DAYTONA STATE COLLEGE

GENERAL BIOLOGY I
TEST III

REVIEW

TERMS TO KNOW

- Anabolism
  - Building molecules for storing energy
- Catabolism
  - Breaking down molecules for usable energy
- Metabolism
  - The combined processes of catabolism and anabolism
- Entropy
  - A measure of disorder in a system
- Kinetic Energy
  - Energy of movement
- Potential Energy
  - Stored Energy
- ATP
  - Adenosine Triphosphate, energy currency used by the body
- Energy coupling
  - A process by which an exergonic reaction provides energy to be used in an endergonic reaction, i.e. electron transport and oxidative phosphorylation

TERMS TO KNOW

- NADH
  - Electron carrier used in cellular metabolism
- NADPH
  - Electron carrier used by chloroplasts in photosynthesis
- Hydrolysis
  - Breaking down a polymer by inserting a water molecule
- Active Site
  - The portion of an enzyme to which a substrate binds and where reactions take place.
- Substrate
  - What is acted on by an enzyme
- Product
  - What is produced by an enzyme from a substrate
- Coenzyme
  - A non-protein organic substance that combines with a protein to form an active enzyme.
- Cofactor
  - Non-protein molecules required for enzymes to function.
  - Typically refers to a non-organic molecule

TERMS TO KNOW

- Energy of Activation
  - The energy required to initiate a reaction
- Competitive Inhibitor
  - An inhibitor that competes for the active site on an enzyme
- Noncompetitive Inhibitor
  - An inhibitor that does not compete for the active site of an enzyme
- Allosteric Inhibitor
  - An inhibitor that binds to the allosteric site of an enzyme. Results in change of shape to the active site.
- Feedback Inhibition
  - The product of an enzymatic reaction is an allosteric inhibitor of the enzyme that creates it
- Exergonic Reactions
  - Release heat
- Endergonic Reactions
  - Absorb heat

TERMS TO KNOW

- Diffusion
  - Movement of a solute from high concentration to low concentration
- Osmosis
  - Diffusion of water
- Hypertonic
  - More solute outside than inside
- Hypotonic
  - Less solute outside than inside
- Isotonic
  - Same amount of solute outside as inside
- Freeze Fracture
  - Technique used to prove the fluid mosaic model of cell membranes
- Induced Fit
  - When a substrate binds to an enzyme, the enzyme's shape is slightly altered.

TERMS TO KNOW

- Plasmolysis
  - The removal of water from plant cells, caused by being in a hypertonic solution
  - Shrinkage or contraction of the protoplasm away from the wall of a living plant or bacterial cell.
- Hemolysis
  - The lysis of red blood cells, caused by placing them into a hypotonic solution
- Crenation
  - The shrinkage of red blood cells when placed in a hypertonic solution
- Turgor Pressure
  - The pressure created when the central vacuole in a plant cell fills with water, allows plants to stand upright. Form of hydrostatic pressure.
- Symport
  - The active transport of substance A drives the active transport of substance B in the same direction
- Antiport
  - The active transport of substance A drives the active transport of substance B in the opposite direction
- Passive Transport
  - The movement of substances that does not require energy
- Active Transport
  - The movement of substances requiring energy (ATP)

TERMS TO KNOW

- Receptor Mediated Endocytosis
  - Endocytosis triggered by the activation of a receptor on the cell surface
- Exocytosis
  - Ejecting something from the cell
- Phagocytosis
  - "Cell Eating" used to bring in large molecules, usually other cells
- Pinocytosis
  - "Cell Drinking" used to bring in smaller, non-visible, water-soluble molecules
- Cyclic Phosphorylation
  - More ATP than NADPH are needed to fix carbon in Calvin cycle
- Non-cyclic phosphorylation
  - Electron Transport Chain used in photosynthesis to make ATP
- Anaerobic
  - Does not use oxygen
- Aerobic
  - Uses Oxygen

TERMS TO KNOW

- Stroma
  - The space inside the chloroplast
- Thylakoid
  - Small, stacked, round discs inside the chloroplast
- Photosystem II
  - First light gathering system in non-cyclic phosphorylation
- Photosystem I
  - Second light gathering system in non-cyclic phosphorylation, after electron transport chain
- First Law of Thermodynamics
  - ☞ **Energy** in the universe is constant or **total quantity** of energy before equals **total quantity** after each energy conversion.
  - ☞ **ENERGY** can be transferred and transformed but energy cannot be created or destroyed.
- Second Law of Thermodynamics
  - Every **energy** transfer makes the universe more disordered, or increases entropy

FILL IN THE BLANK

	High to low or low to high concentration	Requires a protein (yes or no)	Requires added energy (yes or no)
Diffusion			
Facilitated transport = facilitated diffusion			
Active transport			

FILL IN THE BLANK

	High to low or low to high concentration	Requires a protein (yes or no)	Requires added energy (yes or no)
Diffusion	High to Low	No	**No**
Facilitated transport = facilitated diffusion	High to Low	Yes	**No**
Active transport	**Low to High**	**Yes**	**Yes**

FILL IN THE BLANK

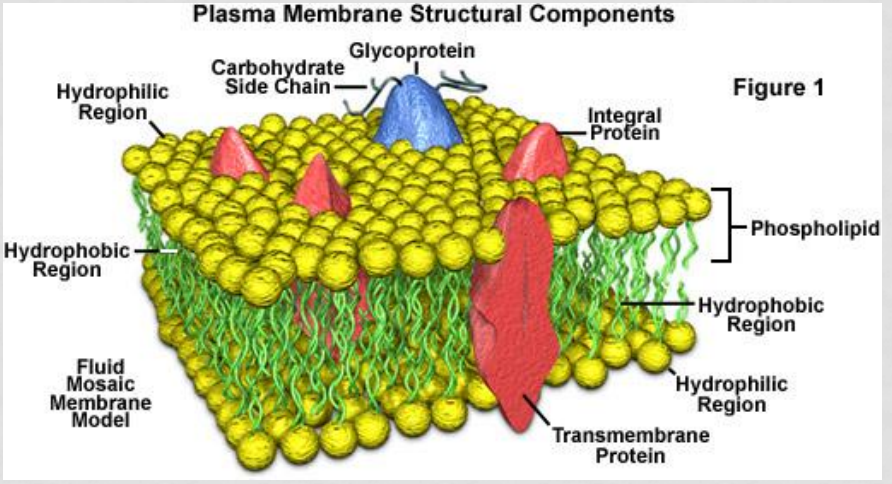
	Red Blood Cell	Plant cell
Hypertonic		
Isotonic		
Hypotonic		

FILL IN THE BLANK

	Red Blood Cell	Plant cell
Hypertonic	Crenation	**Plasmolysis**
Isotonic	Nothing	**Nothing**
Hypotonic	**Hydrolysis**	**Turgor Pressure**

CONCEPT QUESTIONS

- What is the fluid mosaic model for cell membranes?
  - Phospholipids and membrane proteins flow (fluid) and membrane proteins are embedded in the membrane (mosaic)
- What is the structure of a membrane (describe and draw it and include hydrophilic and hydrophobic labels, plus phospholipids, integral proteins, peripheral proteins and glycoproteins)?



CONCEPT QUESTIONS

- What is the fluid mosaic model for cell membranes?
  - Phospholipids and membrane proteins flow (fluid) and membrane proteins are embedded in the membrane (mosaic)
- What is the structure of a membrane (describe and draw it and include hydrophilic and hydrophobic labels, plus phospholipids, integral proteins, peripheral proteins and glycoproteins)?
  - See previous slide
- What are some of the functions of plasma membrane integral proteins?
  - Transport, Recognition, Intercellular Joining, Attachment
- What molecules can pass through a cell membrane without the aid of a protein? What molecules require the aid of a protein?
  - Without Protein: Small nonpolar molecules - lipids
  - With Protein: Small charged particles, polar substances, larger molecules – ions, proteins

CONCEPT QUESTIONS

- How do enzymes lower the energy of activation (or speed up a chemical reaction)?
  - They allow substrates to react with each other faster by straining the reactant's bonds and bringing the reactants closer together.
- Why do enzymes have an optimal pH? Why does pepsin from the stomach act at a lower pH than proteases from the small intestine?
  - pH effects the structure of a protein. Proteins will denature outside the range in which they are designed to work.
- Why do enzymes have an optimal temperature? Why do bacteria from hot springs have a higher optimal temperature than human enzymes?
  - Proteins denature at temperatures outside their optimal range.

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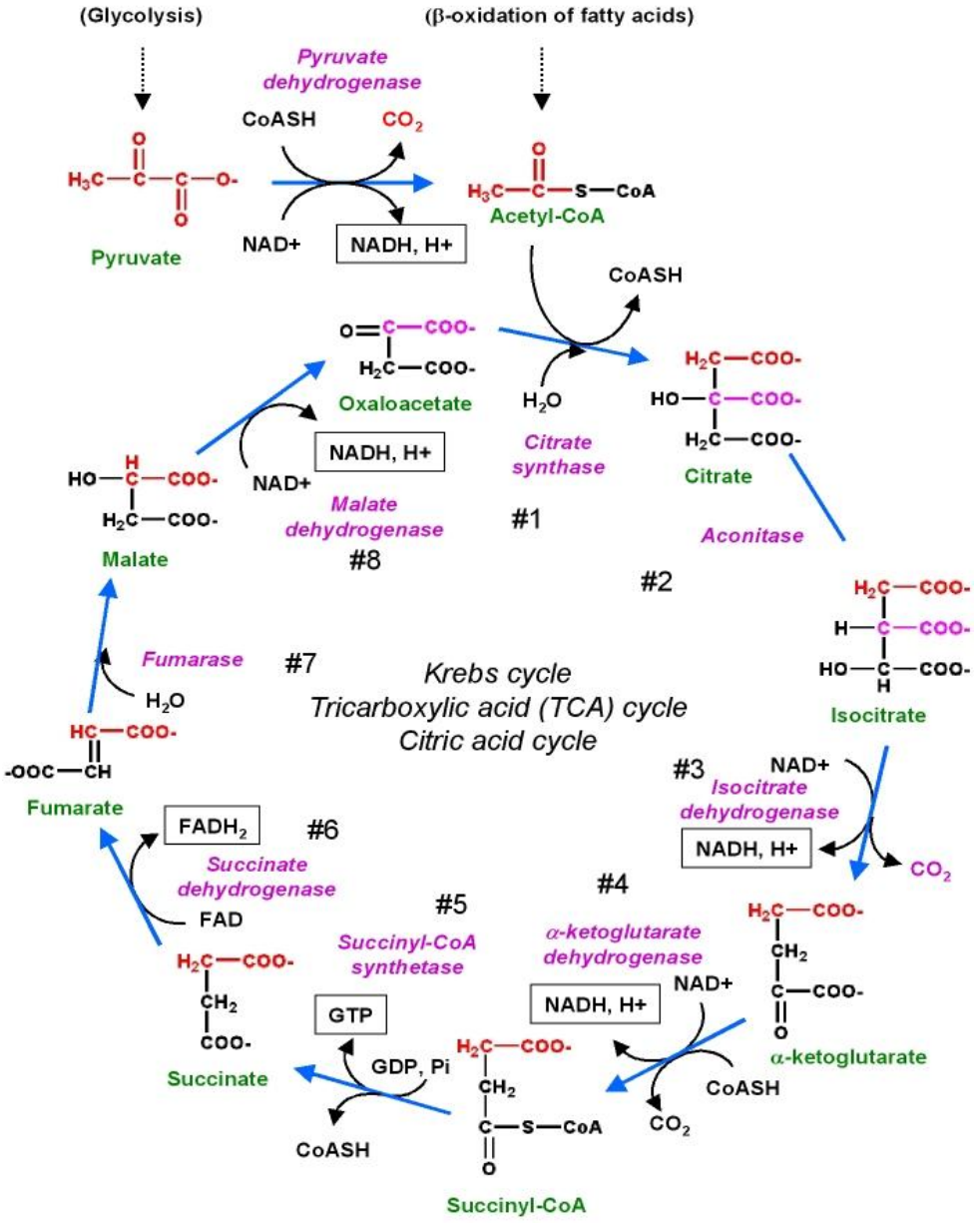
	CO2 per glucose	Oxygen consumed (yes/no)	Oxygen required (yes/no)	Initial step	Final step	Where proteins located
Glycolysis						
Transition Step						
Krebs cycle						
Electron Transport						
Oxidative phosphorylation (ATP synthase)						

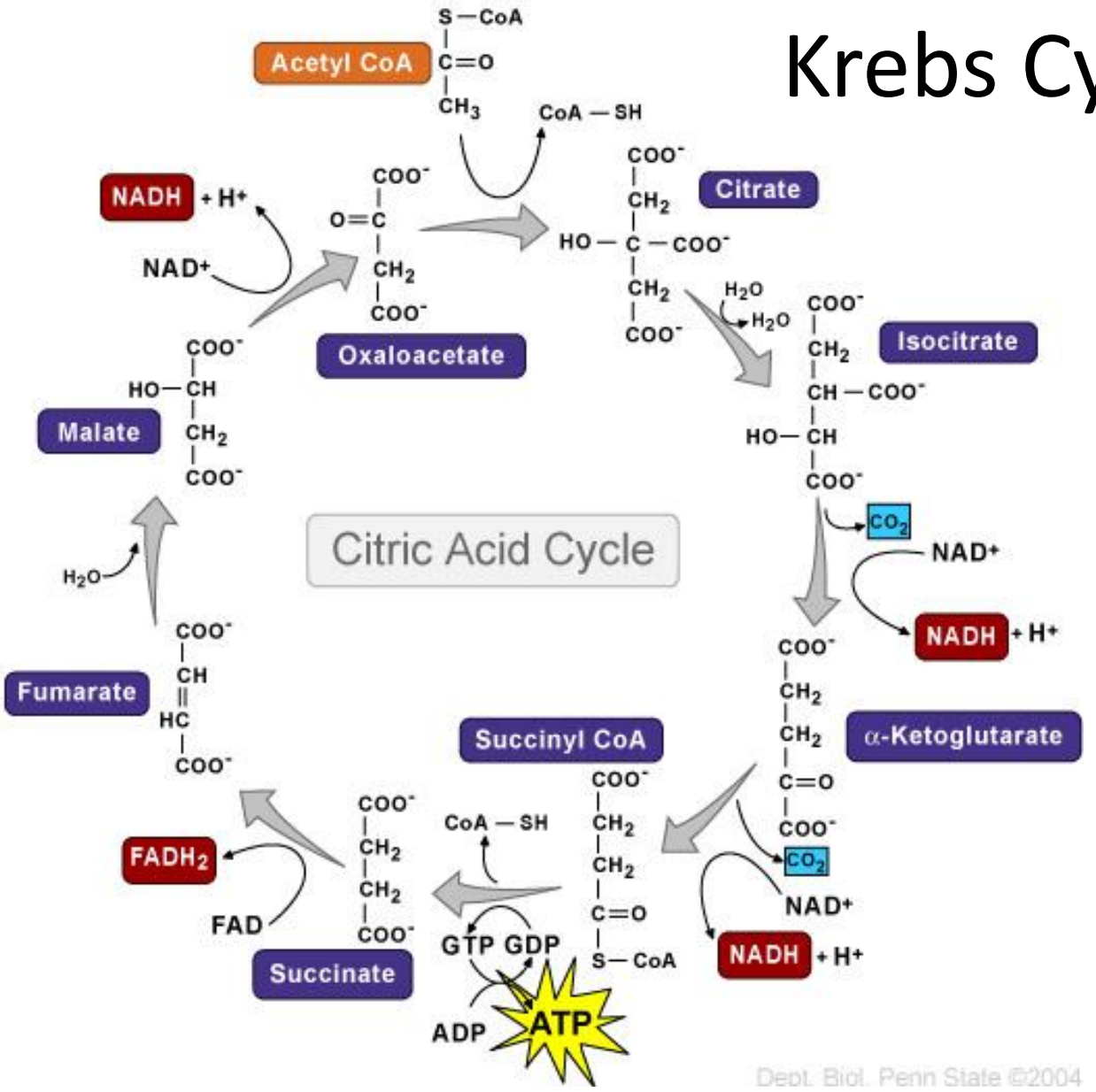
FILL IN THE BLANK

	CO2 per glucose	Oxygen consumed (yes/no)	Oxygen required (yes/no)	Initial step	Final step	Where proteins located
Glycolysis	0	no	no	Glucose 2 ATP	2 Pyruvate 4 ATP 2 NADH	**Cytoplasm**
Transition Step	2	no	yes	2 Pyruvate	2 Acetyl CoA 2 NADH	**Cytoplasm**
Krebs cycle	4	no	no	2 Acetyl CoA 2 Oxaloacetate	6 NADH 2 FADH2 2 ATP	**Mitochondrial Matrix**
Electron Transport	0	yes	yes	10 NADH 2 FADH	34 ATP	**Inner Mitochondrial Membrane**
Oxidative phosphorylation (ATP synthase)	**6**	**yes**	**yes**	**Glucose**	**36-38 ATP**	**Cytoplasm/ Mitochondria**

Krebs Cycle


(Glycolysis)
(β-oxidation of fatty acids)
Pyruvate dehydrogenase
CoASH
CO_2
Pyruvate
NAD+
NADH, H+
Acetyl-CoA
CoASH
Oxaloacetate
H_2O
Citrate synthase
Citrate
NADH, H+
NAD+
Malate dehydrogenase
#1
Malate
#8
Aconitase
#2
Isocitrate
Fumarase
#7
H_2O
Krebs cycle
Tricarboxylic acid (TCA) cycle
Citric acid cycle
Fumarate
#3
NAD+
Isocitrate dehydrogenase
NADH, H+
CO_2
$FADH_2$
#6
Succinate dehydrogenase
FAD
#4
#5
Succinyl-CoA synthetase
α-ketoglutarate dehydrogenase
NAD+
NADH, H+
GTP
GDP, Pi
Succinate
CoASH
CO_2
α-ketoglutarate
CoASH
Succinyl-CoA

Krebs Cycle


Acetyl CoA
S—CoA
C=O
CH3
CoA — SH
Citrate
NADH + H+
NAD+
Oxaloacetate
Isocitrate
H2O
H2O
Malate
Citric Acid Cycle
CO2
NAD+
NADH + H+
H2O
Fumarate
α-Ketoglutarate
Succinyl CoA
CoA — SH
FADH2
FAD
GTP GDP
Succinate
ADP
ATP
CO2
NAD+
NADH + H+
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CONCEPT QUESTIONS

- How many ATP are made through cellular respiration (from one glucose to CO_2 and H_2O)?
  - 36-38
- How many ATP are made from one NADH?
  - 3
- How many ATP are made from one FADH?
  - 2
- Where is ATP synthase located?
  - In the inner mitochondrial membrane
- Compare where mitochondria and chloroplasts put the H+ ions.
  - They both put them into a small space to better form a concentration gradient (intermembrane space in mitochondria and thylakoid space in chloroplasts)

CONCEPT QUESTIONS

- Why are plants green?
  - The chlorophyll in plants absorbs all spectra of light except green
- Where does oxygen come from in photosynthesis?
  - Water
- Which pigments are responsible for absorbing light energy for the light dependent reactions?
  - Chlorophylls
- Where are the photosynthetic pigments located within the chloroplast?
  - In the thylakoid membrane

FILL IN THE BLANK

- Know the key steps (organic molecules) of the Calvin-Benson cycle, especially initial steps and final steps. Which molecule forms glucose?
  - Carbon Dioxide
- What are the differences between **"light dependent reactions" of photosynthesis** and **Calvin Cycle or "light independent reactions**" of photosynthesis? [Quick summary table]

Process	Location	Reactants	Products
Light dependent reactions			
Light Independent reactions or Calvin Cycle			

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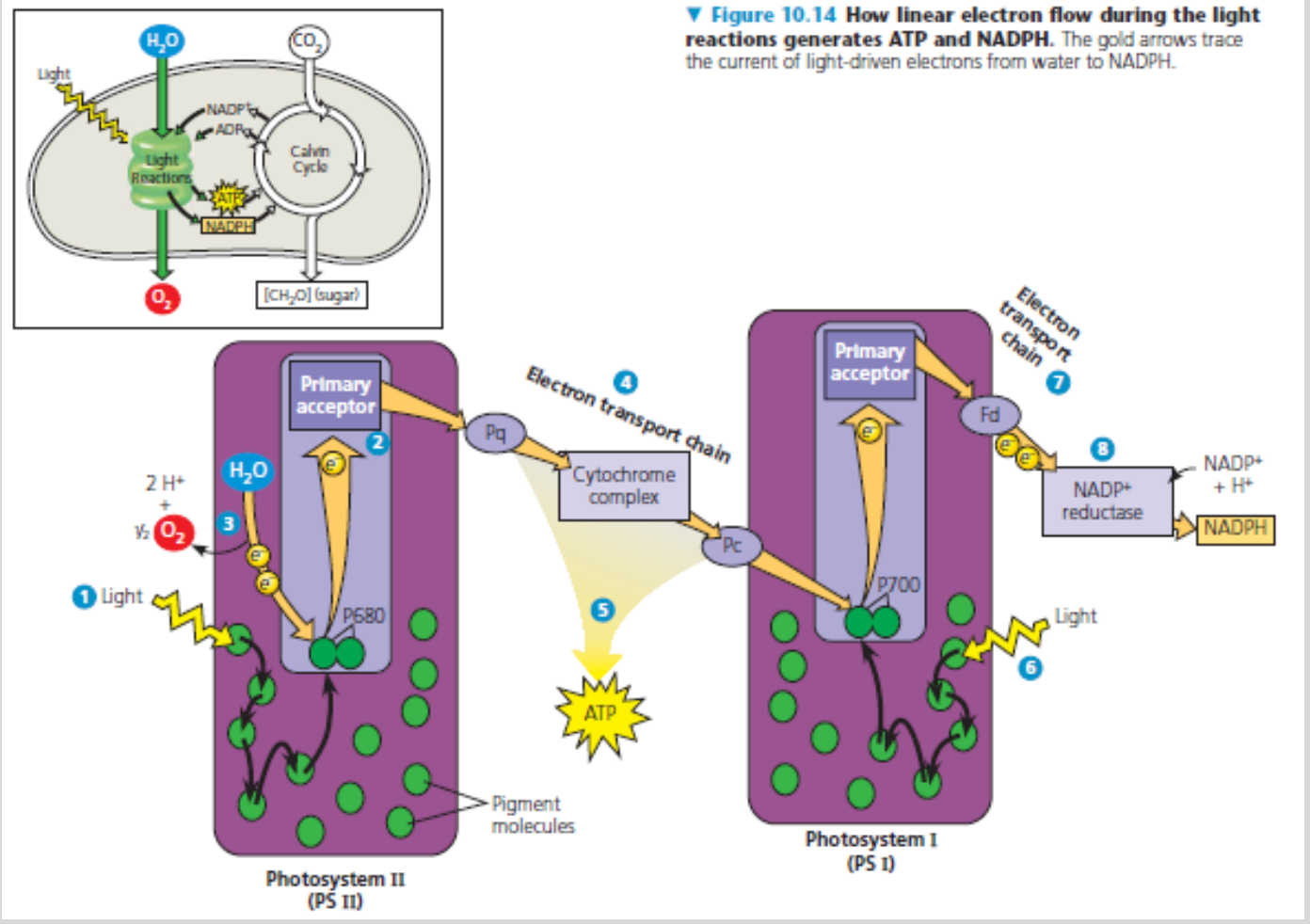
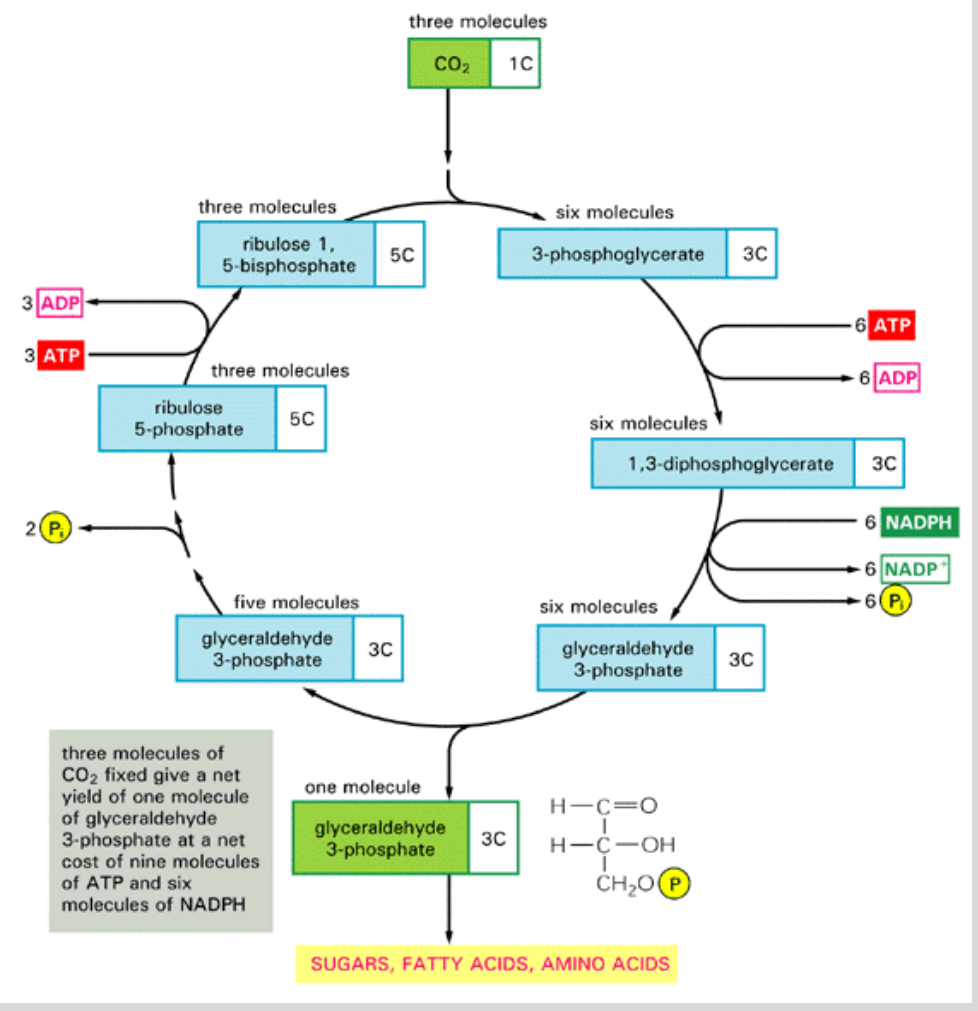
Process	Location	Reactants	Products
Light dependent reactions	Thylakoid Membrane	H_20 NADP+ ADP Light	Oxygen ATP NADPH
Light Independent reactions or Calvin Cycle	Stroma	3 CO_2 9 ATP 6 NADPH	2 G3P 9 ADP, 6 NADP+.

Light Dependent Reactions



▼ **Figure 10.14 How linear electron flow during the light reactions generates ATP and NADPH.** The gold arrows trace the current of light-driven electrons from water to NADPH.

Calvin Cycle



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Questions

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