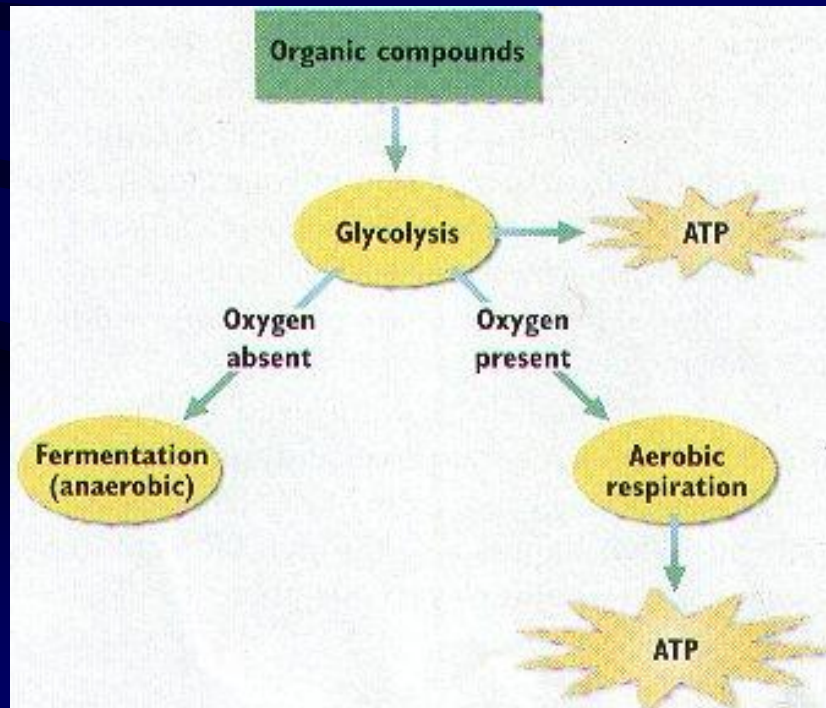


# Glycolysis and Cellular Respiration

Harvesting Energy

# Cellular Respiration

- Harvesting of energy (in the form of ATP) from food molecules by cells.



# Let's Focus on Glucose!!!

## Aerobic Cellular Respiration



# Stages of Cellular Respiration

Glycolysis

---

Transition Reaction

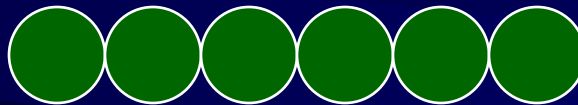
Krebs Cycle

Electron Transport Chain

Chemiosmosis

# Glycolysis

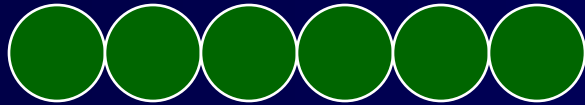
**Glucose  
molecule**



**6 carbon atoms**

# Glycolysis

“Priming the pump”



NAD<sup>+</sup>



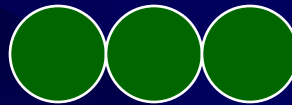
2 ATP



4 ATP



pyruvate



pyruvate

# Stages of Cellular Respiration

Glycolysis

---

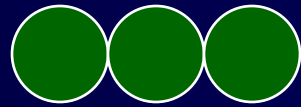
Transition Reaction

Krebs Cycle

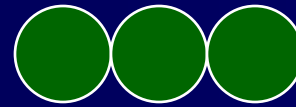
Electron Transport Chain

Chemiosmosis

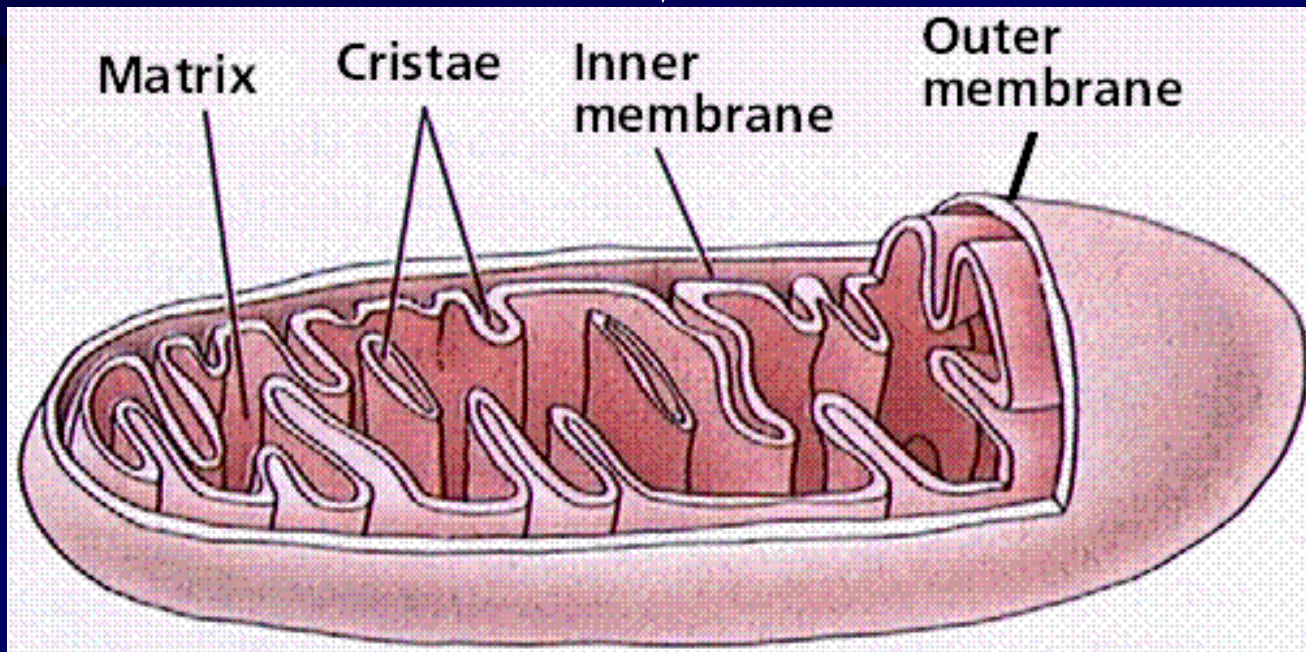
# Transition Reaction



pyruvate

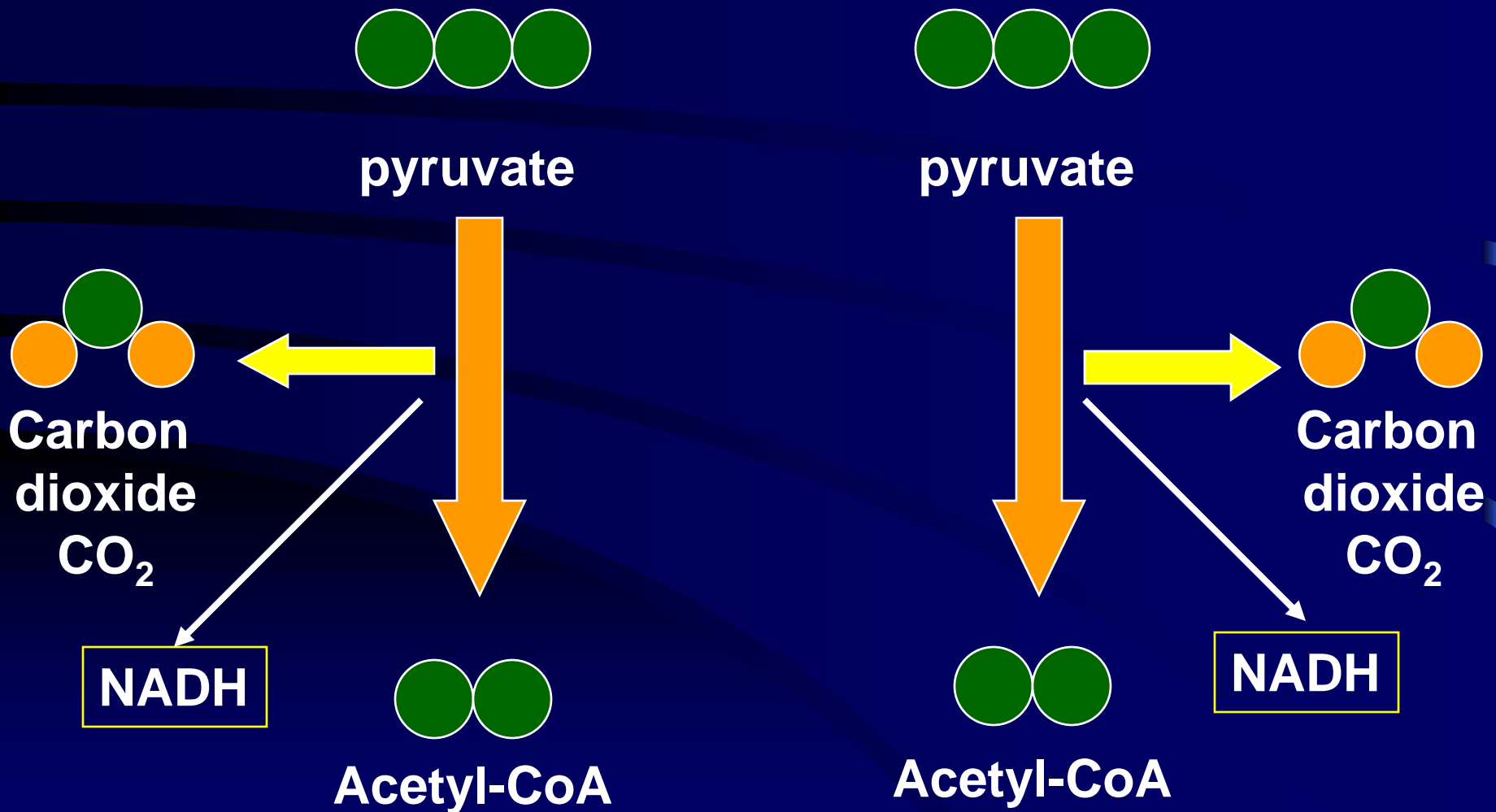


pyruvate





# Transition Reaction



# Stages of Cellular Respiration

Glycolysis

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Transition Reaction

Krebs Cycle

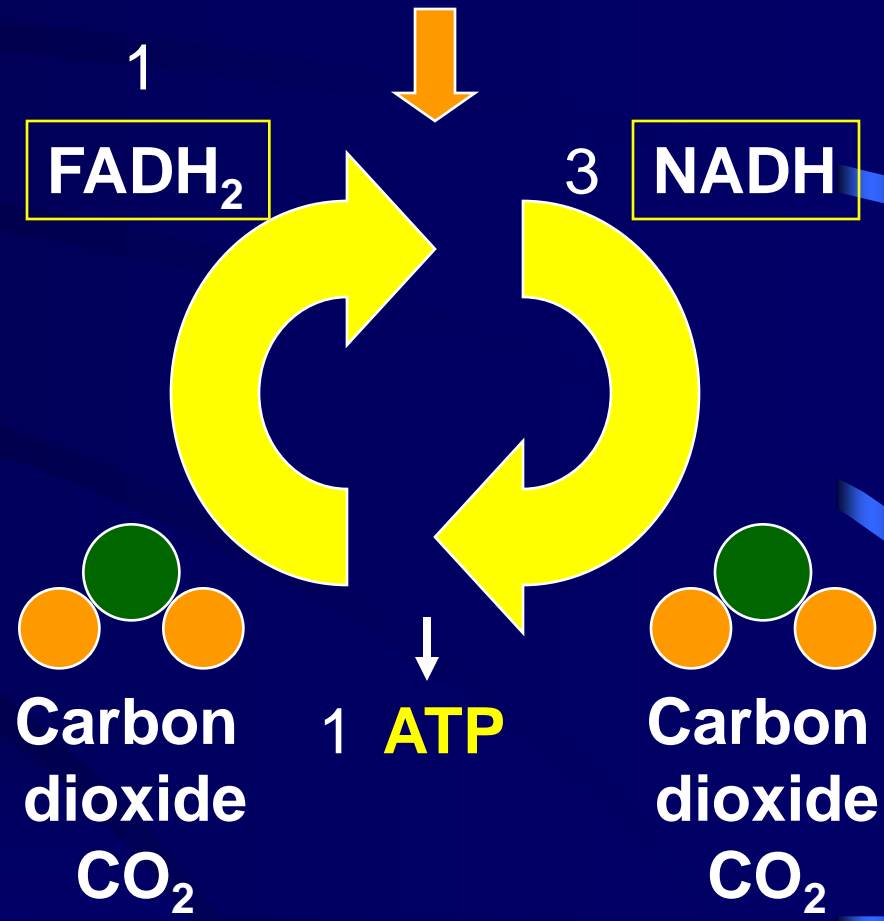
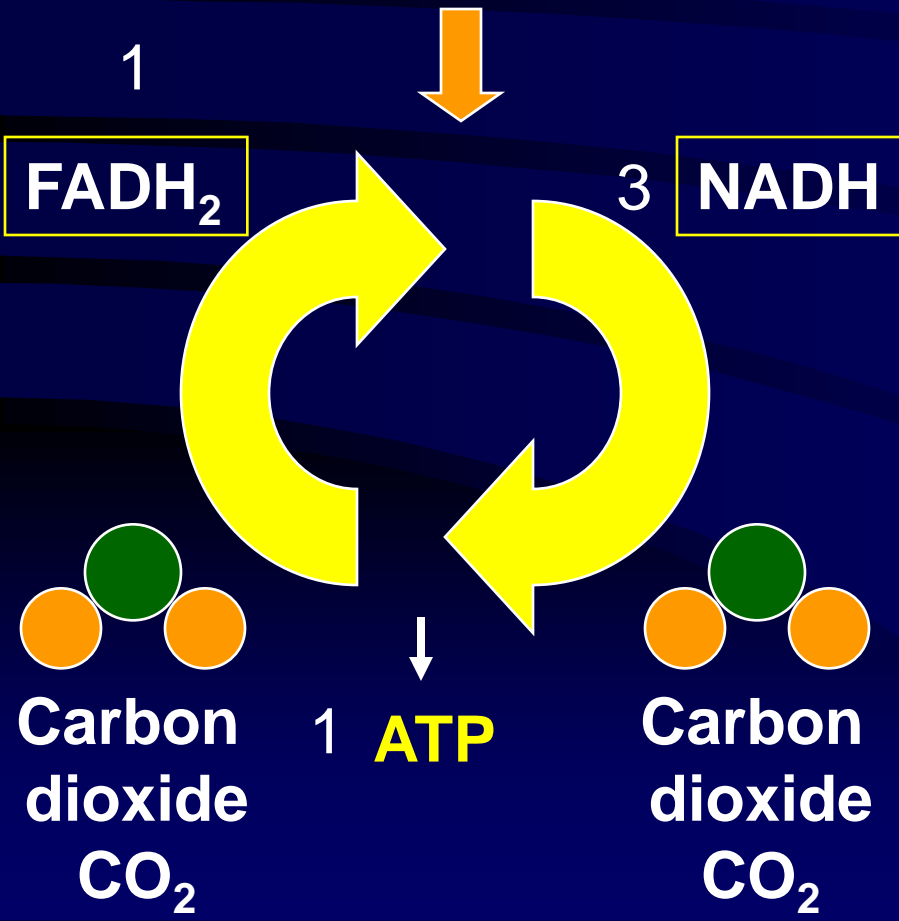
Electron Transport Chain

Chemiosmosis

# Krebs Cycle

Acetyl-CoA

Acetyl-CoA



# Stages of Cellular Respiration

Glycolysis

---

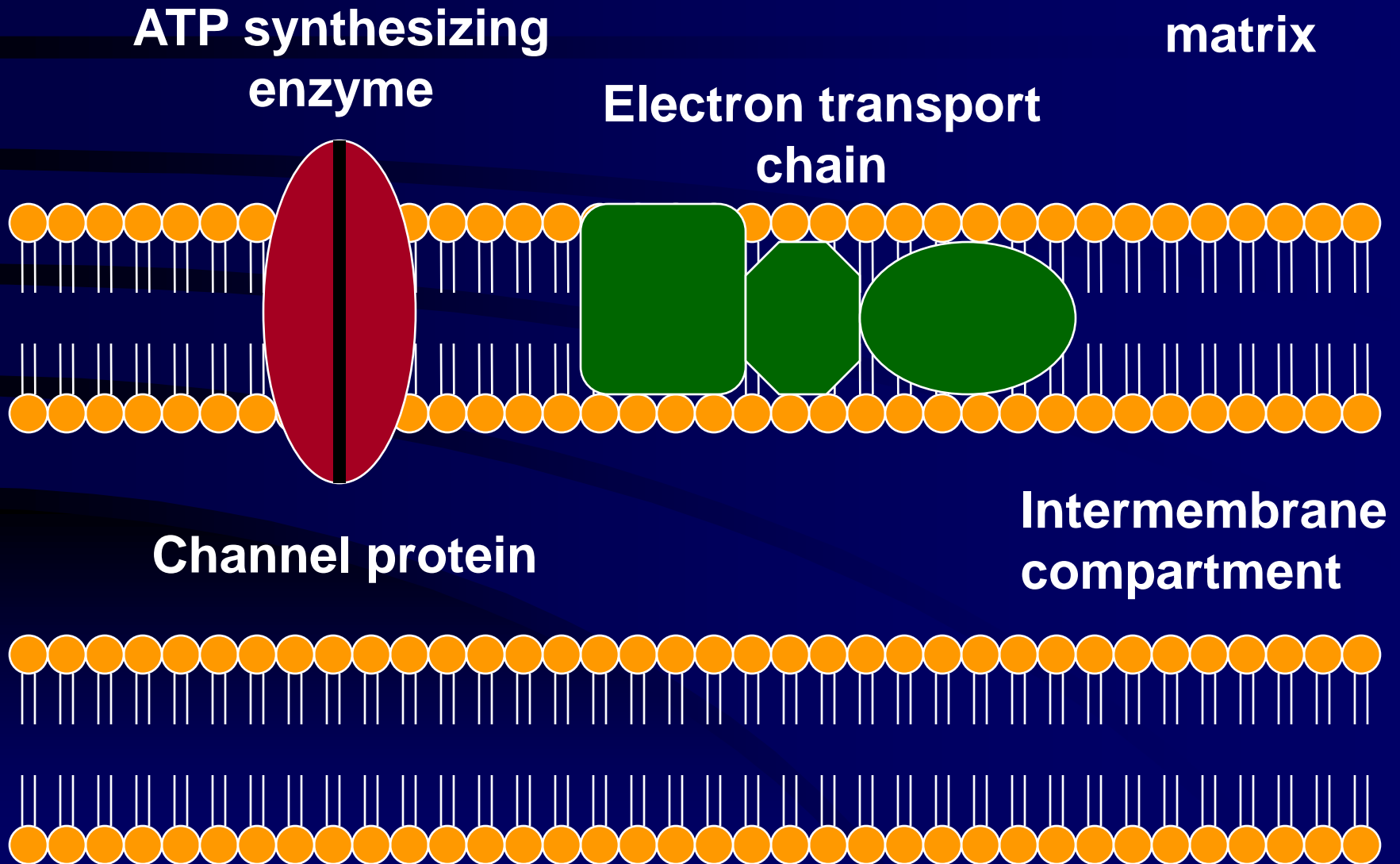
Transition Reaction

Krebs Cycle

Electron Transport Chain

Chemiosmosis

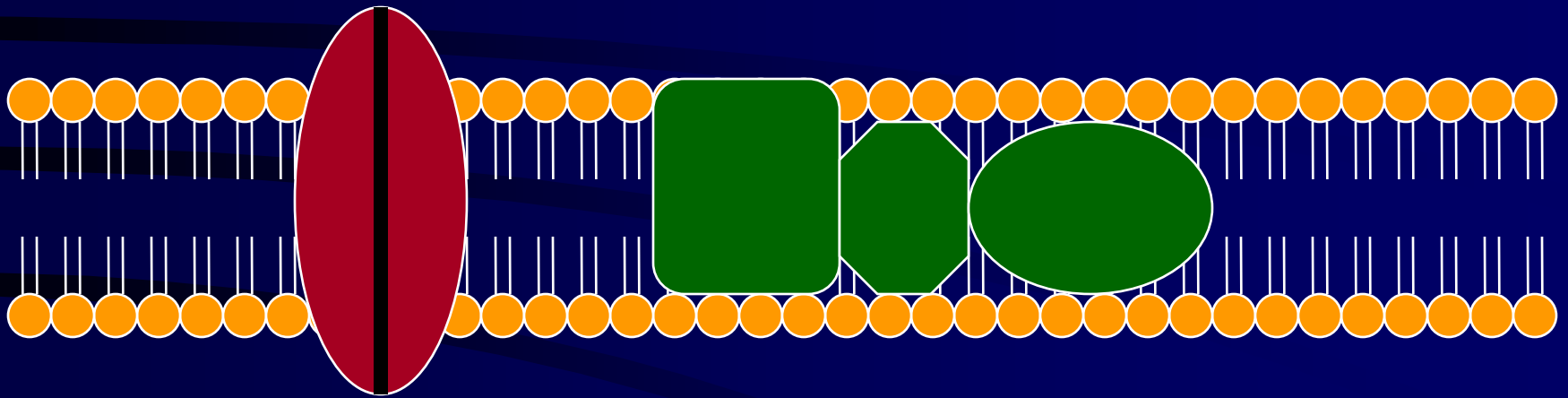
# Electron Transport Chain



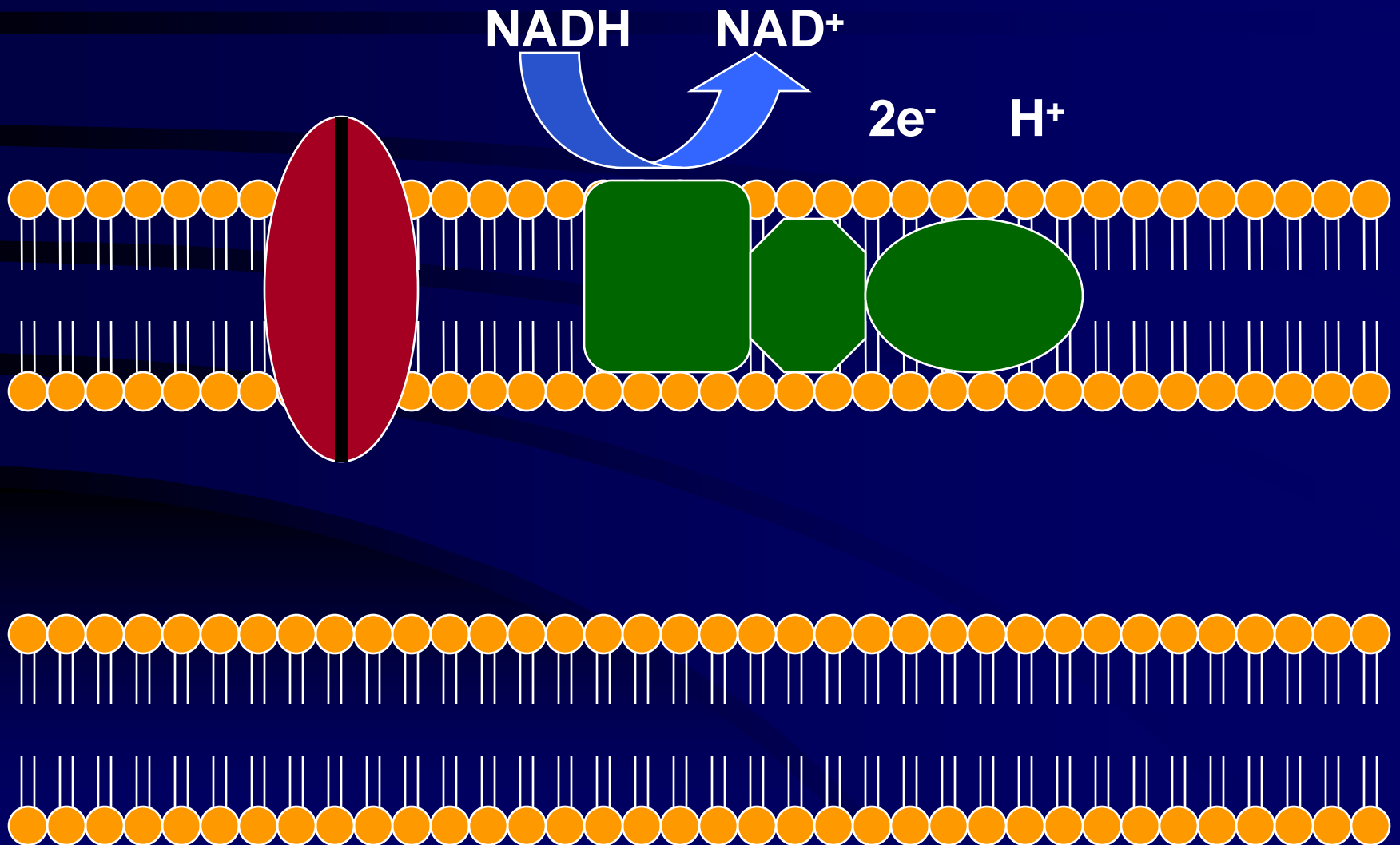
# Electron Transport Chain

NADH

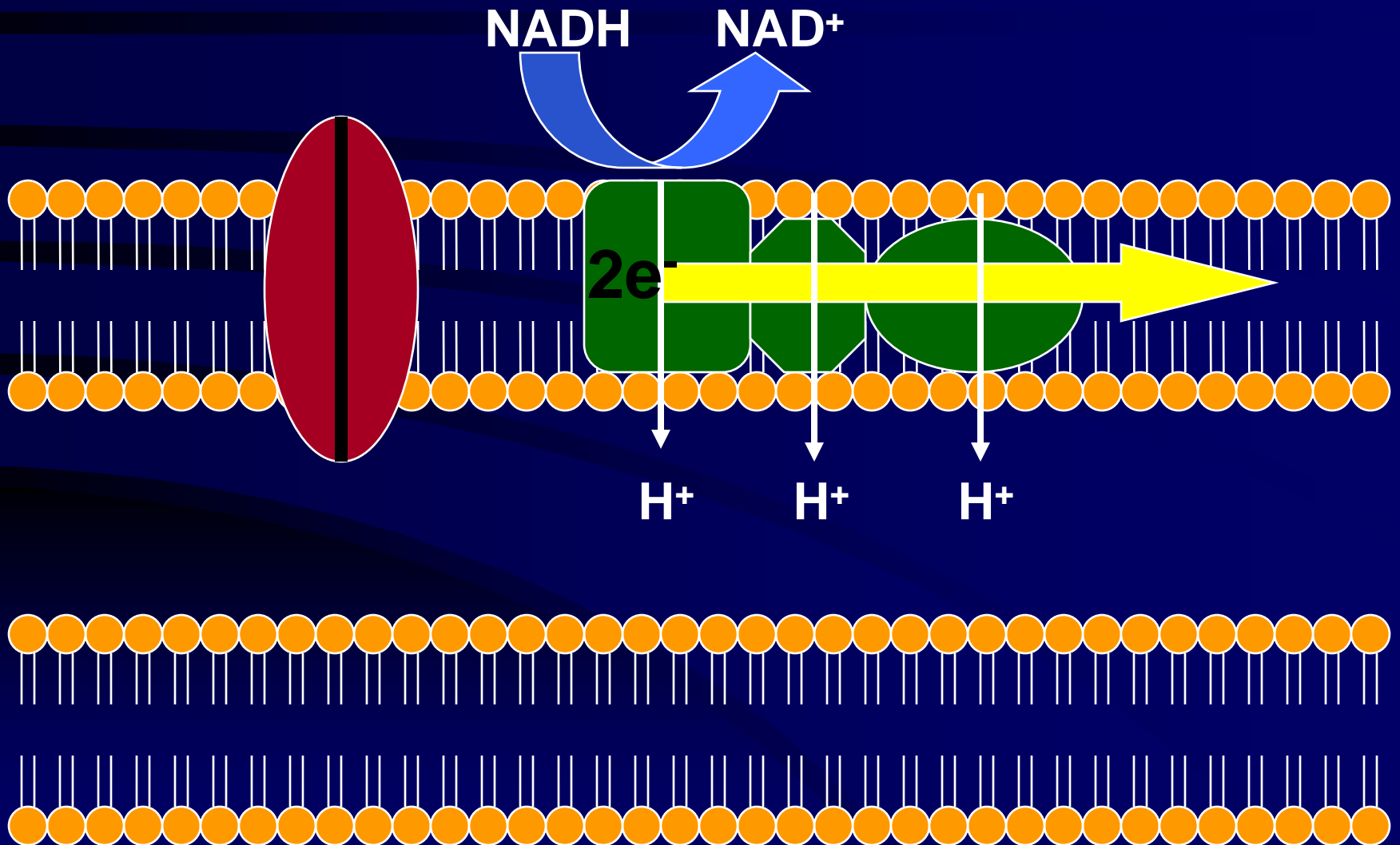
FADH<sub>2</sub>



# Electron Transport Chain

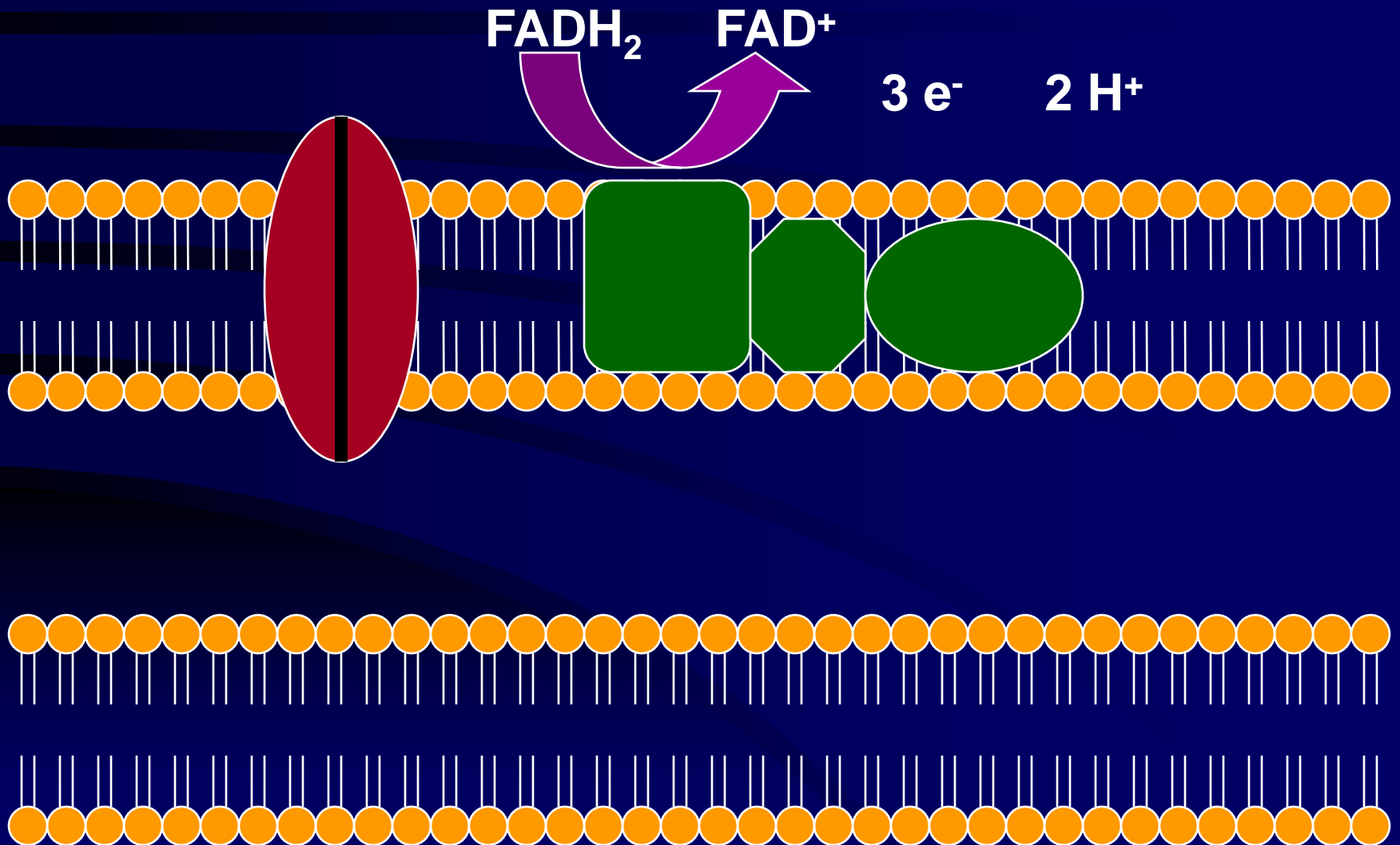


# Electron Transport Chain

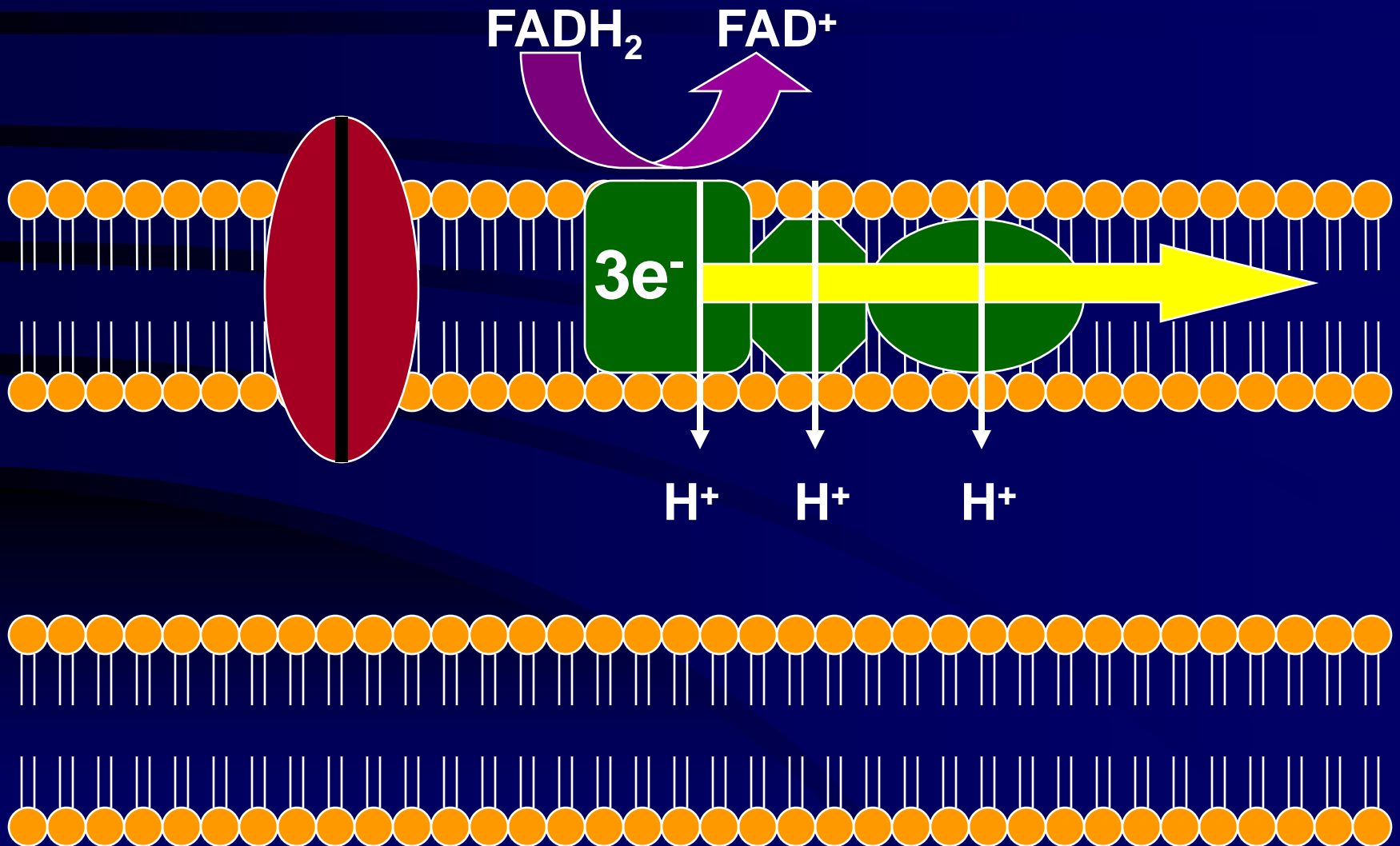


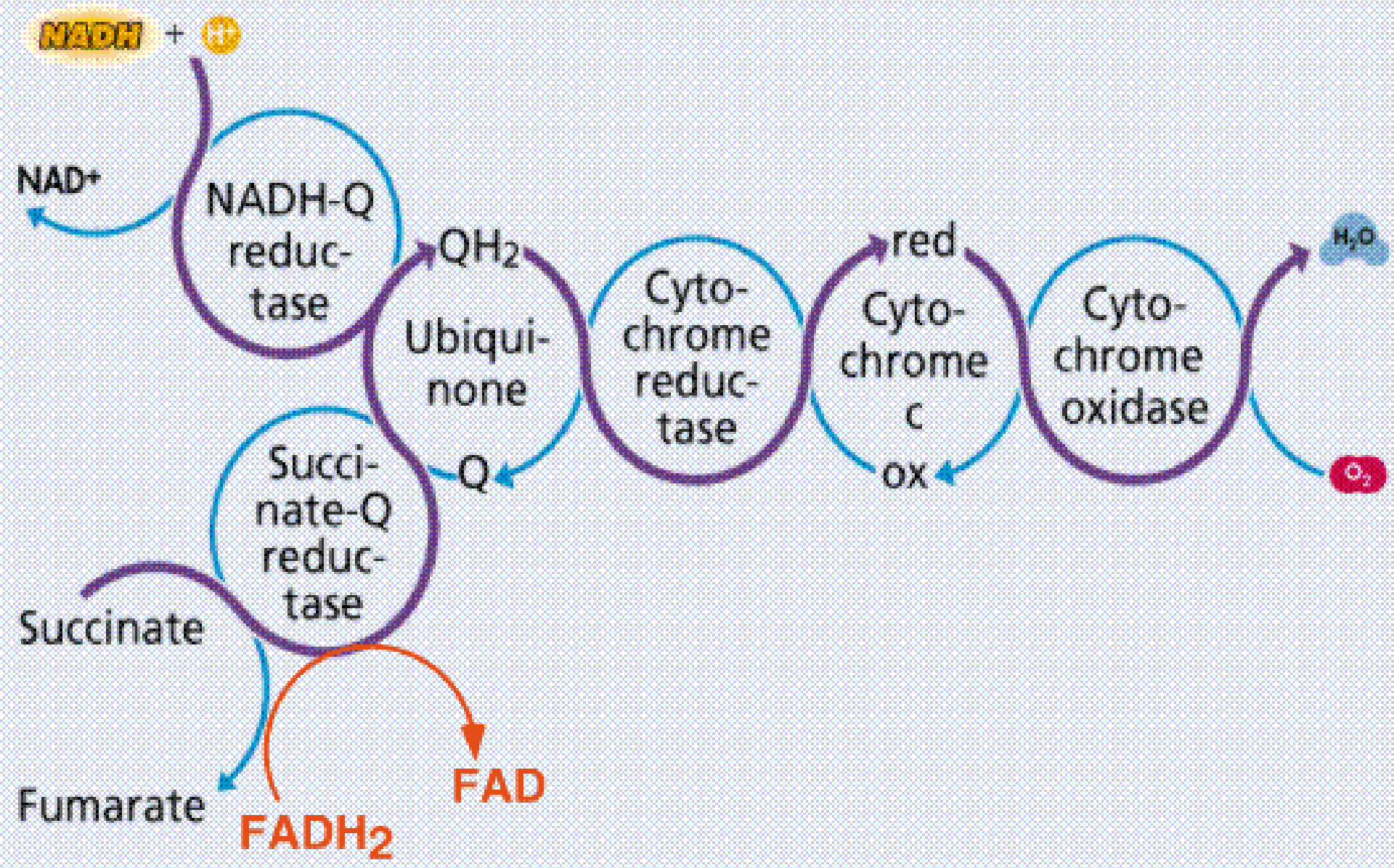


# Electron Transport Chain

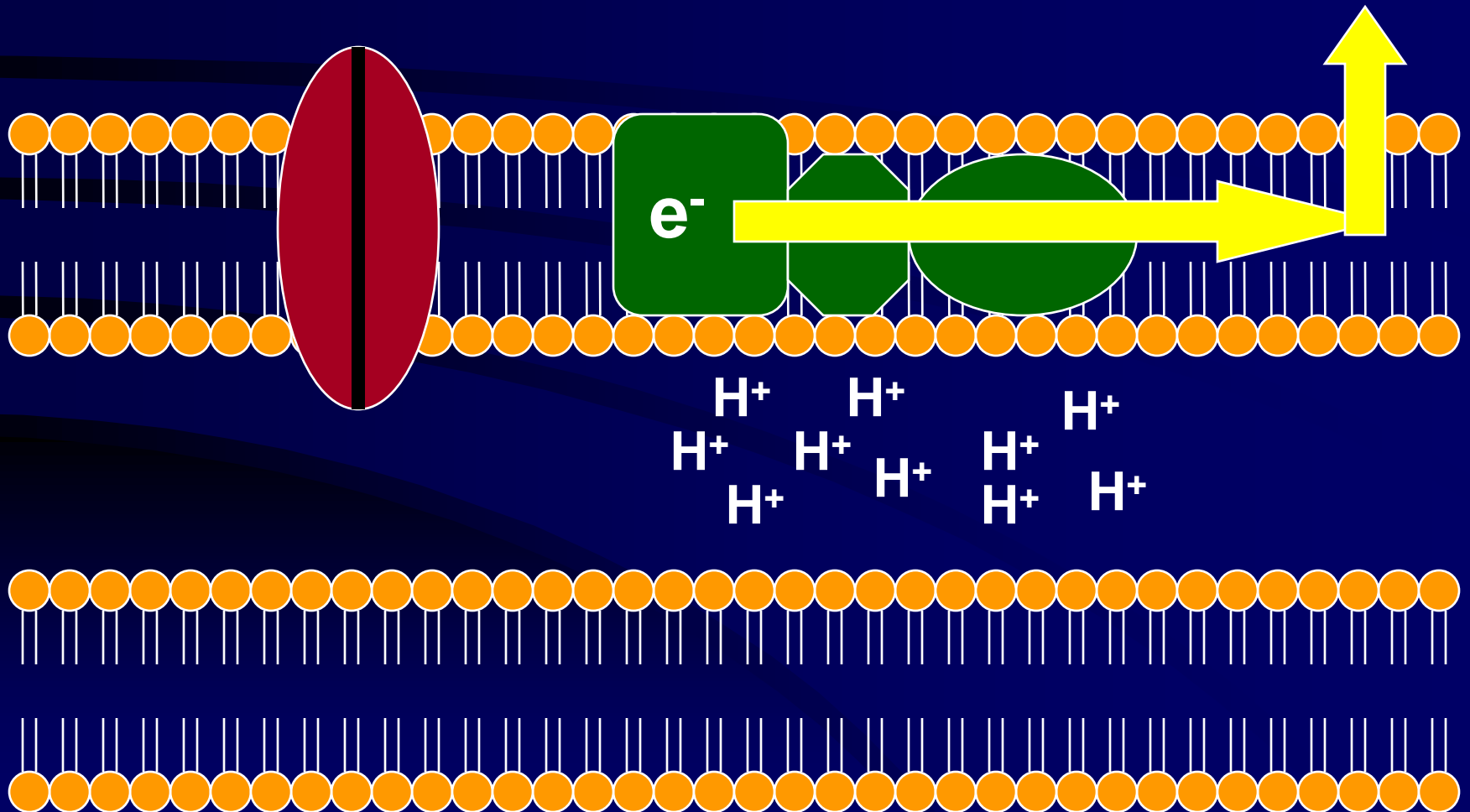


# Electron Transport Chain



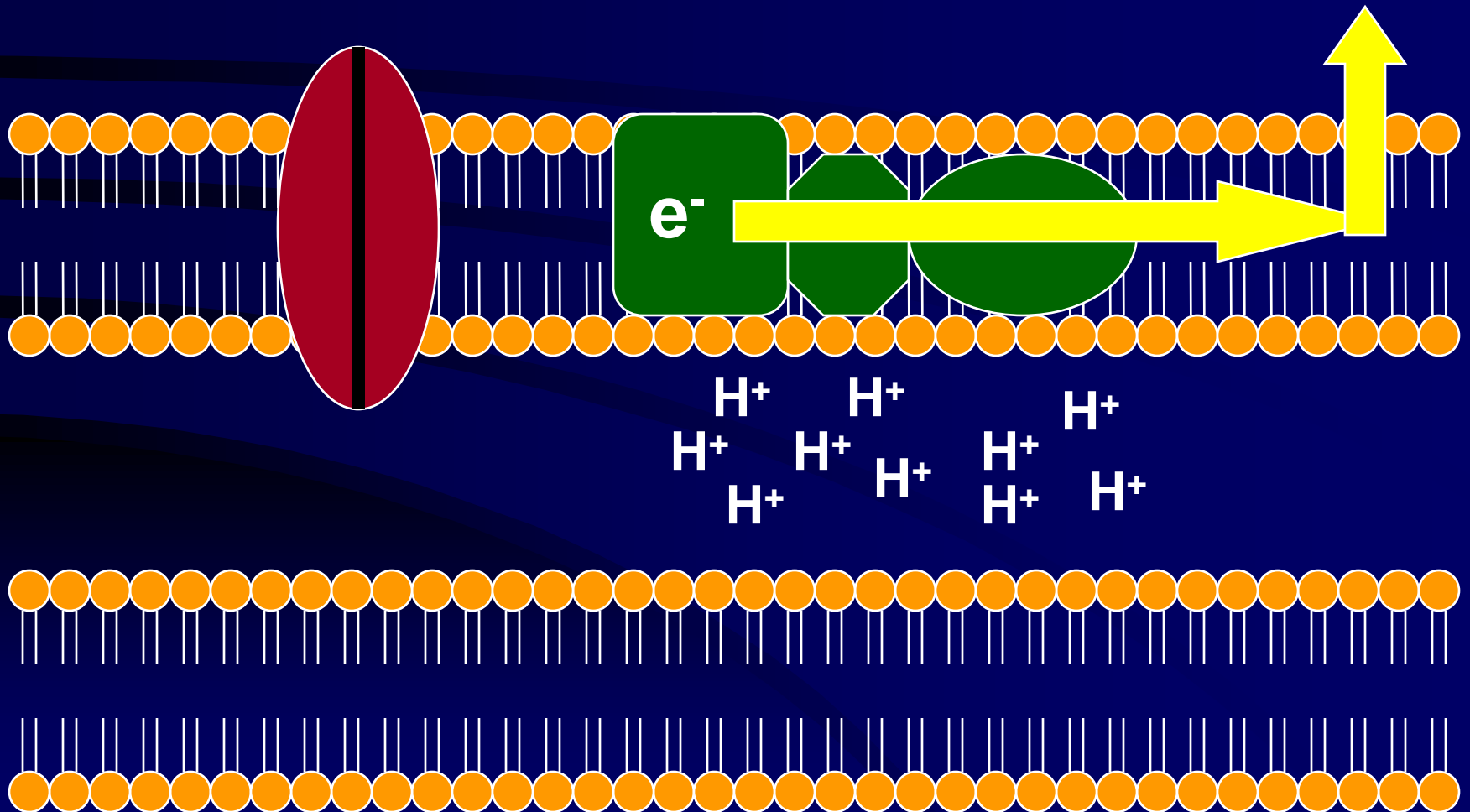


# Electron Transport Chain

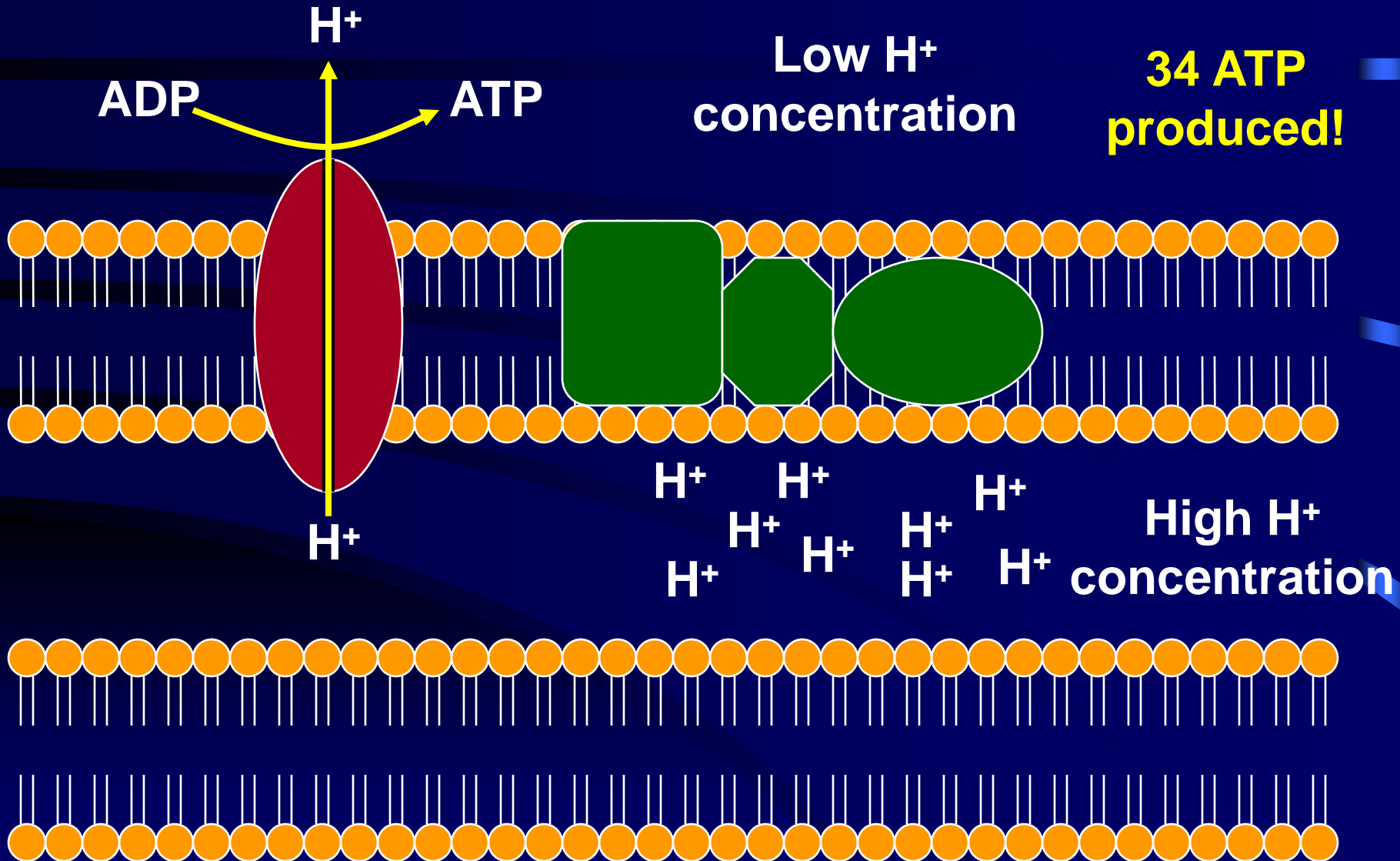


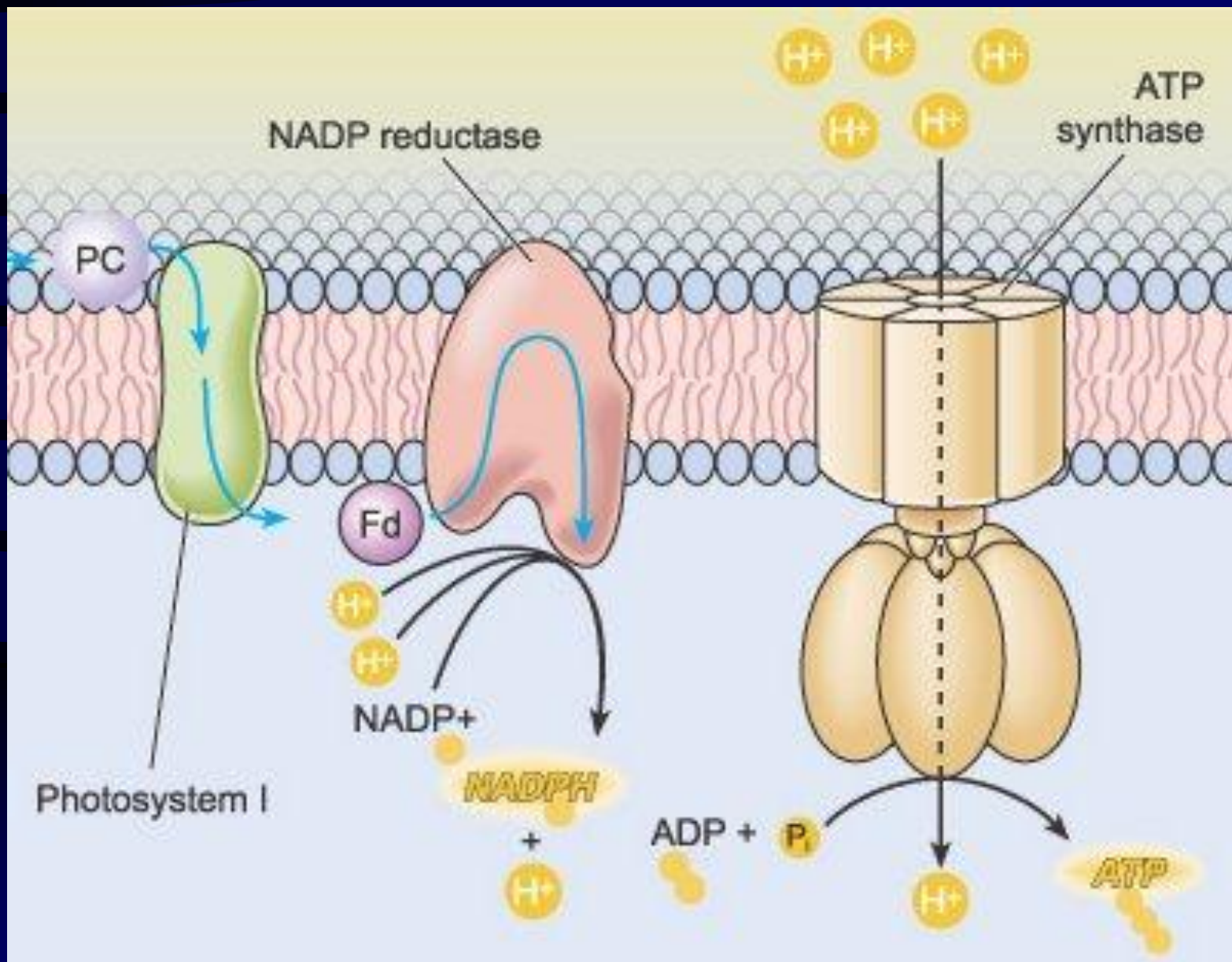
# Electron Transport Chain

Oxygen is the final  
electron acceptor



# Chemiosmosis

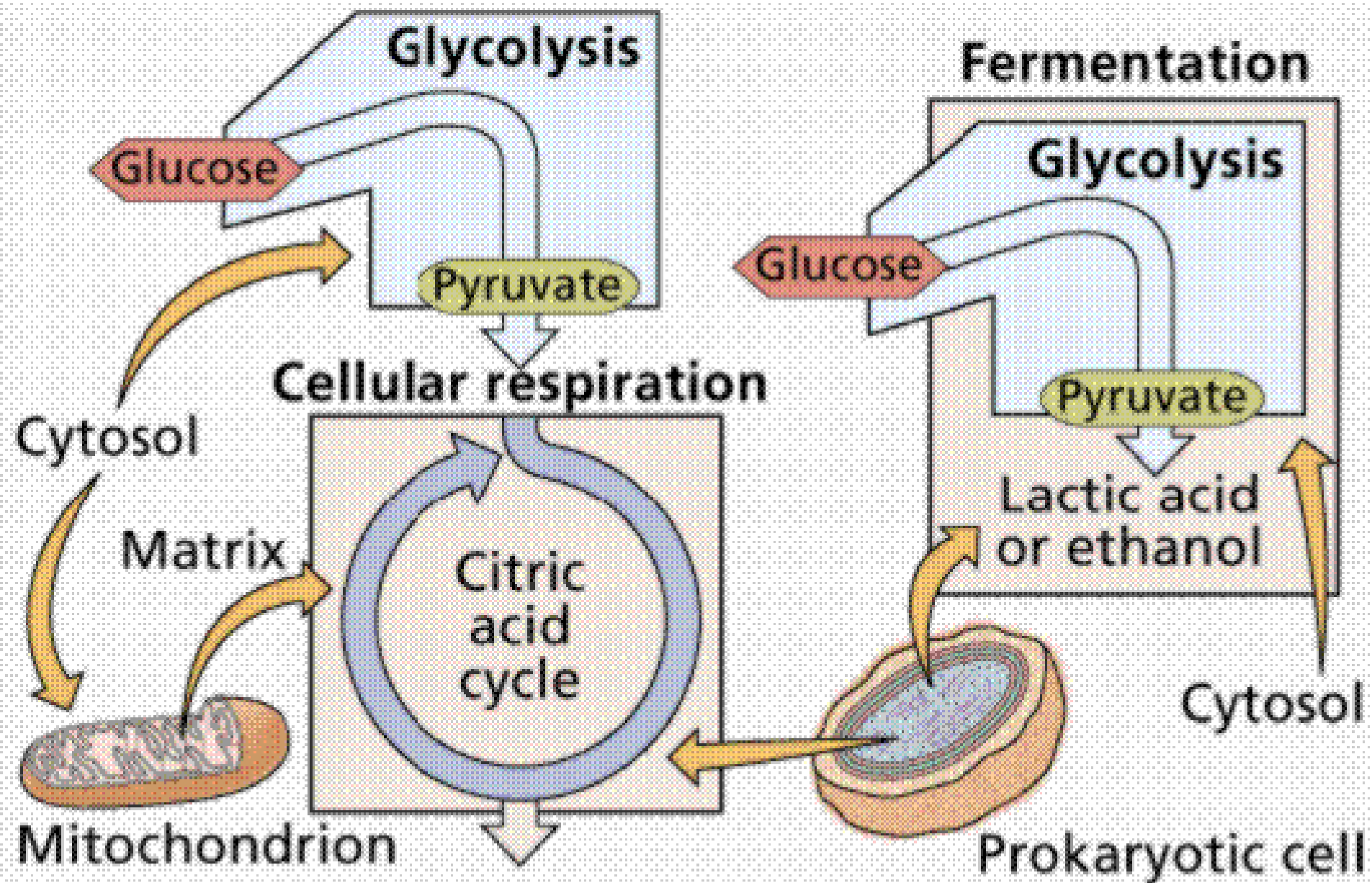




# Summing Up (Aerobic Cellular Respiration)

• Glycolysis	2	ATP
• Transition Reaction	0	ATP
• Krebs Cycle	2	ATP
• Electron Transport Chain	0	ATP
• Chemiosmosis	34	ATP
-----		
• Total	38	ATP





# Making Cheese



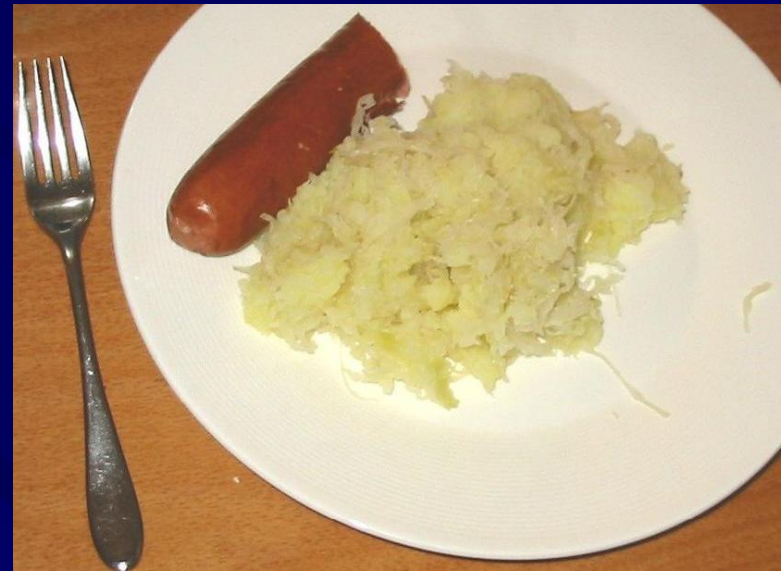
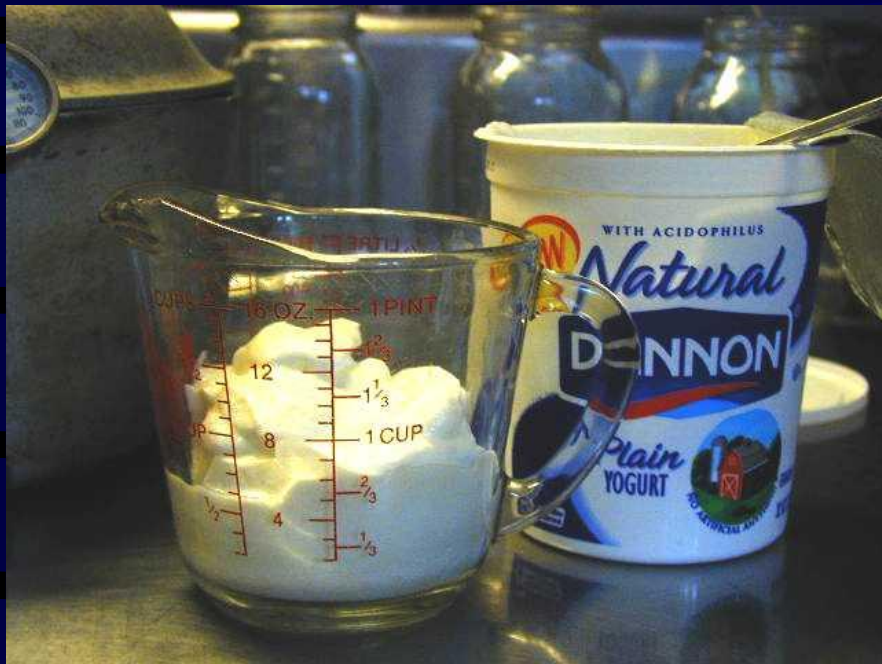
# Lactic Acid Fermentation



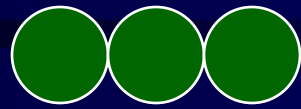




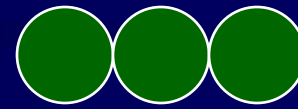
# Lactic Acid Fermentation



# Lactic Acid Fermentation



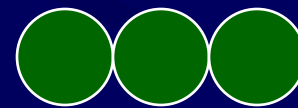
Pyruvate  
 $C_3H_4O_3$



Pyruvate  
 $C_3H_4O_3$



Lactate  
 $C_3H_6O_3$

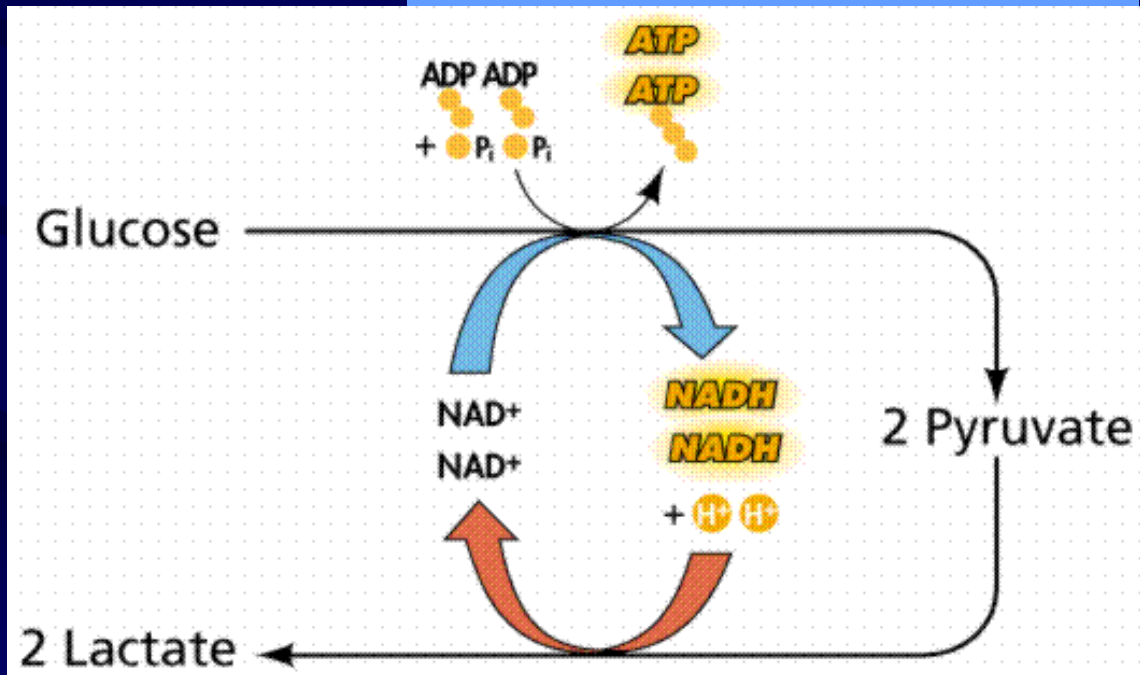
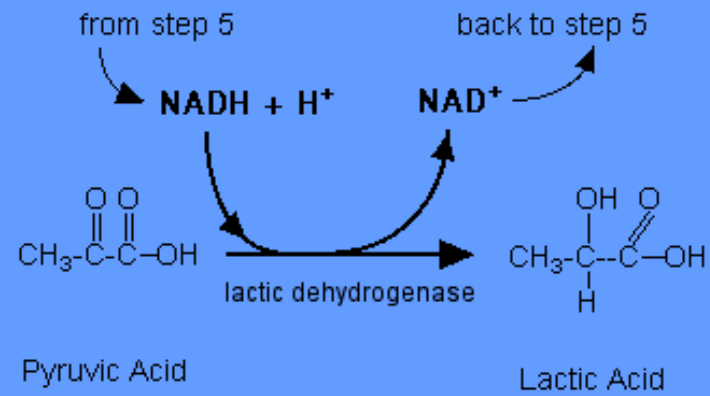


Lactate  
 $C_3H_6O_3$





### Anaerobic - Lactic Acid





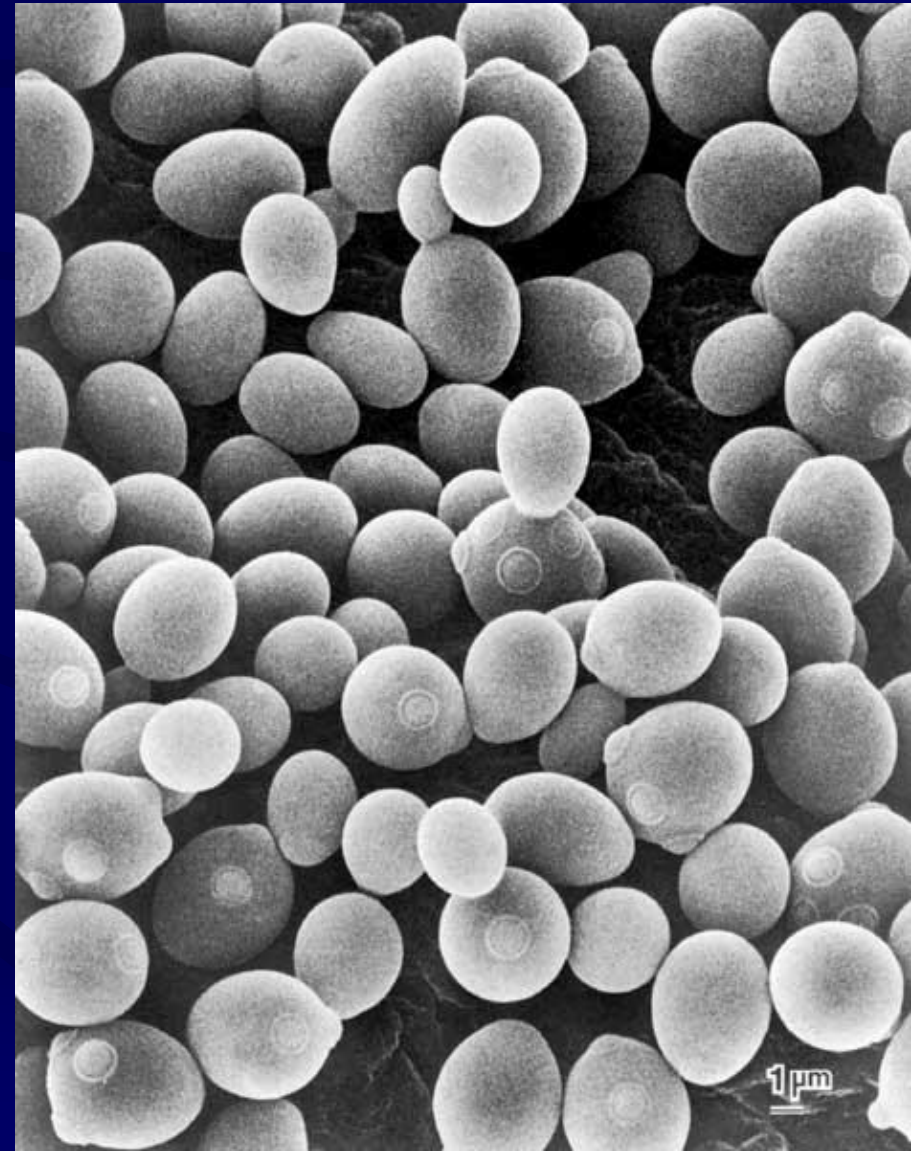
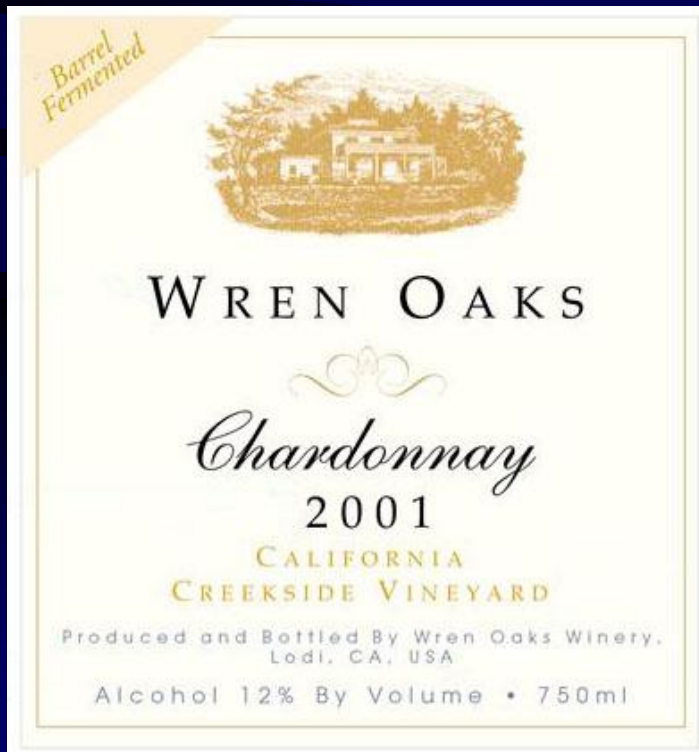
# Making Beer and Bread





# Alcohol Fermentation

- *Saccharomyces cerevisiae*









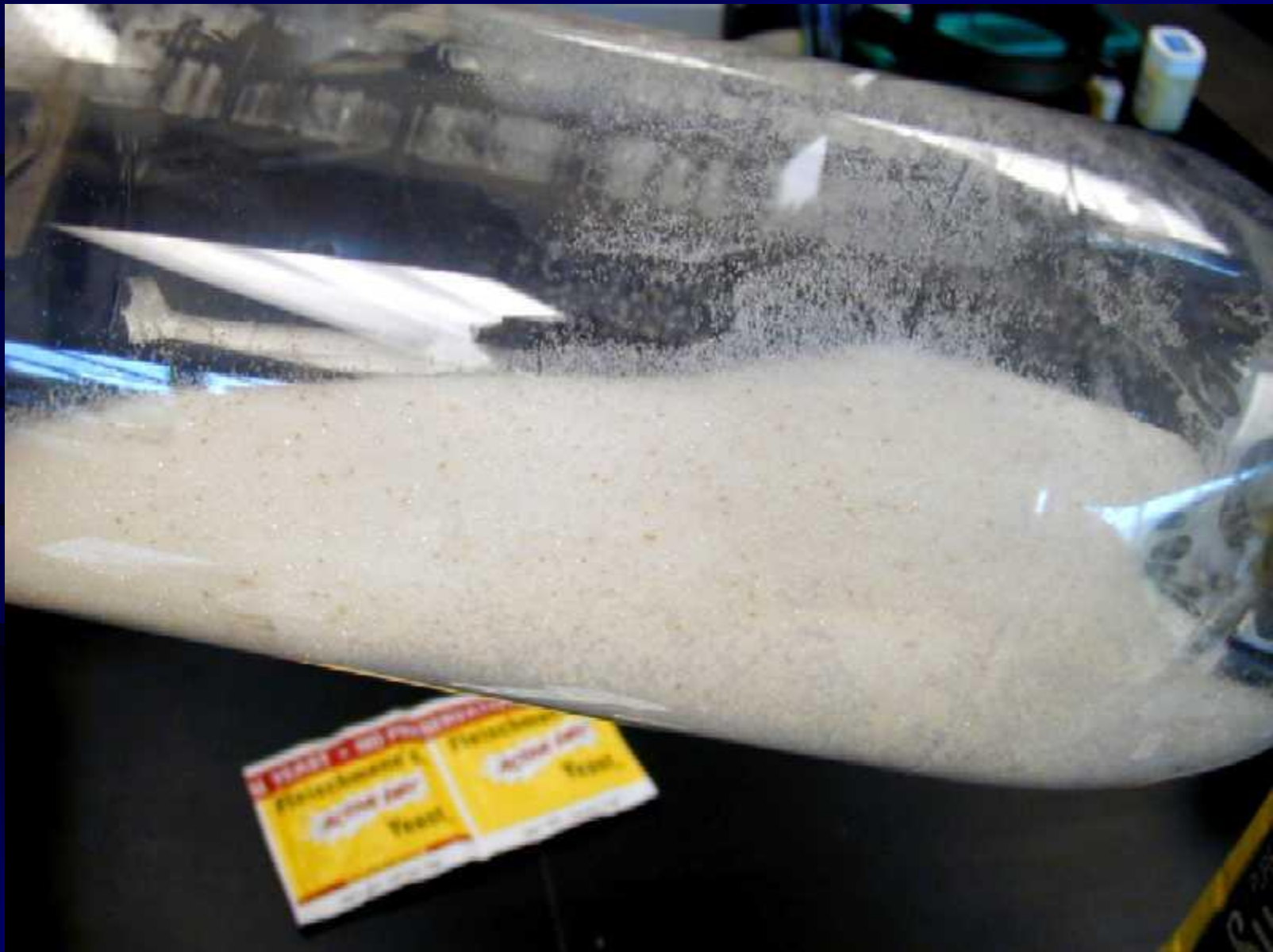
1 Cup Sugar



$\frac{1}{4}$  teaspoon  
Active Yeast



Mix



1 Tablespoon  
Root Beer  
Extract



Fill  $\frac{1}{2}$  with water then swirl; Then fill to neck and screw cap on tightly





Room temperature about three to four days until the bottle feels hard to a forceful squeeze.

Move to a cool place (below 65 F).

Refrigerate overnight to thoroughly chill before serving.

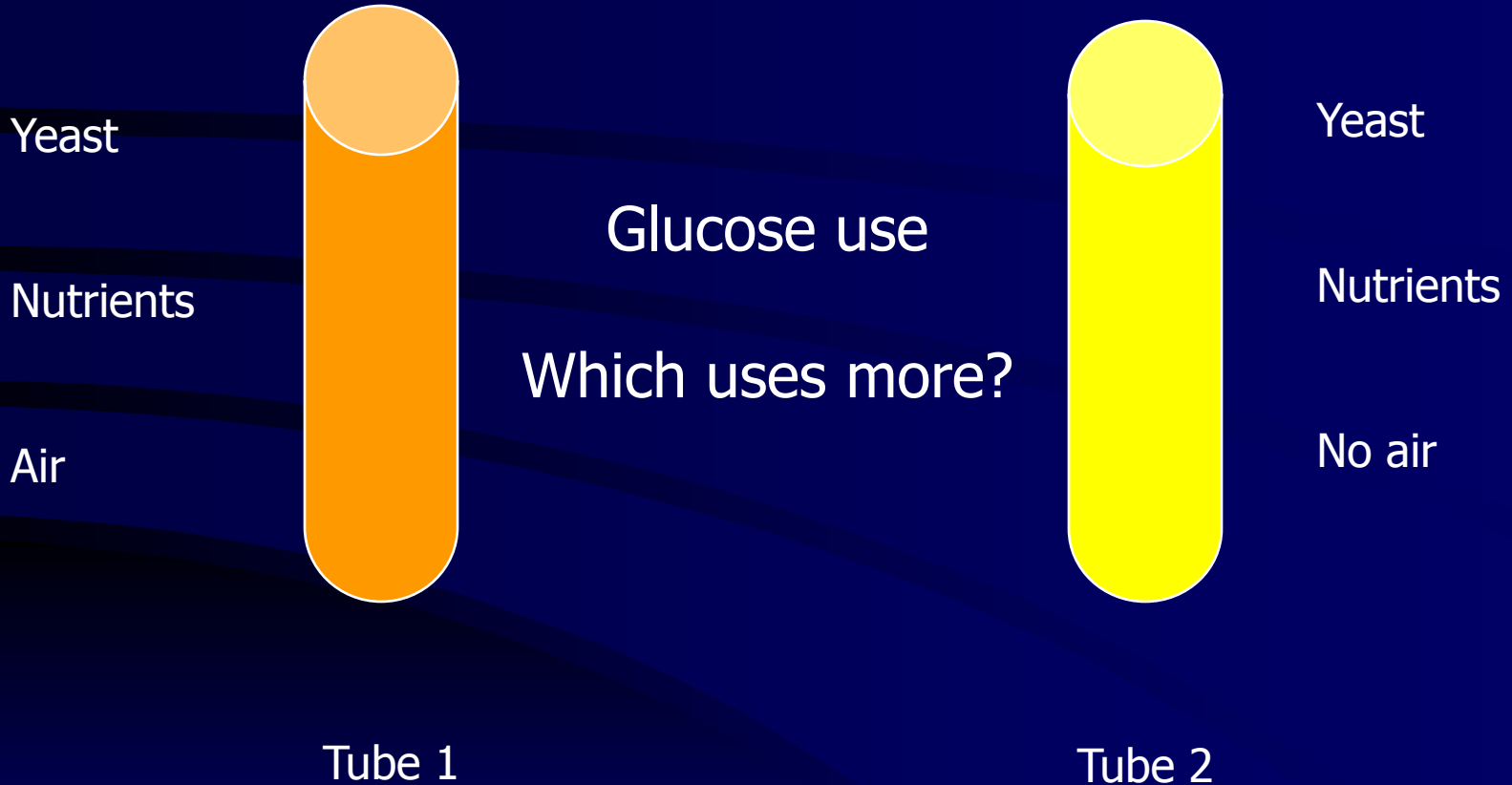


# Louis Pasteur

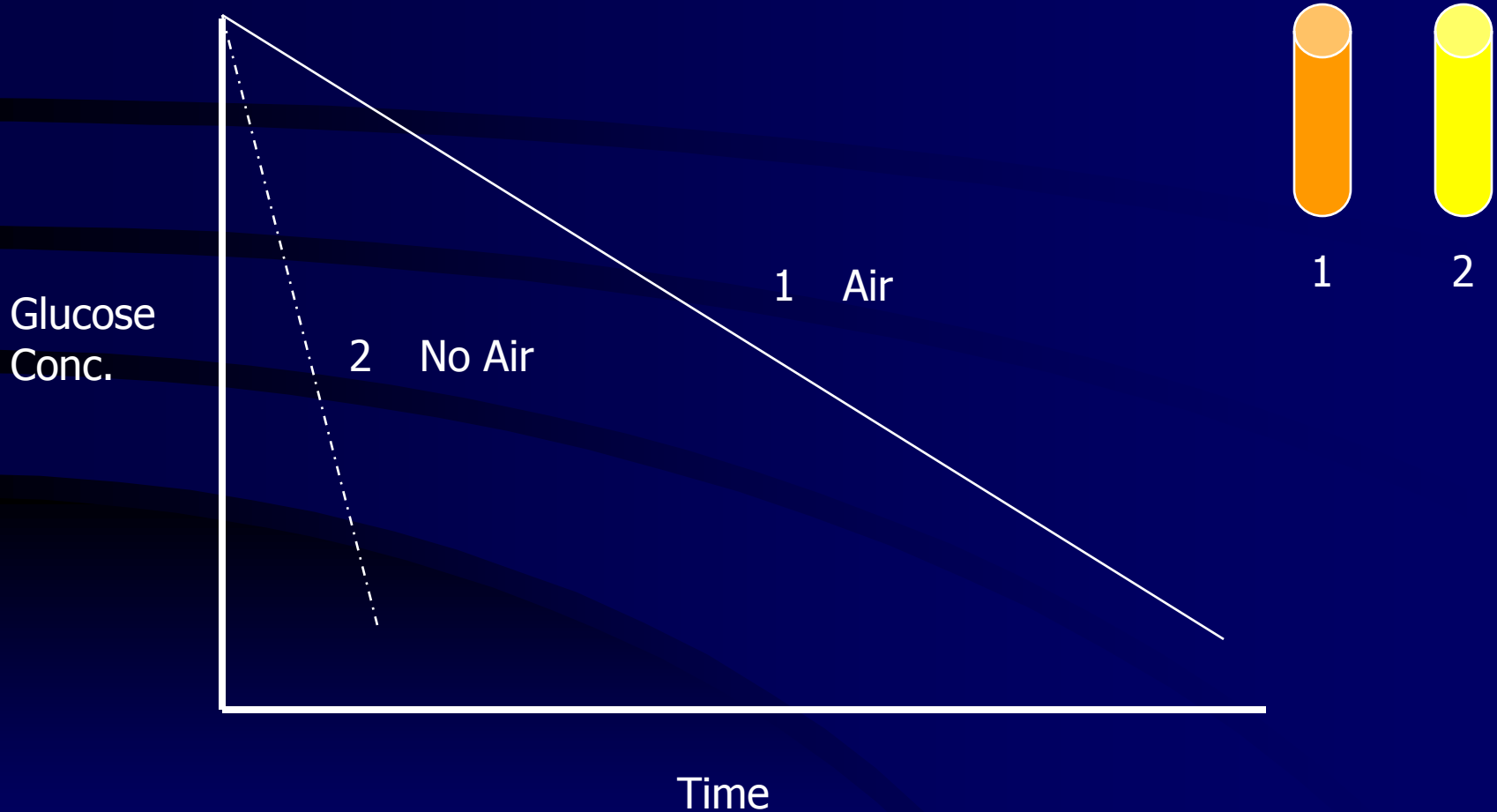
- First to describe alcoholic fermentation
  - discovered yeast as the organism that turned sugar into alcohol
- Pasteur Effect



# Pasteur Effect



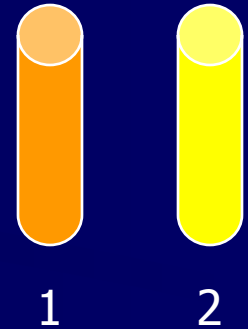
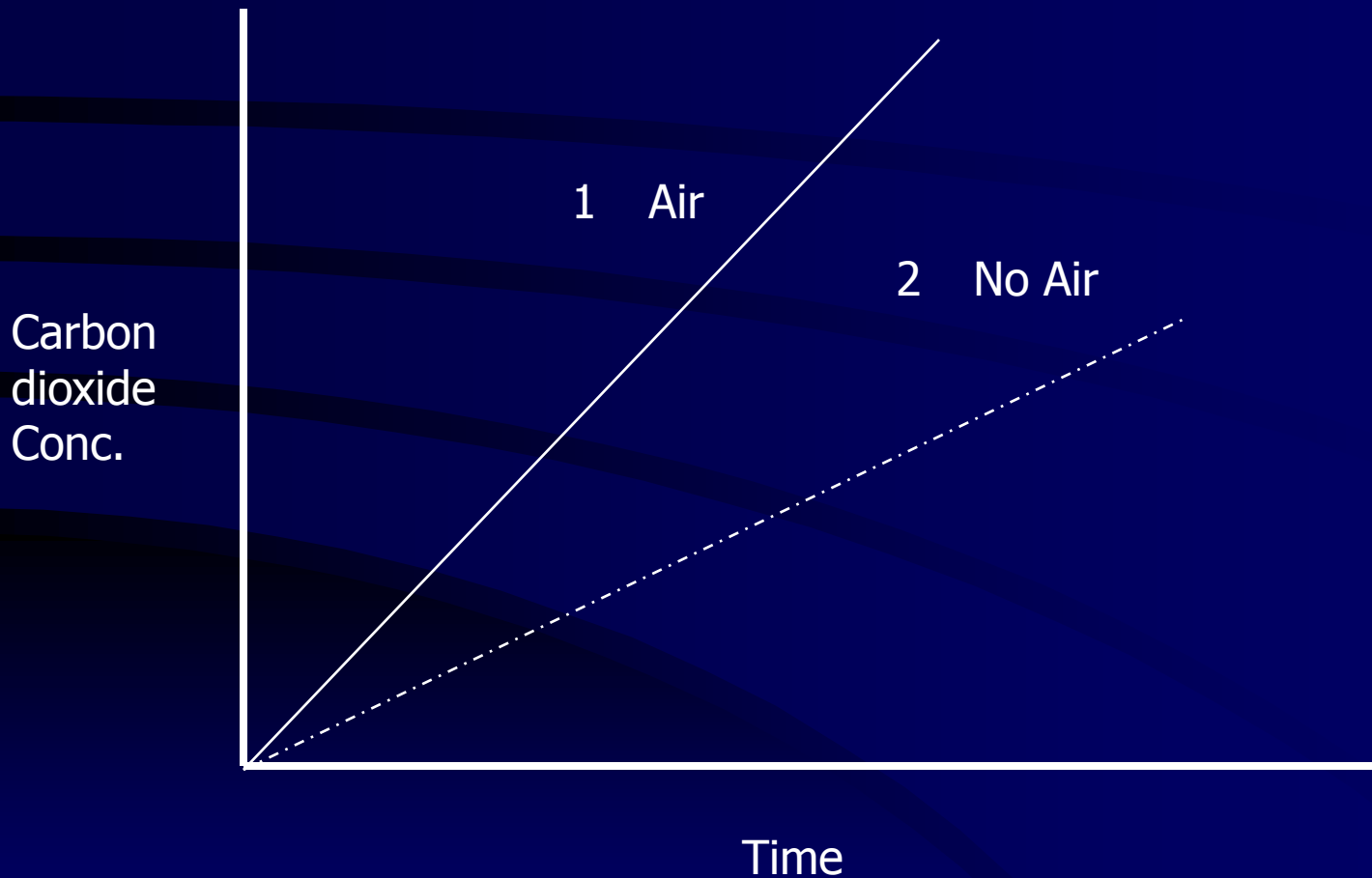
# Pasteur Effect



# Pasteur Effect

- Tube 1 (Air)
  - Aerobic Cellular Respiration
  - How many ATP's generated per glucose?
  - 38 ATP
- Tube 2 (No Air)
  - Fermentation
  - How many ATP's generated per glucose?
  - 2 ATP

# Pasteur Effect









# Making Red Wine



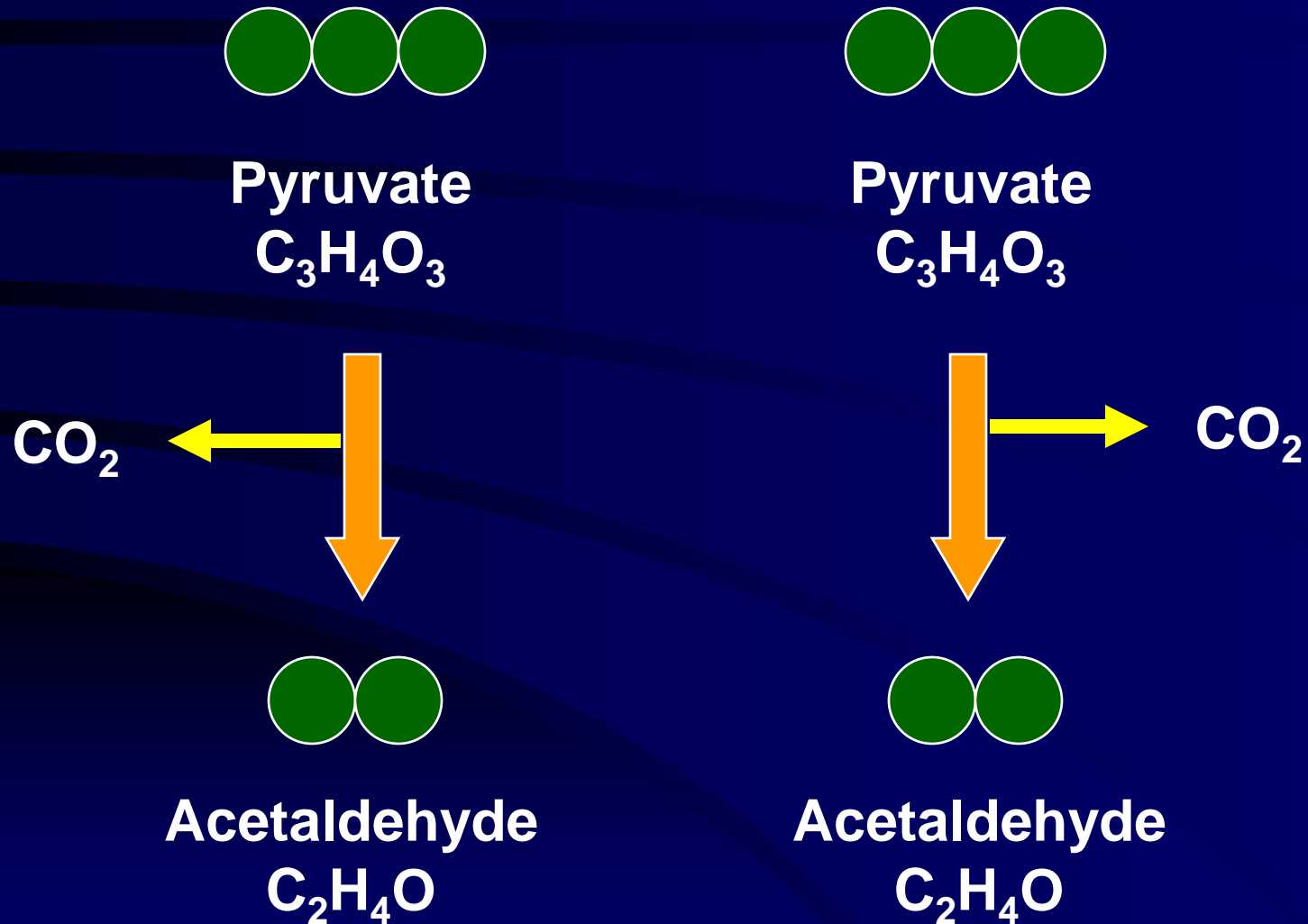
- Foam cap  
– CO<sub>2</sub>



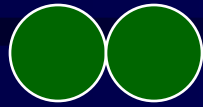




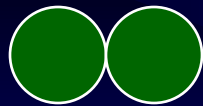
# Alcohol Fermentation



# Alcohol Fermentation



Acetaldehyde  
 $C_2H_4O$

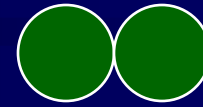


Ethanol  
 $C_2H_5OH$

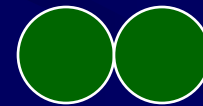
NADH



NAD<sup>+</sup>



Acetaldehyde  
 $C_2H_4O$



Ethanol  
 $C_2H_5OH$

NADH



NAD<sup>+</sup>

