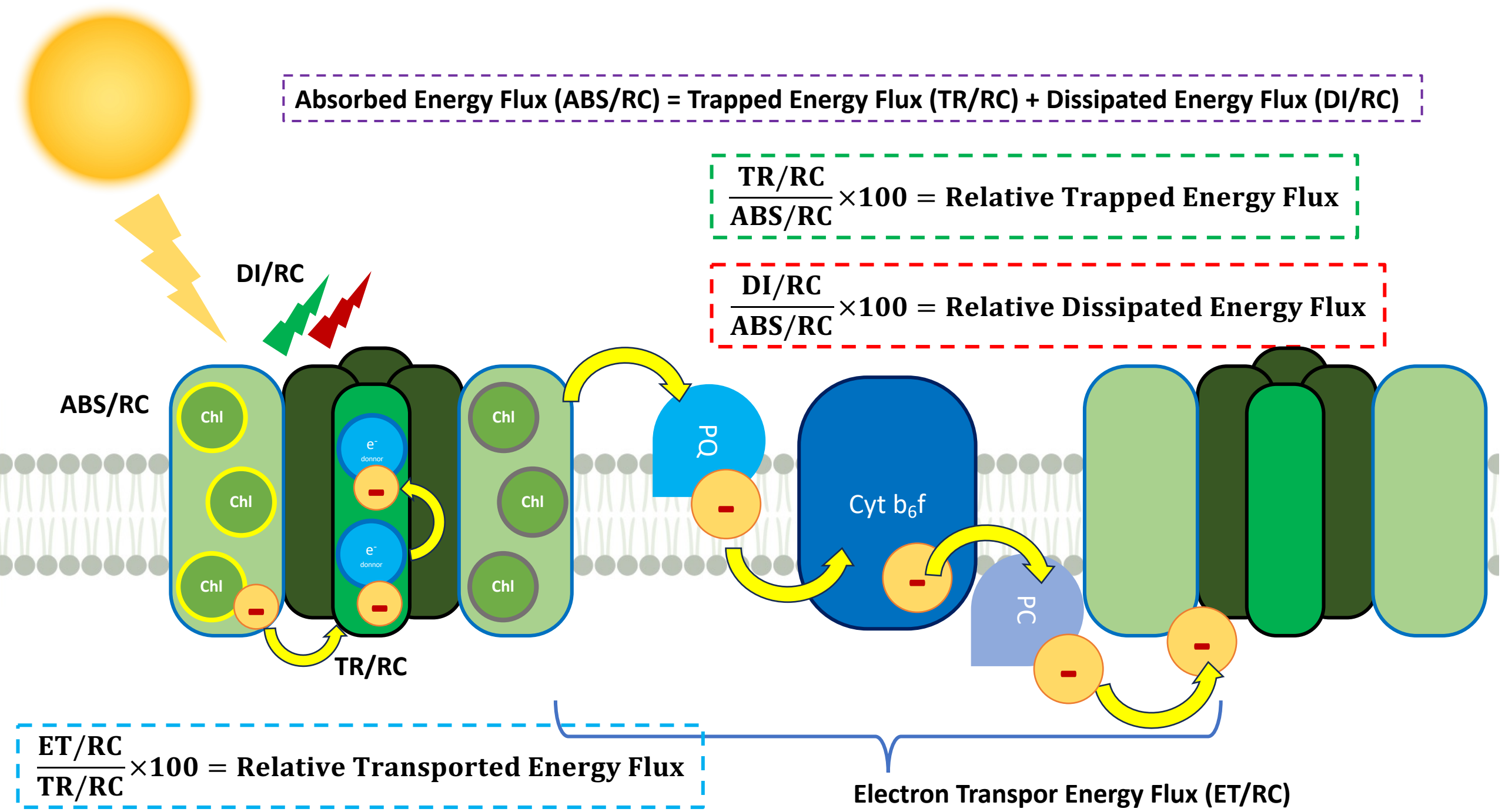
**$\frac{DI/RC}{ABS/RC} \times 100 = \text{Relative Dissipated Energy Flux}$**



$$\text{Absorbed Energy Flux (ABS/RC)} = \text{Trapped Energy Flux (TR/RC)} + \text{Dissipated Energy Flux (DI/RC)}$$

$$\frac{\text{TR/RC}}{\text{ABS/RC}} \times 100 = \text{Relative Trapped Energy Flux}$$

$$\frac{\text{DI/RC}}{\text{ABS/RC}} \times 100 = \text{Relative Dissipated Energy Flux}$$

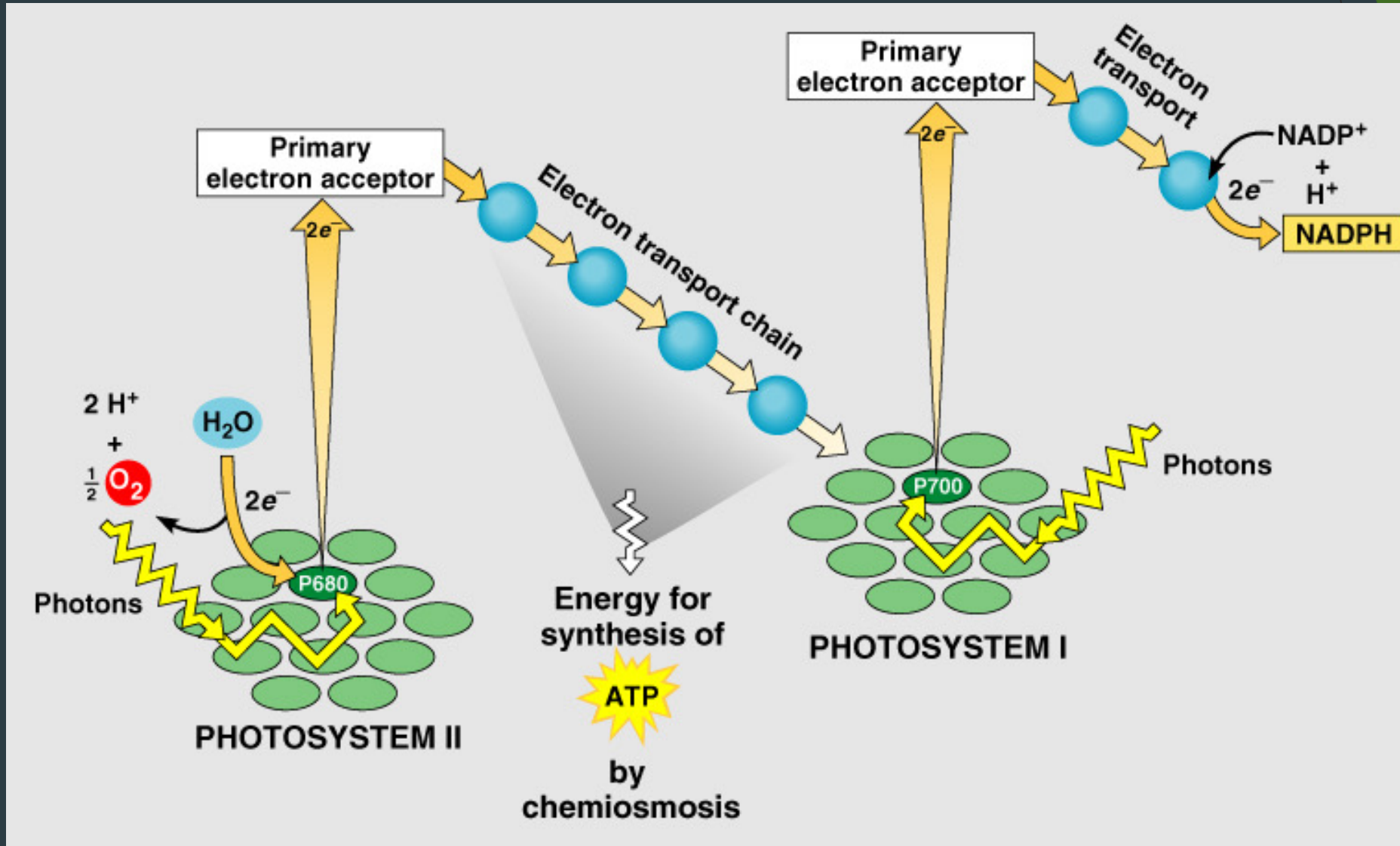


$$\frac{\text{ET/RC}}{\text{TR/RC}} \times 100 = \text{Relative Transported Energy Flux}$$

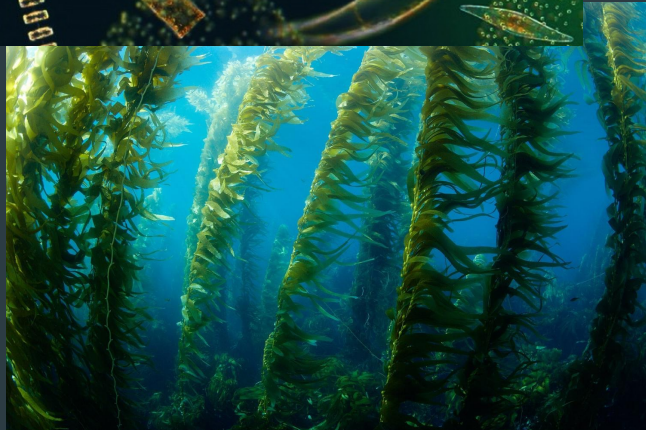
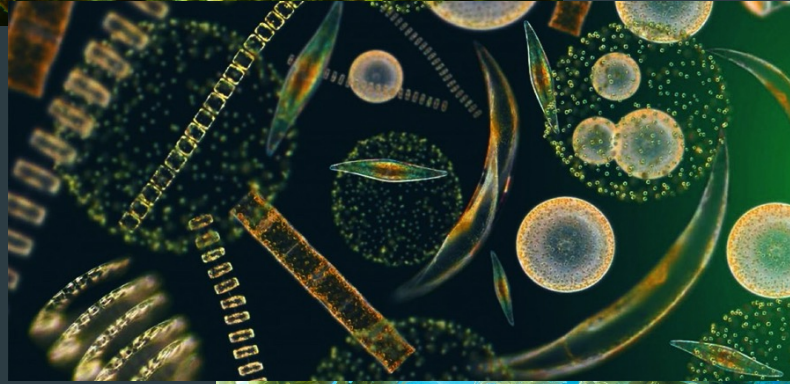
Electron Transport Energy Flux (ET/RC)

# Fotossistemas e Cadeia Transportadora de Electrões

Cadeia Transportadora de Electrões (*Electrtron Trasnpot Chain, ETC*):



No Oceano...



**OCEANS** FACTS

It's #WorldOceansDay!

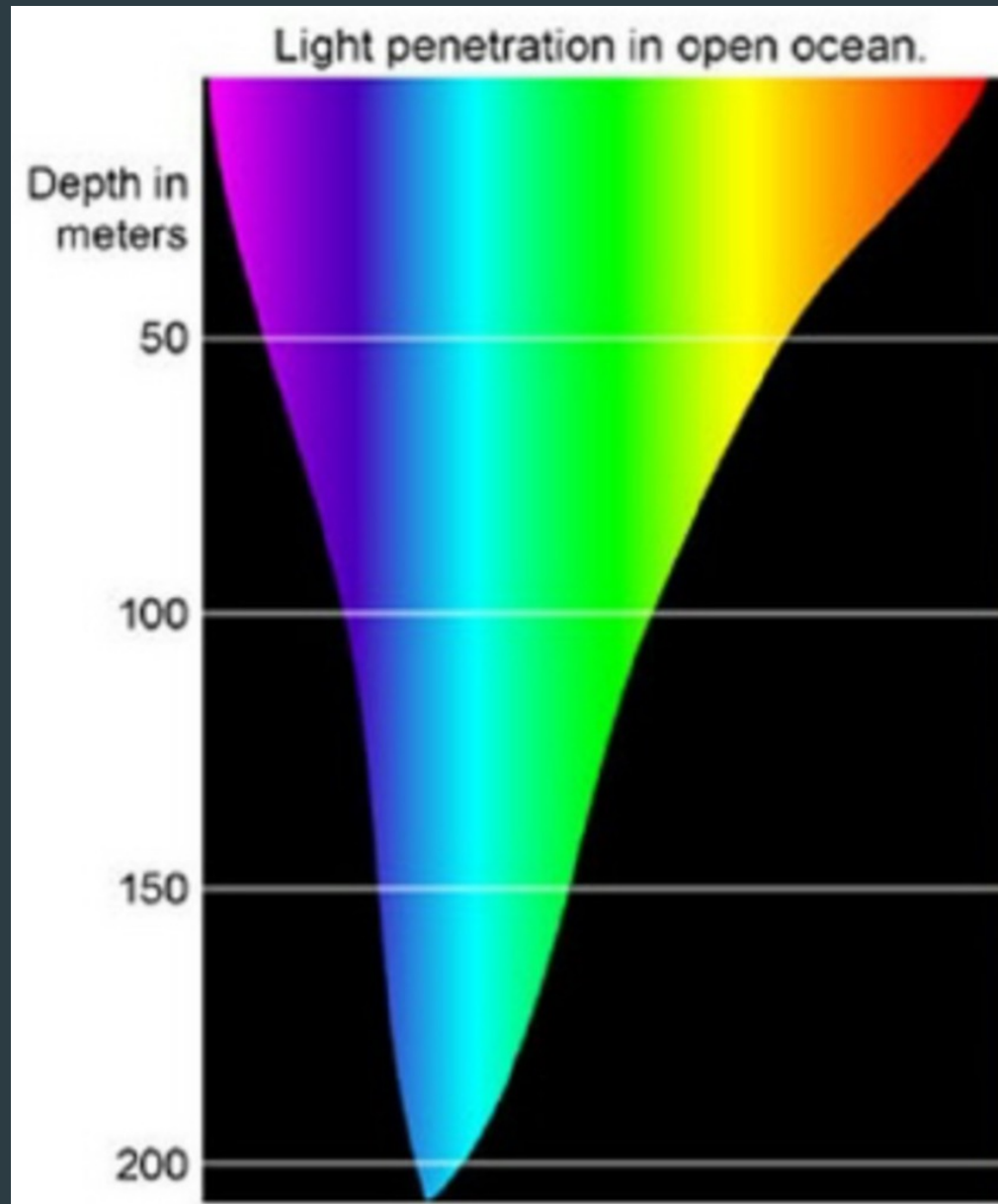
Every second breath you  
take comes from the ocean.

14 LIFE BELOW  
WATER



#OCEANCONFERENCE

# No Oceano...



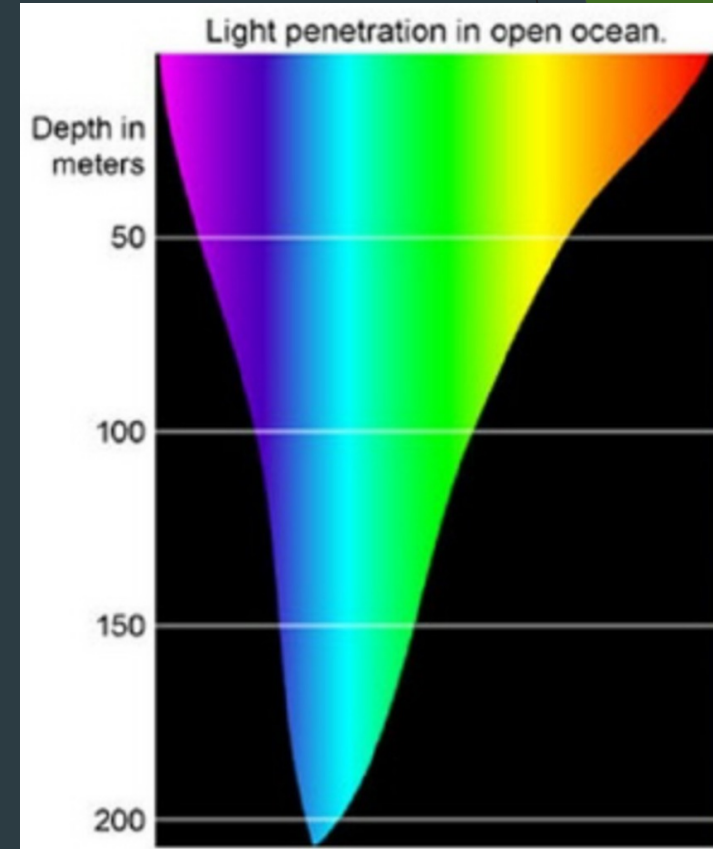
Os comprimentos de onda mais altos (menos energéticos) extinguem-se nos primeiros metros da coluna de água

A maior profundidade os organismos fotossintéticos apenas recebem apenas luz de comprimentos de onda mais baixos (mais energéticos).



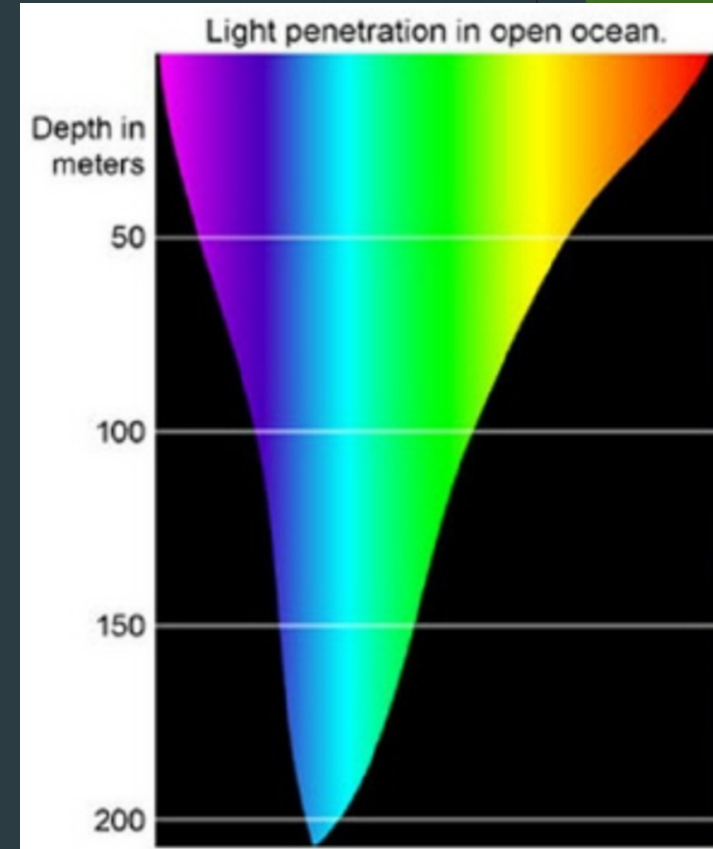
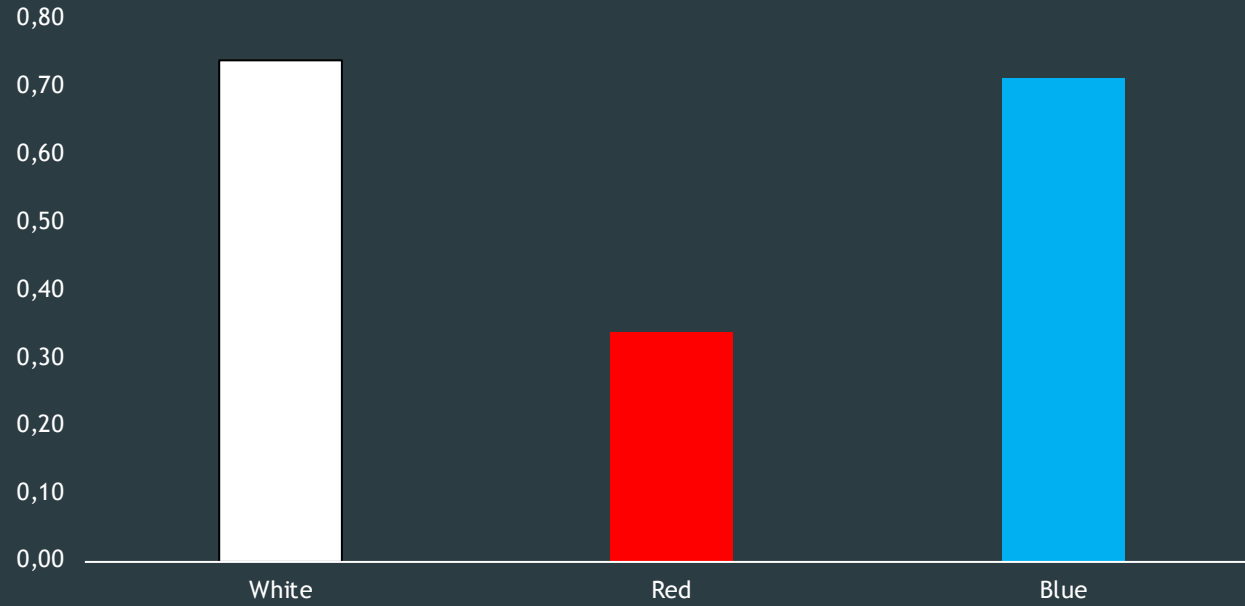
# No Oceano...

Taxa de crescimento (células mL<sup>-1</sup> dia<sup>-1</sup>)

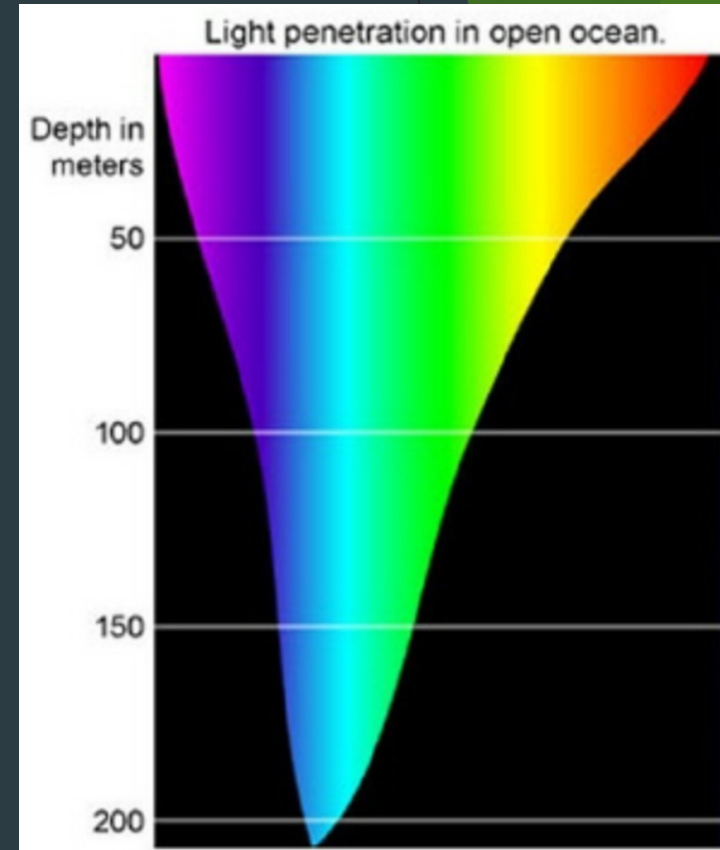
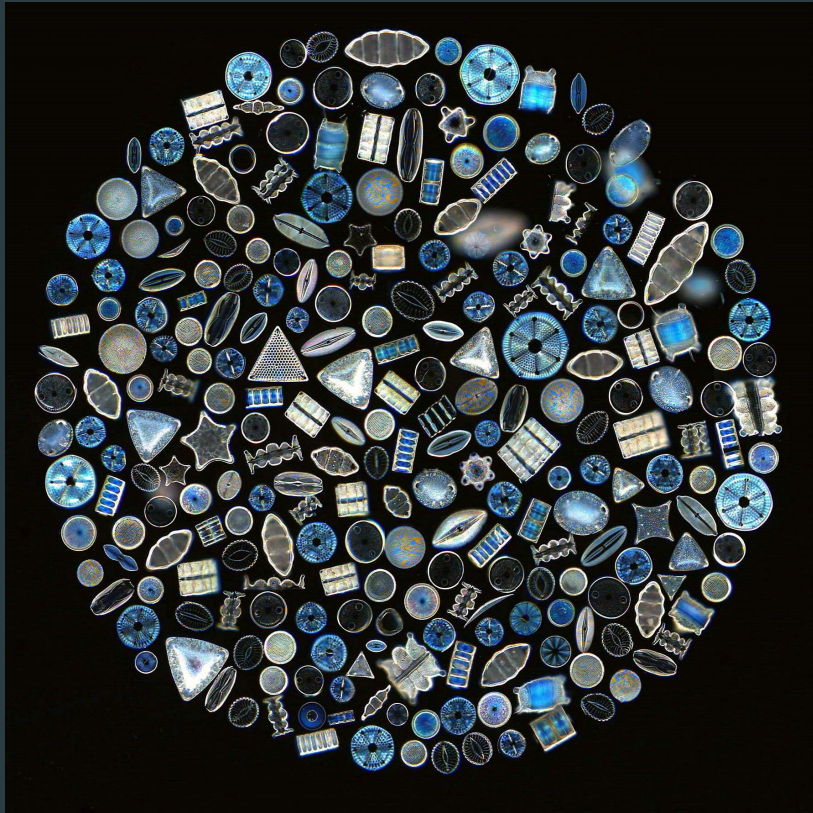


# No Oceano...

Taxa de crescimento (células mL<sup>-1</sup> dia<sup>-1</sup>)

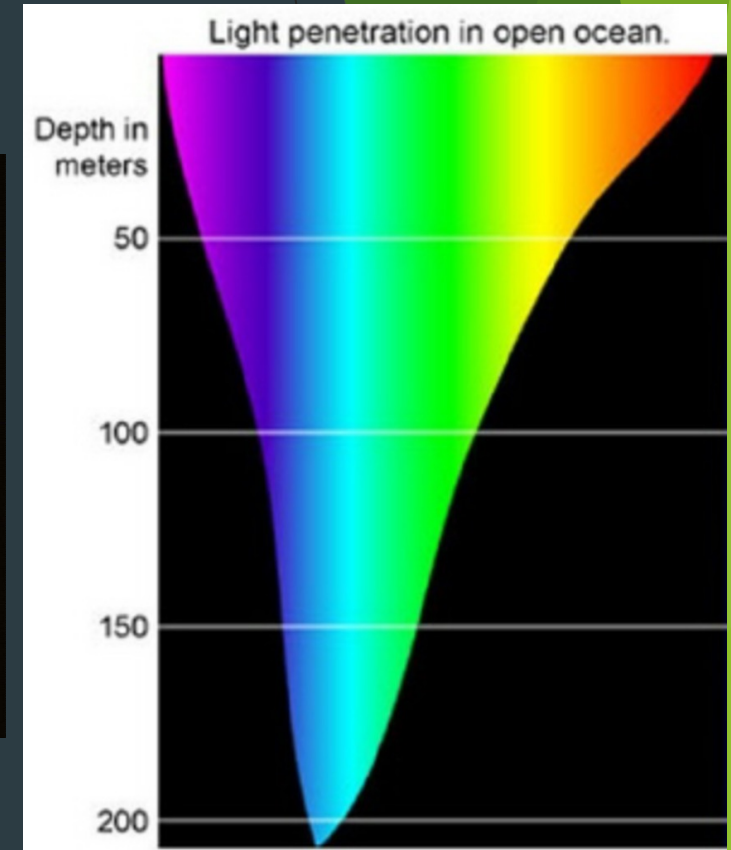
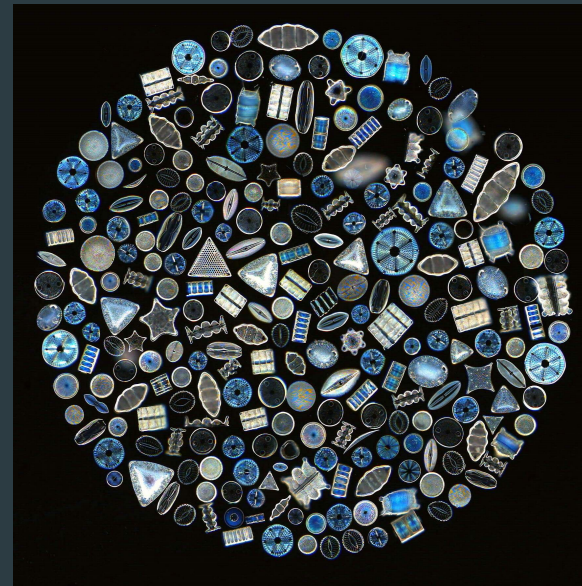
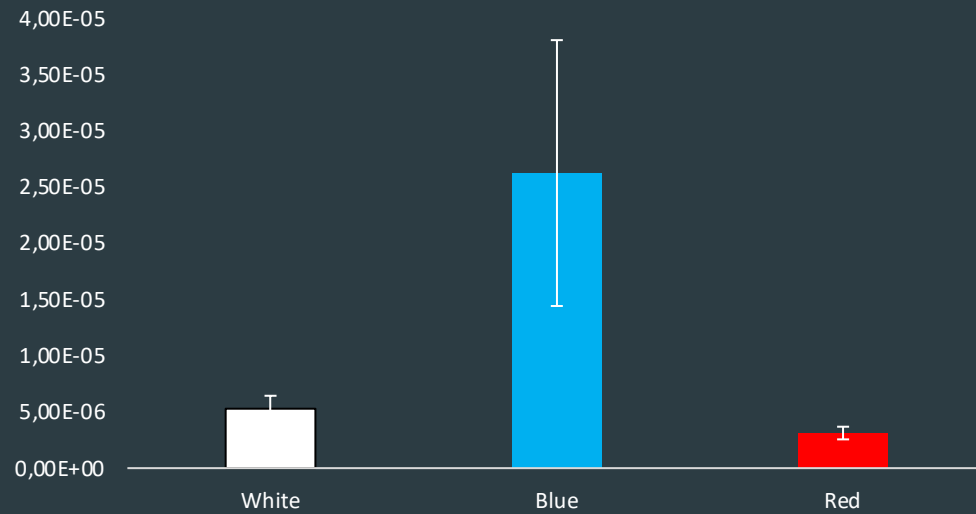


# No Oceano...

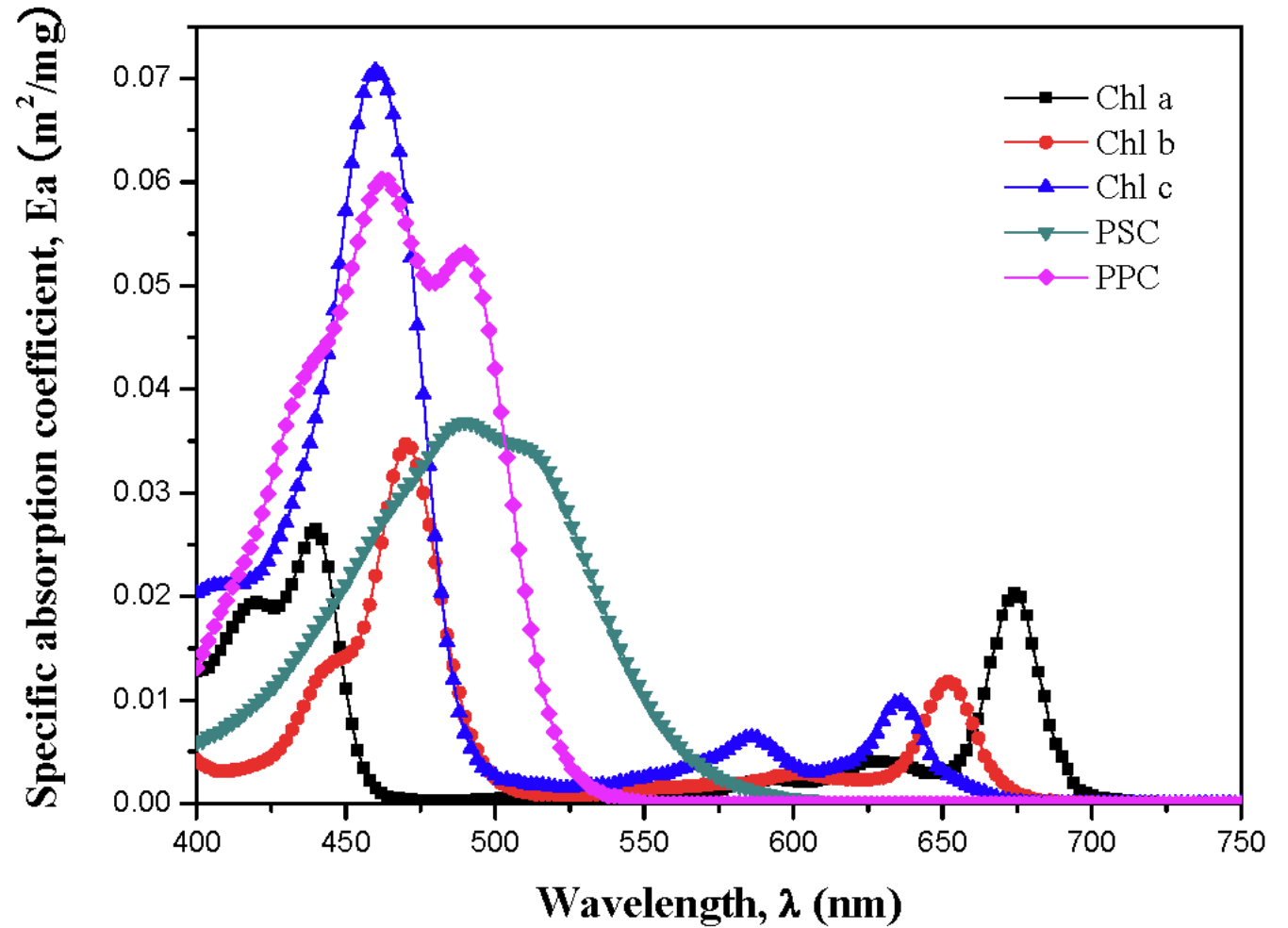
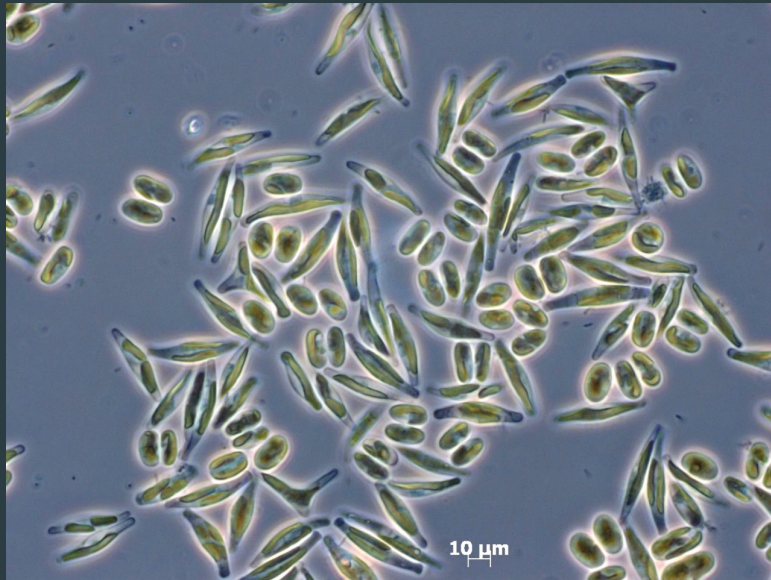


# No Oceano...

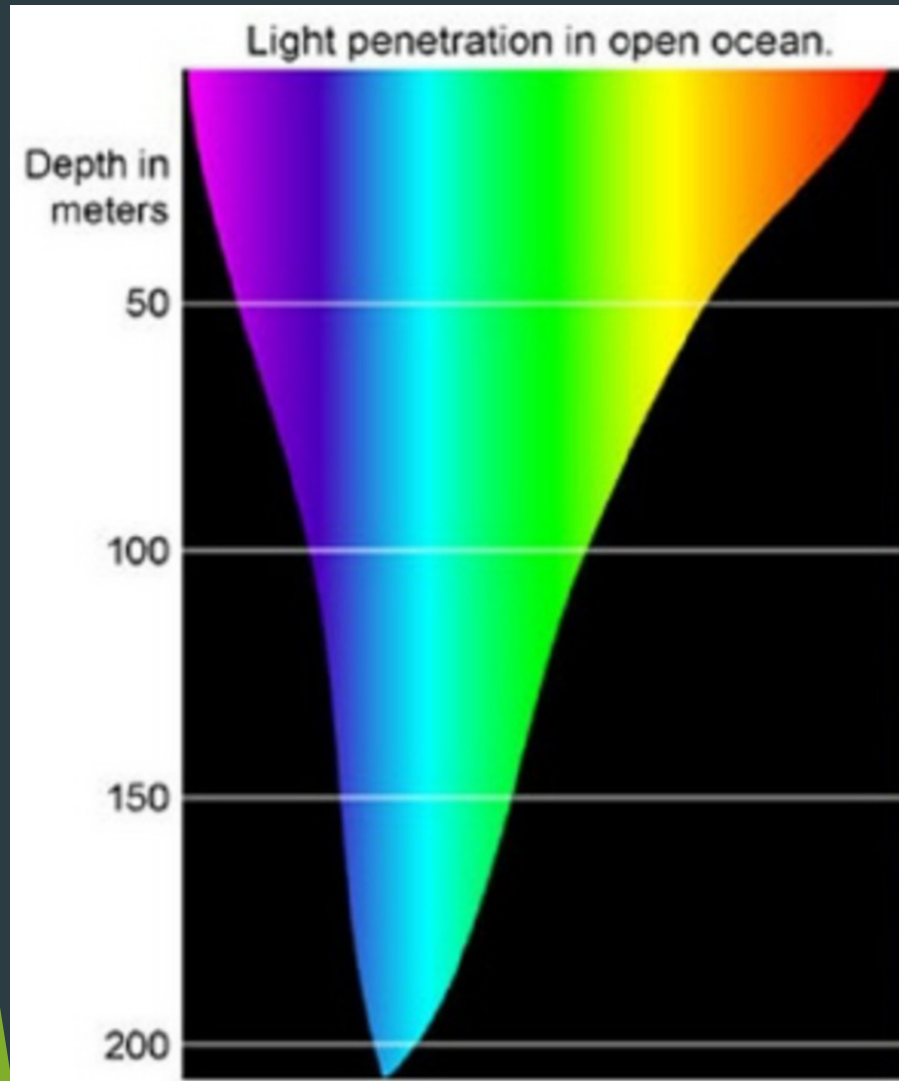
## Ácidos gordos totais ( $\mu\text{g cell}^{-1}$ )



# Pigmentos fotorreceptores em diatomáceas

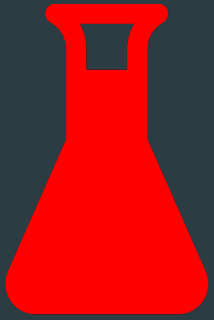


# Aula Prática



Culturas de diatomáceas marinhas

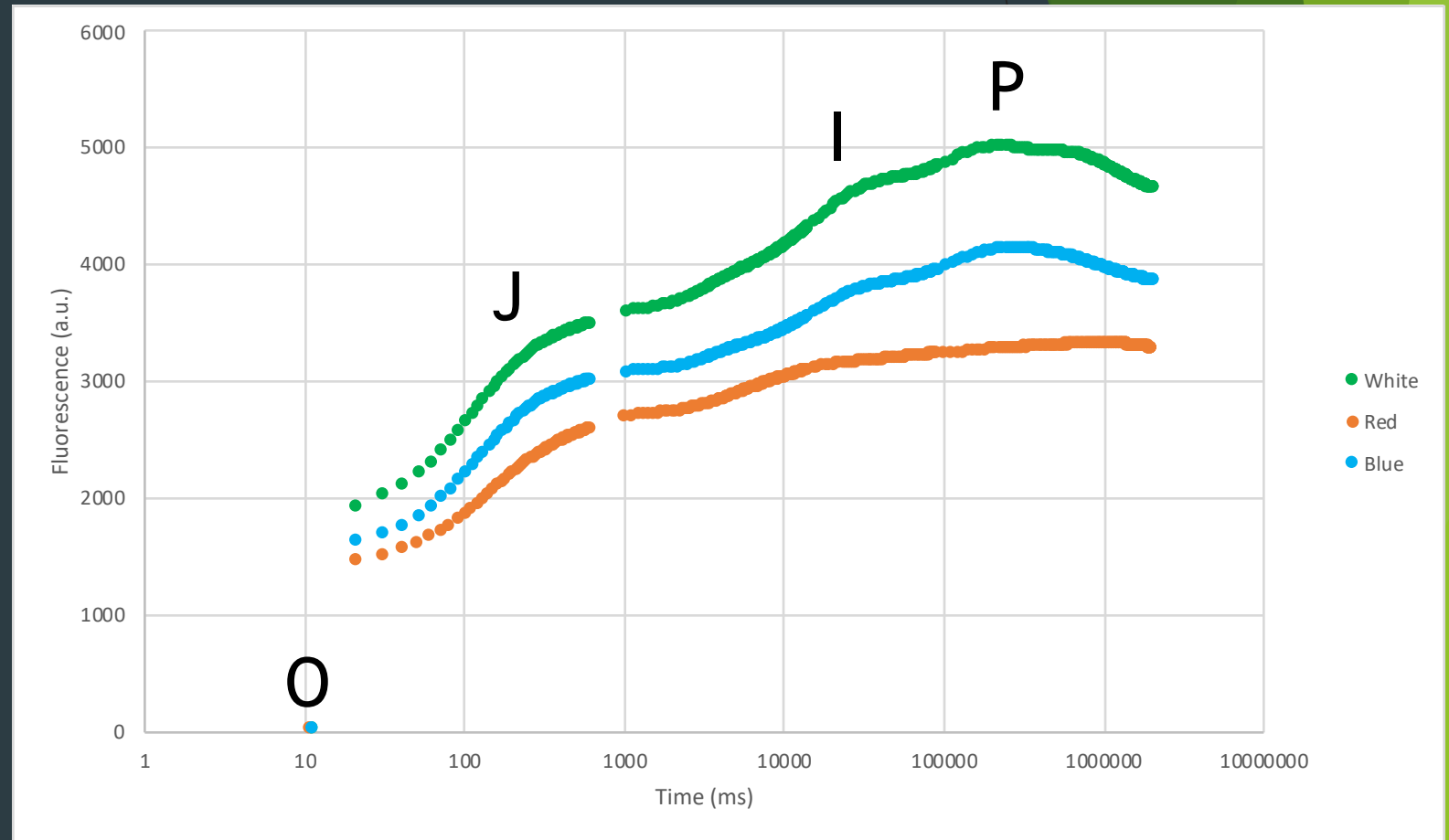
- Luz total
- Apenas luz vermelha
- Apenas luz azul



Rendimento Quântico do PS II ( $F_v/F_m$ )

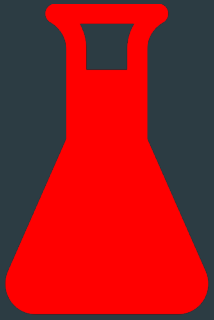
Fluxos Energéticos

# Aula Prática





# Aula Prática



## Fluxos Energéticos

ABS/RC - Fluxo de energia absorvido

TR/RC - Fluxo de energia aprisionado

ET/RC - Fluxo de energia transportado

DI/RC - Fluxo de energia dissipado

$$ABS/RC = TR/RC + DI/RC$$

$$\%TR = \frac{TR/RC}{ABS/RC} \times 100$$

$$\%DI = \frac{DI/RC}{ABS/RC} \times 100$$

$$\%ET = \frac{ET/RC}{TR/RC} \times 100$$