

# THROWBACK THURSDAY!



Science related  
**Questions?**



# Test-

- » Three parts:
- » 1. MCQ on an scantron (26)
- » 2. Images write on the sheet (14)
- » 3. Short answer. Write on the Page (24)
- » Time 75 minutes.

# Break Time

BREAK TIME!



MAD  
madmagazine.com

# Proposal



**PROPOSAL**  
PROJECT SUCCESS  
SUSTAINABILITY  **EVALUATION**  
ANALYSIS   
**RESEARCH OBJECTIVE**  
**GRANT CYCLE MILESTONES**  
**TIMELINE IMPACT** humanism **LOGFRAME**  
**REPORT** **NON PROFIT**  
*scientific* **EVIDENCE**  
Commitment *Development* Letter of Inquiry  
 **BUDGET** **rationale** **BASELINE STUDY**  
INVESTMENT **PROGRAM** *THANK YOU* **STORIES**   
foundation *content* **award** **CONTENT**  
*OPERATION*  
**CASE STUDY** **PROJECT TITLE**  
**OUTPUT** JUSTIFICATION EXECUTIVE SUMMARY  
**MARKETING** *myths* **beneficiaries** **PRACTICE** *Support*  
**LETTER FUND** *logic* **Agreement** **Timeline** **RESOURCES**  
**partnership**   
**OUTCOME** *MISSION* **CROSS-CUTTING THEMES** *social* **TEAM**  
*VISION* *solutions*  
**CONCEPT NOTE** **WORK PLAN** **BETTER** **ACTIVITIES** **COVER PAGE** **PROFILE** **FUNDRAISING** Voluntary **NETWORK**

# Visualize your Ideals in an Annotated diagram



- 5 Beaker filled with 300 ml tap water
- 5 duck weed single leaf plants
- placed under sunlight for 10 days
- took the dry weight of final duck weed after 10 days



- 5 Beaker filled with 300 ml tap water
- 5 duck weed single leaf plants
- 2 g of maple leaf material added
- placed under sunlight for 10 days
- took the dry weight of final duck weed after 10 days



- 5 Beaker filled with 300 ml tap water
- 5 duck weed single leaf plants
- 2 g of pine needle material added
- placed under sunlight for 10 days
- took the dry weight of final duck weed after 10 days



- 5 Beaker filled with 300 ml tap water
- 5 duck weed single leaf plants
- 1 g of pine needle material added
- 1 g of maple leaf material added
- placed under sunlight for 10 days
- took the dry weight of final duck weed after 10 days

INCLUDE POSITIVE,  
Negative,  
Confounding variables

**\*Water loss was topped up each day**

**\*Day photos and temperatures are be taken**

# How hard was that ?

- » Break off in pairs (social distance)
- » Explain your experiment to your partner
- » Partner listens and then pokes holes in the experiment. i.e. Try to make them cry
- » Make changes to your proposal
- » Switch roles

# BIOLOGY IA

## 2020-2021

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**Biology IA Checklist**





# WHAT IS A BIOLOGY IA?

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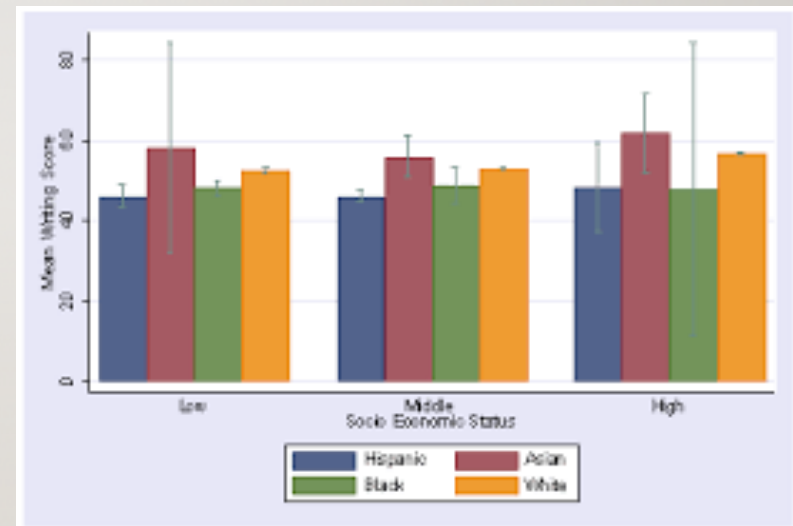
- IA = Internal Assessment
  - Some is completed in class, marked by your teachers, marks sent to IB, random sample sent to IB to check accuracy of marking
  - 20% of your final HL Biology mark
  - An **original/new** experiment about a **living organism** that you design and conduct yourself, record and analyze observations and report results; you could also use a database with results from another researcher and analyze them in a new way or a simulation with data collection
  - Need to examine the effects of an independent variable on a measurable, quantifiable dependent variable
  - Like a mini-Biology EE



# COMPONENTS OF IA WRITE-UP: ANALYSIS

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- Data in tables, including consideration of uncertainties
- Graphs
- Statistical Analysis



# COMPONENTS OF IA WRITE-UP: EVALUATION

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- Conclusion – justified by data, with reference to scientific concepts
- Discussion of relevant limitations (What could you not control?)
- Suggestion of realistic improvements and/or possibilities for future research



## HOW DO I GET IDEAS FOR AN IA?

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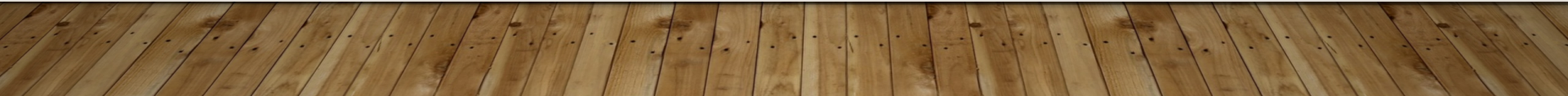


- Choose a topic that's meaningful/interesting to you (Personal Engagement is necessary)
- Science News
- Lifestyle “hacks”: cooking, gardening, health, cleaning, beauty
- YouTube

# IA INSPIRATION

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- <https://www.thinkib.net/biology/page/34574/ia-experiment-ideas-inspired-by-youtube>



# RSS EQUIPMENT AVAILABLE FOR DATA COLLECTION

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Glassware

Microscopes, slides

Bunsen burners

Hot plates

Electronic balances  
(mass)

Incubator



Vernier probes (data collection):

- Dynamometer (grip strength, pinch strength, muscle fatigue)
- Hand Grip Heart Rate monitor
- Exercise heart rate monitor
- O<sub>2</sub> gas sensor
- CO<sub>2</sub> gas sensor
- Dissolved oxygen
- Gas pressure sensor
- pH meter
- Spectrophotometer (pigmentation)
- Colorimeter
- Temperature probes
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# ITEMS YOU WILL NEED TO OBTAIN

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- Seeds (investigate germination – subject half to one condition/variable vs other half = control)
- Plants (purchase plants grown in same conditions, subject half to one variable, other half = control)
- Kitchen supplies (salt, baking soda, coffee filters)



# SIMULATION IDEAS

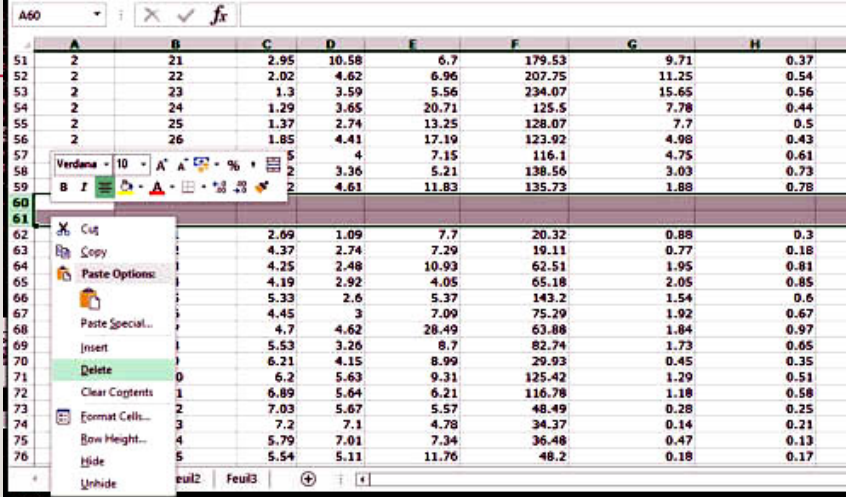
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- [Explorellearning.com](https://www.explorellearning.com) Gizmos (expires Dec 31, 2020)
- Take screenshots of results/get other subjects to take screenshots and share
  - Sight vs Sound reaction times
  - Time estimation
  - Real time histogram
  - Reverse the field
  - Hearing frequency and volume



# EXAMPLES OF DATABASES

- [Global Invasive Species Database](#)
- [CITES endangered species database](#)
- [ReefBase](#) coral reef health survey data
- [Wallace Resource Library](#)
- [USDA nutrients database](#)
- [WHO Global Health Observatory](#)
- [NOAA Climate and weather databases](#)
- [Menstrual cycle hormones database](#) (and spreadsheet)
- [Entrez gene sequence database](#) ([here's our activity](#))
- <http://datanuggets.org/resources/data/>
- <https://www.ncbi.nlm.nih.gov/gene/>



	A	B	C	D	E	F	G	H	
51	2	21	2.95	10.58	6.7	179.53	9.71	0.37	
52	2	22	2.02	4.62	6.96	207.75	11.25	0.54	
53	2	23	1.3	3.59	5.56	234.07	15.65	0.56	
54	2	24	1.29	3.65	20.71	125.5	7.78	0.44	
55	2	25	1.37	2.74	13.25	128.07	7.7	0.5	
56	2	26	1.85	4.41	17.19	123.92	4.98	0.43	
57				4	7.15	116.1	4.75	0.61	
58				2	3.36	5.21	138.56	3.03	0.73
59				2	4.61	11.83	135.73	1.88	0.78
60									
61									
62			2.69	1.09	7.7	20.32	0.88	0.3	
63			4.37	2.74	7.29	19.11	0.77	0.18	
64			4.25	2.48	10.93	62.51	1.95	0.81	
65			4.19	2.92	4.05	65.18	2.05	0.85	
66			5.33	2.6	5.37	143.2	1.54	0.6	
67			4.45	3	7.09	75.29	1.92	0.67	
68			4.7	4.62	28.49	63.88	1.84	0.97	
69			5.53	3.26	8.7	82.74	1.73	0.65	
70			6.21	4.15	8.99	29.93	0.45	0.35	
71			6.2	5.63	9.31	125.42	1.29	0.51	
72			6.89	5.64	6.21	116.78	1.18	0.58	
73			7.03	5.67	5.57	48.49	0.28	0.25	
74			7.2	7.1	4.78	34.37	0.14	0.21	
75			5.79	7.01	7.34	36.48	0.47	0.13	
76			5.54	5.11	11.76	48.2	0.18	0.17	

# HOW TO COVID-PROOF YOUR IA:



- Design an experiment that:
  - Does not require much time or equipment
  - Could be conducted in the Biology lab early in Quad 2
  - Could be conducted at home
  - Makes use of computer simulations (Gizmos)
  - Uses an existing database that you analyze in a new way

# WHAT NOT TO DO

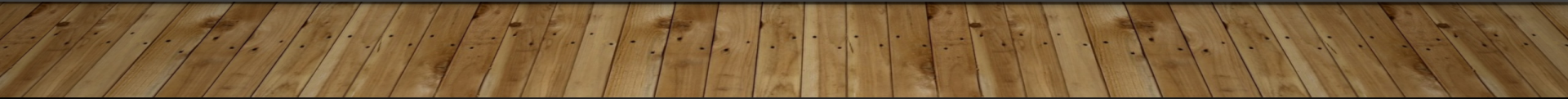
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- Do not research something that has already been investigated (do background research)
- No animal subjects, observation studies in natural settings OK.
- No physical stress on human subjects
- No growing bacteria or molds
- Anything unsafe or unethical
- No prescribed labs (doing these in class)



# EXPERIMENTS TO AVOID

- Microscope-cell structure
- Estimation of osmolarity in tissues
- Investigating factor affecting enzyme activity that we've done.
- Sealed Mesocosm
- Monitoring ventilation in humans at rest and after exercise
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# DUE DATES

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- Final INVESTIGATION PROPOSAL – due Friday October 30<sup>th</sup> – proposal outline (form you have)– to be attached to an Edsby message
- EXPLORATION – due Monday November 23<sup>rd</sup>
  - Research question, background, safety, ethical & environmental issues,
  - experimental design, procedure
- DATA COLLECTION & ANALYSIS – due Friday December 11<sup>th</sup>

Feedback to you over the christmas holiday.

- FIRST DRAFT – due Monday January 11<sup>th</sup> – formal feedback to you by Friday January 15<sup>th</sup>
- FINAL IA – due Friday February 12<sup>th</sup>



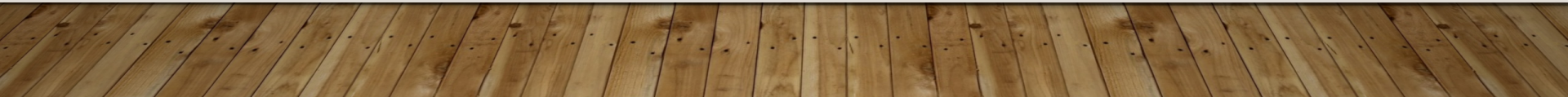


- Take photos of the stages of your experiment
- **Do your very best** – if any IB exam components are cancelled (last year French exam cancelled), then IA is weighted heavily
- Pay attention to marking scheme
- Check out “How to write a Biology IA videos on YouTube
- Read sample Biology IAs that received high scores + feedback

# EXAMPLES OF IAs

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- **GOOD examples —>See the IA duo tang I gave you. Ideas about marking is there.**
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# HELPFUL RESOURCES

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[Your textbook: Oxford Biology textbook p. 708-712](#)

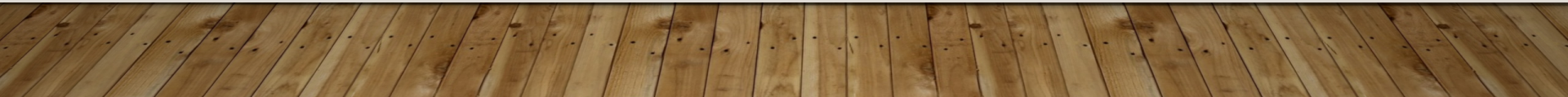
[Original research papers: https://datasetsearch.research.google.com/](https://datasetsearch.research.google.com/)

[How to write a Biology IA that gets top marks:](#)

<https://www.youtube.com/watch?v=YrokMNND6Co>

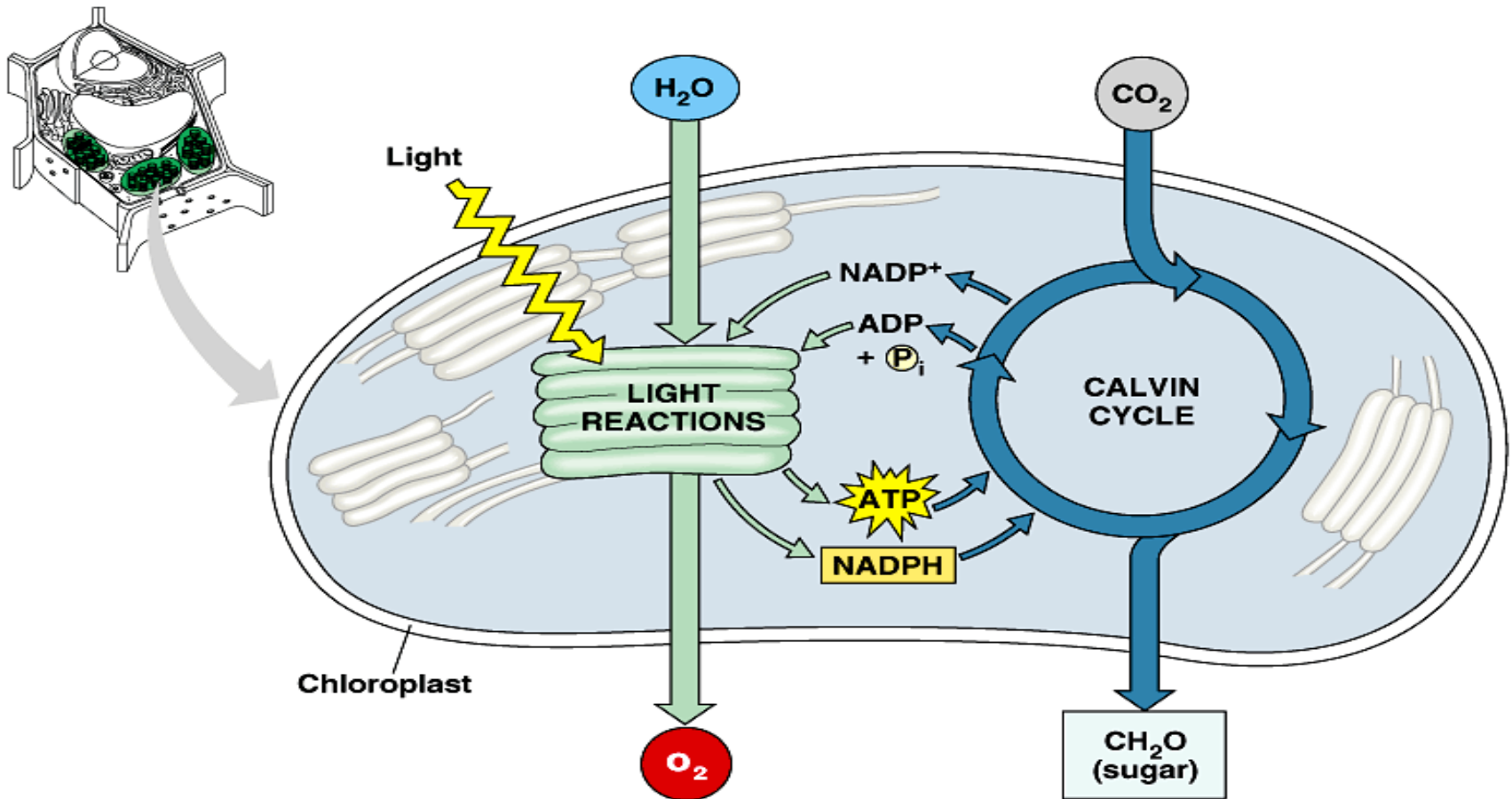
[Excellent IB Biology websites by experienced IB teachers:](#)

- <https://www.mrgscience.com/ibdp-biology.html>
- <https://ib.bioninja.com.au/>
- <https://www.thinkib.net/biology/page/17622/the-investigation>





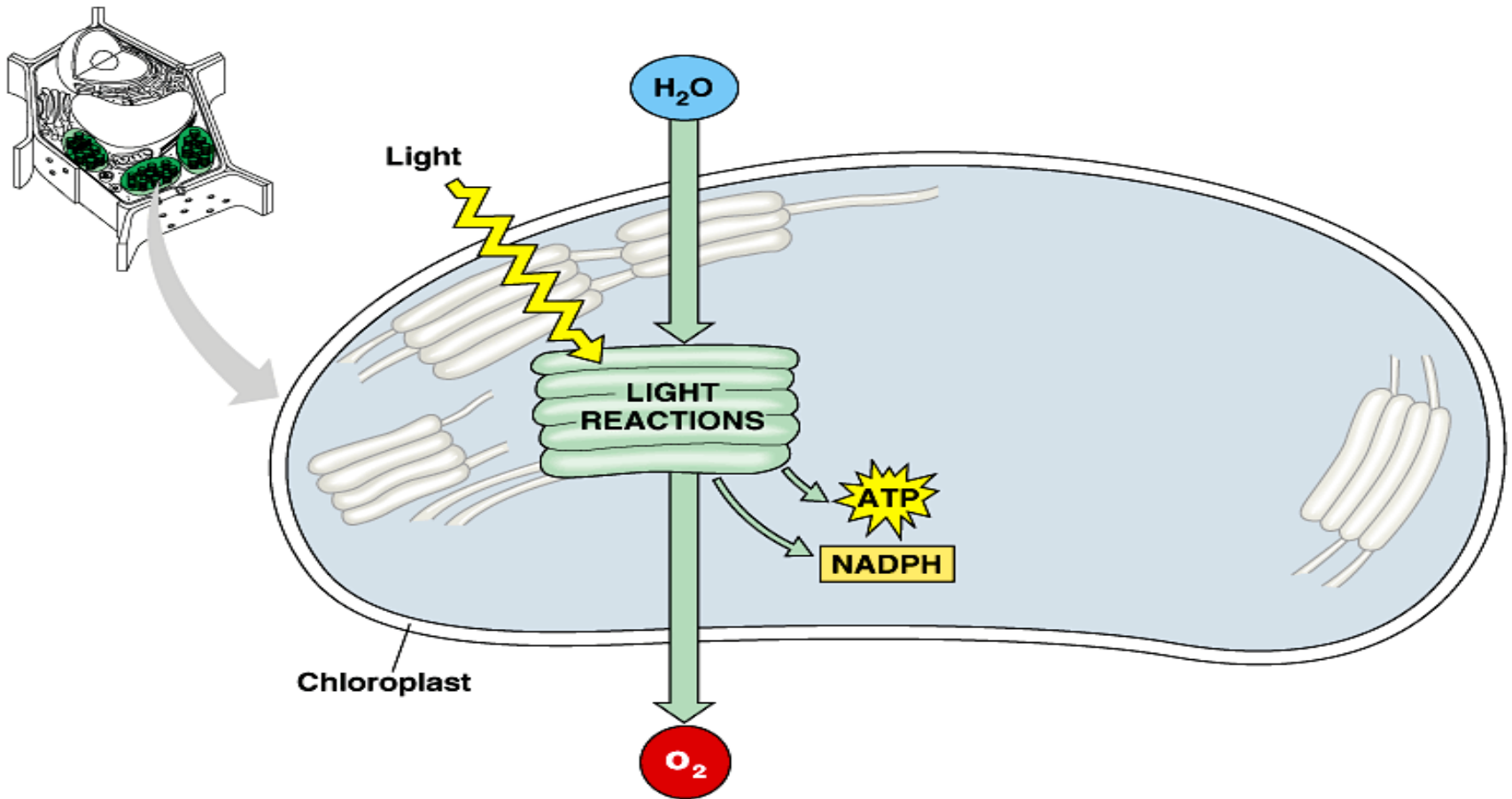
# Photosynthesis Overview



# 2 Stages of Photosynthesis

- **light-dependent reactions** (Covered here)
  - light energy is captured and used to synthesize ATP and NADPH
- **light-independent reactions (Calvin cycle)**
  - energy in ATP and NADPH is used to “fix” CO<sub>2</sub> into simple carbohydrate molecules

# Light-Dependent Reactions



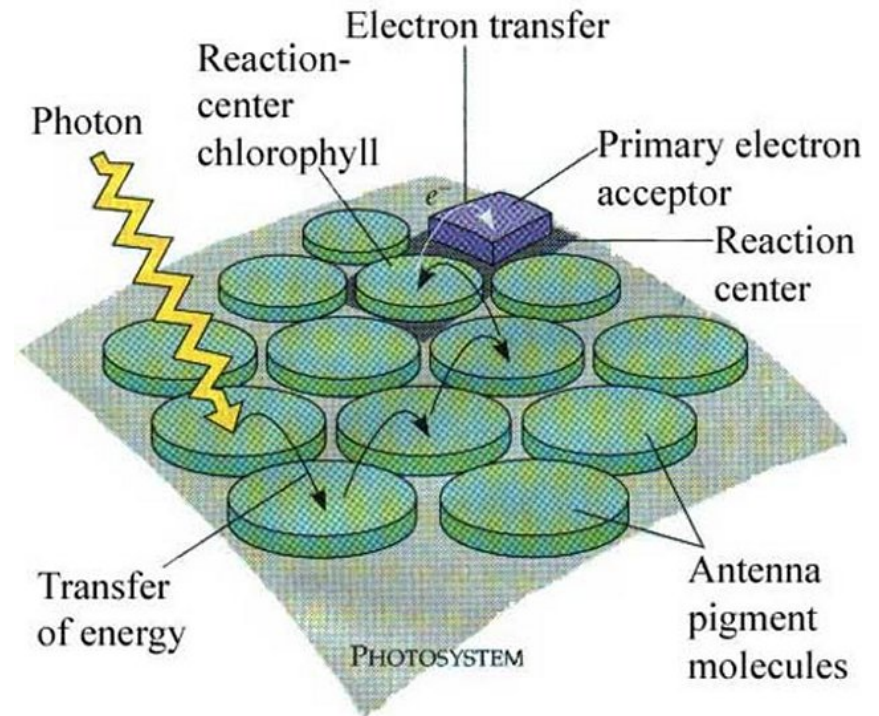
# Light-Dependent Reactions

- absorption of a photon of light excites electrons in chlorophyll
- in thylakoid membranes, the excited electrons are transferred to primary electron acceptors .  
**AKA Photoactivation**
- occurs in **photosystems I (P700) and Photosystem II (P680)**
- electrons are regained back by **photolysis** (splitting water which releases O<sub>2</sub>)



# Photosystems

- antenna pigments  
chlorophyll molecules  
& accessory pigments  
in a protein matrix
- reaction centre  
chlorophyll *a* &  
primary electron  
acceptor



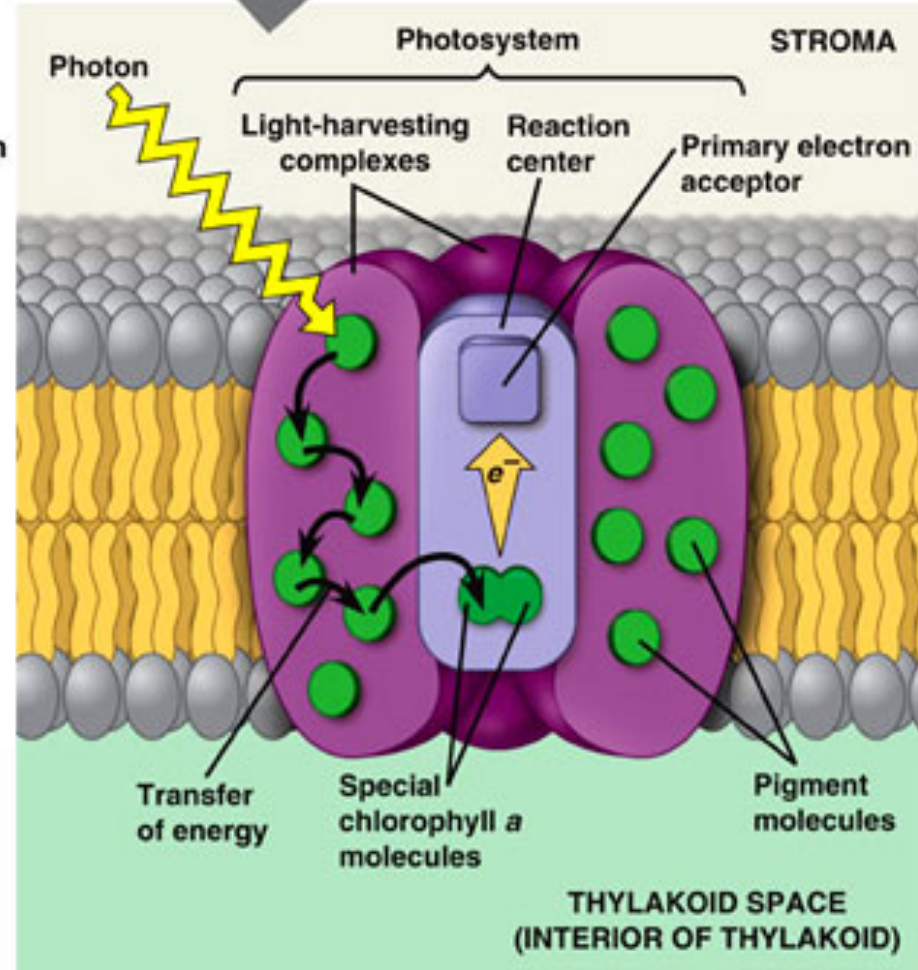
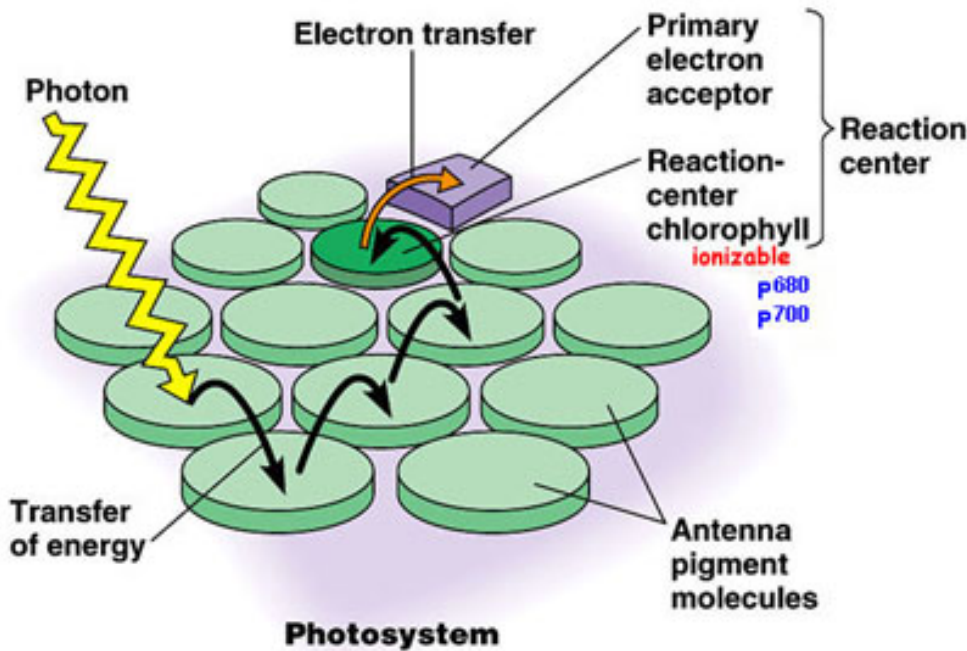


# Visit the Khan Academy...

Great summary explanation (10 minutes long)

[https://www.youtube.com/watch?v=vEsAtC9d\\_MQ](https://www.youtube.com/watch?v=vEsAtC9d_MQ)

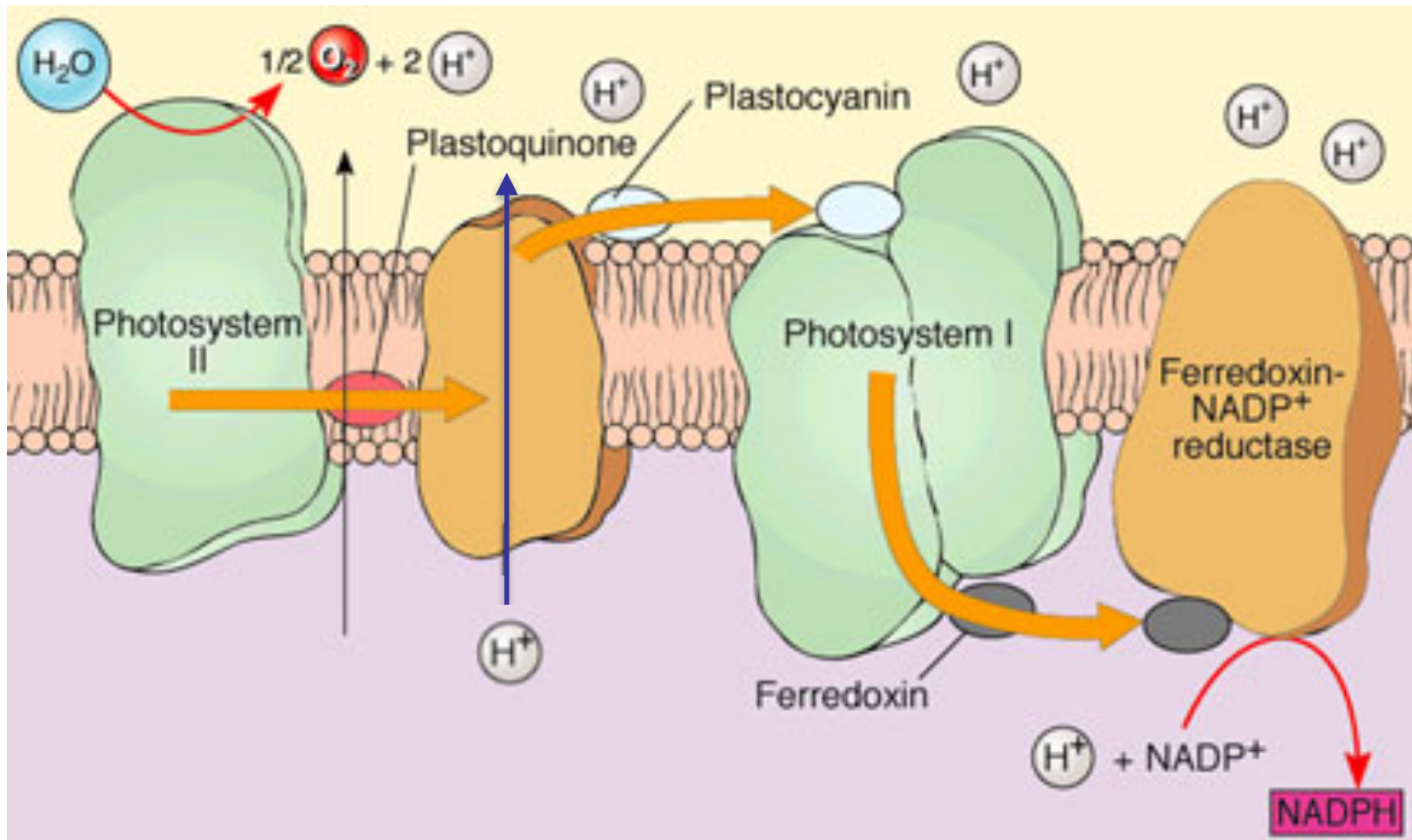
# Photosystems



# Light-Dependent Reactions

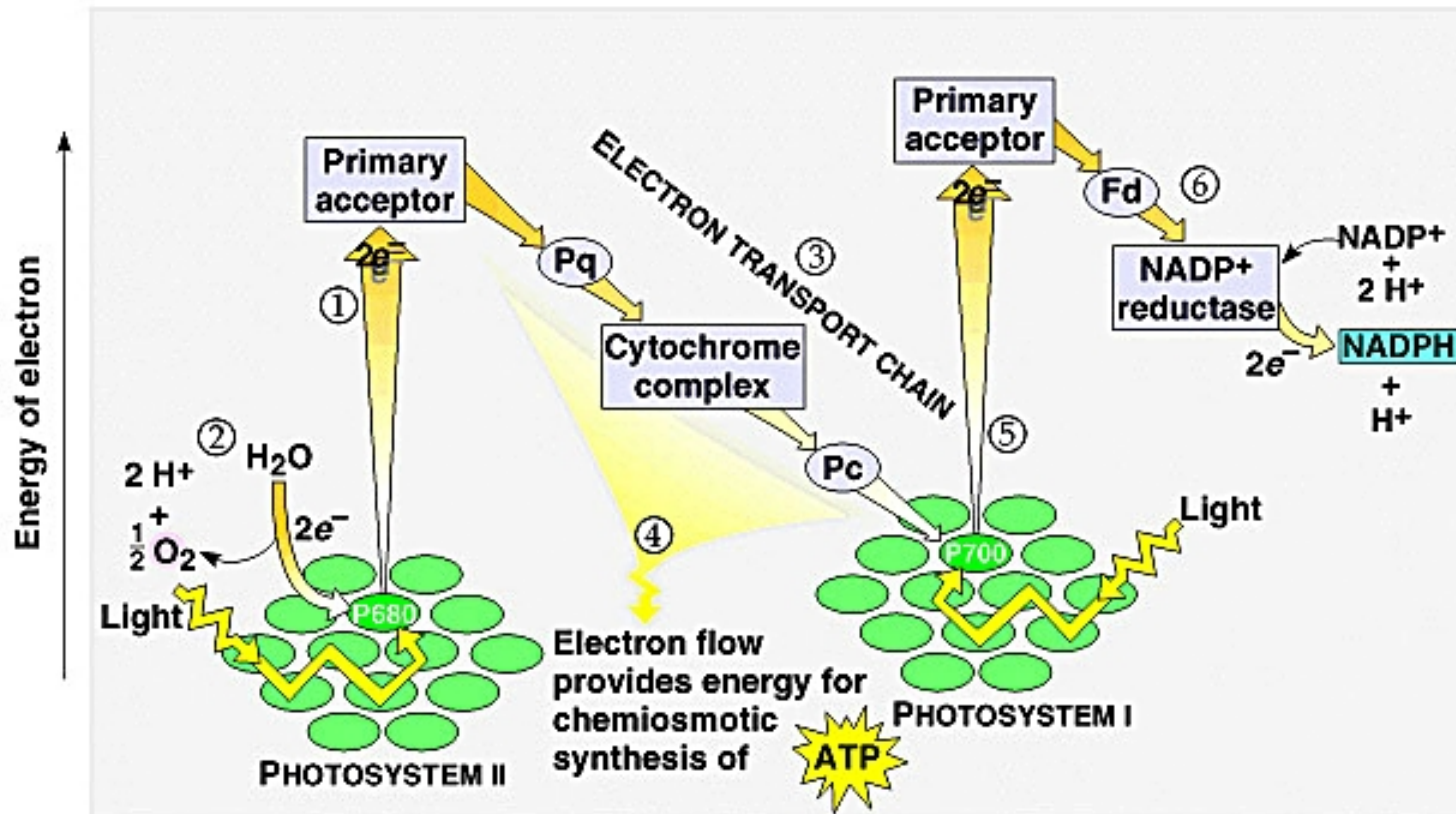
- Located in the thylakoid membrane ( Grana for many thylakoid)
- excitation of electron in Photosystems, results is transferred to a primary electron acceptor
- **linear electron flow**- electrons lost by chlorophyll a, move to a primary electron acceptor which is then is transferred along until is reaches the electron carrier NADP<sup>+</sup> to form NADPH
- The electrons that are lost by chlorophyll a are replaced by the splitting of water and producing O<sub>2</sub>
- A gradient (like cellular respiration) is formed to generate ATP from ATP synthase.

# Electron Transport



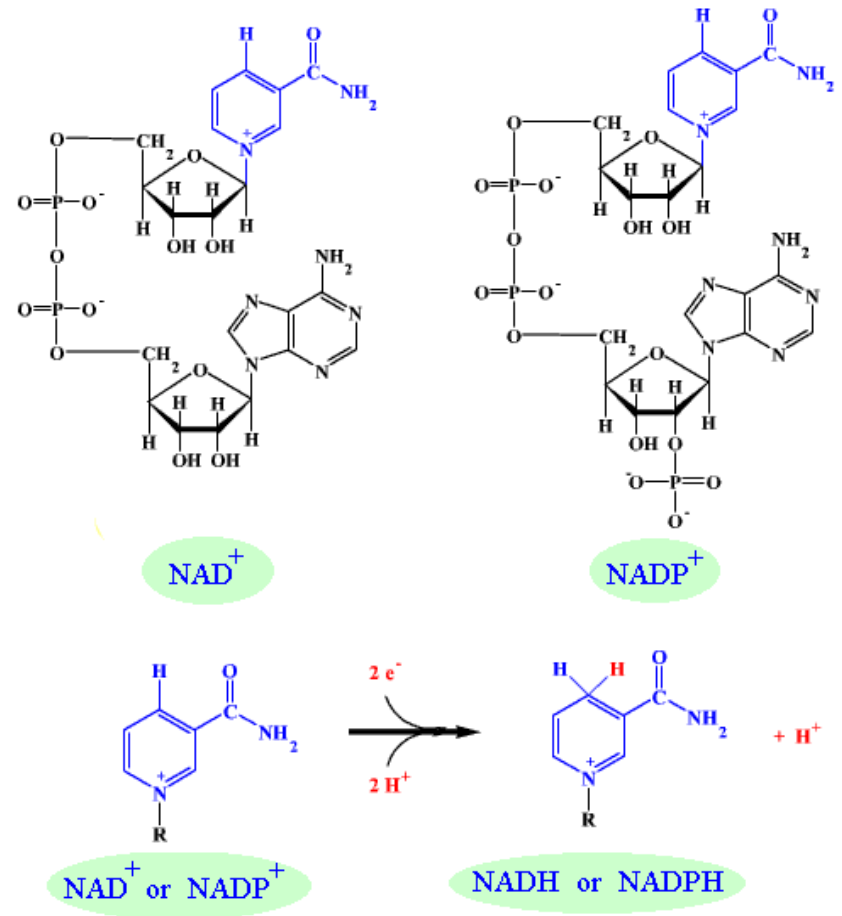
# Non-cyclic Electron Flow

Figure 10.11 Noncyclic electron flow during the light reactions generates ATP

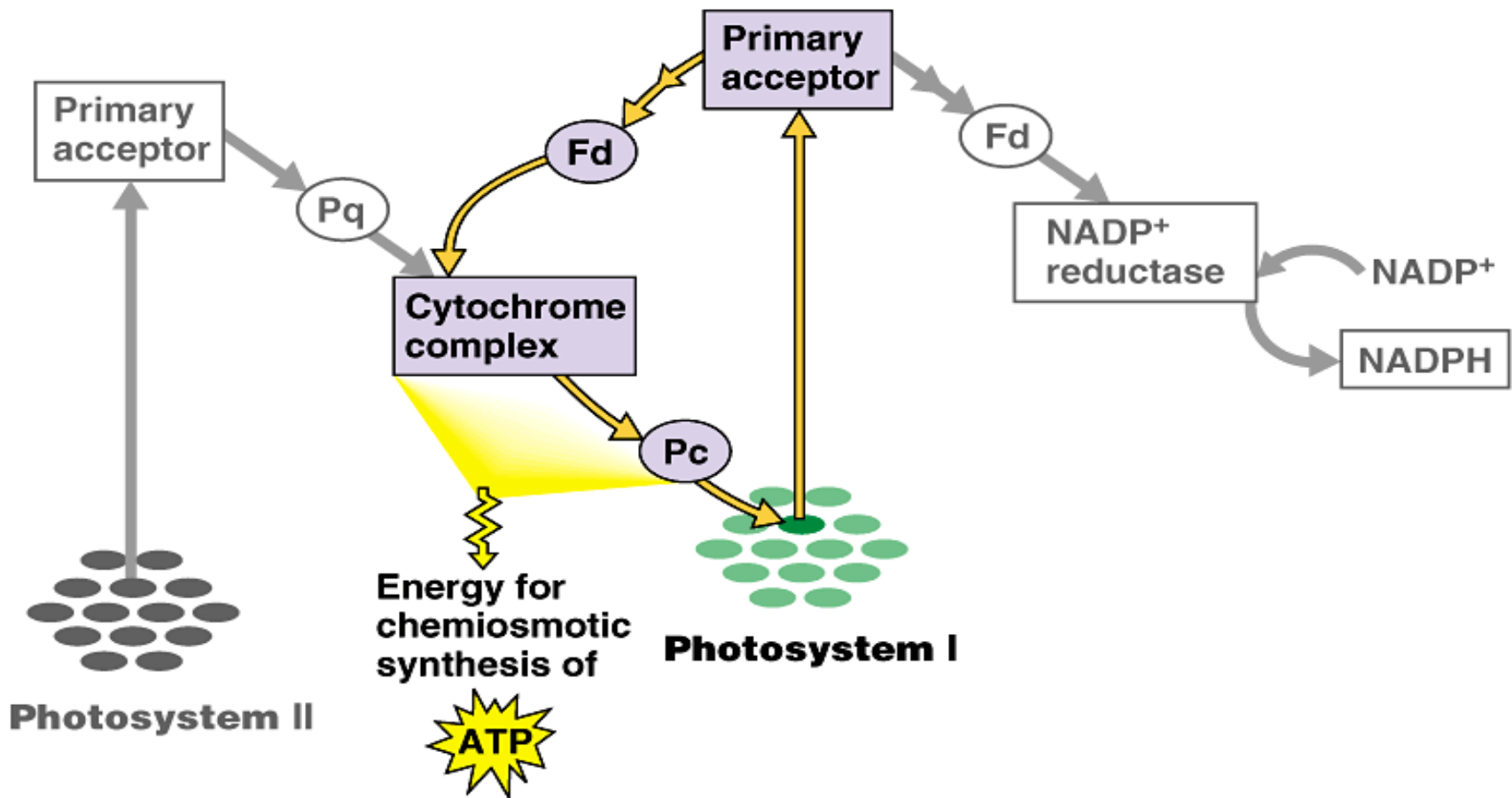


# NAD<sup>+</sup> & NADP<sup>+</sup>

- nicotinamide adenine dinucleotide phosphate
- coenzyme used in anabolic reactions such as photosynthesis



# Cyclic Electron Flow



# Other Resource

