

**HOWARD UNIVERSITY
COLLEGE OF ARTS AND SCIENCES
COMPREHENSIVE SCIENCES**

**LIFE SCIENCES LECTURE TIMELINE
Fall 2017**

UNIT VI: METABOLISM

<u>WEEK(S)</u>	<u>LECTURE TOPIC(S)</u>	<u>TEXTBOOK CHAPTER(S)</u>
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October 17th-26th

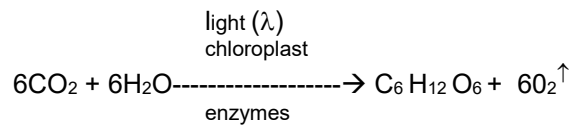
Chapter 5

- definition – Metabolism is the sum total of synthesis (anabolism) and decomposition (catabolism) events that occur in all types of living cells. The cells of all the types of life forms will exhibit some aspects of metabolism
 - necessary requisites for metabolism: (1) energy (light and chemical), (2) enzymes (reductases and oxidases), (3) organelle venues (i.e., chloroplast, mitochondria, cytoplasm)
 - types of METABOLIC SYNTHESIS events:
 - (1) biosynthesis of macromolecules from unit molecules – summary
 - * proteins from amino acids
 - * carbohydrates from saccharides
 - * lipids from fatty acids and glycerol
 - * nucleic acids from nucleotides
 - (2) chemosynthesis – formation of organic molecules from inorganic substances
 - (3) photosynthesis – the transformation of solar energy into chemical energy
 - types of METABOLIC DECOMPOSITION events
 - (1) extracellular decomposition
 - * pathways of digestion in animals – summary
 - * transport systems in plants
 - (2) intracellular decomposition/chemical respiration – overview:
 - * oxidation of sugar molecules in cell cytoplasm and mitochondria to release chemical energy (ATP)
 - energy (the ability to do work)
 - * work/tasks performed by all living cells
 - * 1st and 2nd Laws of Thermodynamics
 - * types of energy
 - (1) solar – source: sunlight (photons)
 - (2) hydraulic – source: water
 - (3) *chemical (ATP) – source: chemical bonds of glucose molecules
- (*Note: ALL life forms use chemical energy to do work)
--i.e., cell division, enzyme action, biosynthesis of macromolecules, transmission of electrical impulses, muscle contractions, etc.

October 17th-26th

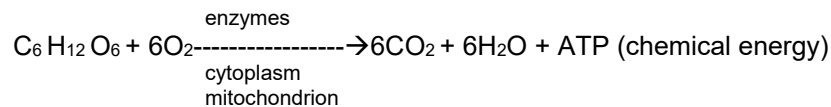
- general equations
(1) photosynthesis (the conversion of solar energy into chemical energy)

Chapter 6



- the light spectrum
(2) chemical (aerobic) respiration (the release of chemical energy/ATP from organic molecules)

Chapter 7



- organelles where reactions occur (chloroplast and mitochondrion)
- chloroplast

Chapter 4.7

- o stroma, grana areas
- o pigment: chlorophyll
- light dependent reaction (λ)
 - o light splits water ($\text{light} + \text{H}_2\text{O} \rightarrow \text{H}^+ + \text{O}_2 \uparrow$)
- light independent reaction (CO_2 fixation) p. 101
 - o carbon dioxide is reduced (H^+ added) to form phosphoglyceraldehyde (PGAL) a sugar molecule precursor
 - o $\text{H}^+ + \text{CO}_2 \rightarrow \text{PGAL}$ (PGAL is a 3-carbon fragment molecule [C_3])
- mitochondrion(a) - chemical respiration
 - o structure: outer membrane, cristae
 - o glycolysis (in cytoplasm)
 - ($\text{C}_6 \rightarrow \text{C}_3 + \text{C}_3$)
 - o Krebs Cycle
 - o Electron Transport
 - o summary of photosynthesis
 - o summary of chemical respiration
- the inter-relationship between photosynthesis and chemical respiration
- review equations

Chapter 4.7

IMPORTANT TOPICS:

- * FREE RADICALS (molecules)
- * ANTIOXIDANTS (molecules)
- * AUTOTROPHS and the BIOSPHERE
- * CALORIES