

**Highlights from Chapters 10, 26 & 27**

**Concepts to Ponder Thoroughly:**

**Photosynthesis**

**Autotrophy**

Electromagnetic Spectrum – Absorption vs. Action spectra

Reaction Center and Accessory Pigments

Light Independent vs. Light Dependent Reactions

Cyclic vs. Noncyclic: Why bother with two possible outcomes?

Substrate level Phos, OxPhos & now PhotoPhos: Compare & Contrast

What are the three stages of the Calvin Cycle

Photorespiration: What a drag to Carbon Fixation & two ways to cope with it.

**Origins of Life**

Conceptual Hurdles for Origins of Life on Earth

Molecular Clues regarding limitations placed on the origins of life

RNA World and Ribozymes

Photosynthesis as the source of atmospheric oxygen

What type of Prokaryotes invented this first and when did their fossils show up?

Why is Louis Pasteur considered the father of origins of life research?

What are the constraints placed on the origins of life by “Impact Frustration”?

What are some of the lessons learned from the “Big Tree of Life”?

How does the “Big Tree of Life” differ from the classical biology ideal?

Prokaryotes, the ultimate biochemists in terms of the metabolic menu.

So what’s the big deal about the evolution of the “Porphyrin Ring”?

Highlights from the Earth’s Timeline (Natural History)

Oxygen in the Atmosphere, what did that pave the way for?

In addition to the Big Five Extinction Events, are we looking at another soon?

### Sample Short Answer Questions:

1. Consider the methods available to make ATP: Ox-phos, photo-phos, & substrate level phosphorylation. (A) Which can occur without oxygen, (B) which is dependent upon the electrons from water, AND (C) which is responsible for generating most of the ATP in your body?
2. (A) Name **two** different metabolic pathways that contain steps where a particular molecule gets **two** phosphate groups attached AND (B) describe/name the molecules within each pathway where this occurs AND (C) briefly describe why each of these molecules are critical to the functioning of their respective pathway.
3. Compare and contrast **cyclic** and **noncyclic photosynthesis** in terms of (A) which photosystems are used, (B) what ultimate products are made in each AND (C) specifically what molecule gets reduced first in each pathway's redox chain (by an excited electron).
4. The addition of norepinephrine (a water soluble hormone) to a solution bathing thyroid cells in culture causes an increase in cytosolic  $\text{Ca}^{++}$  levels and the release of thyroxine (another hormone) by these cells. What is the likely mechanism for this effect?
5. Describe the role that **oxygen** has played regarding the evolution of multicellular organisms. Why did multicellularity get "put off" for such a long time? What were the sources and the sinks for oxygen over the history of the Earth? Now that an excess of oxygen has occurred, what are the feedback mechanisms that control its level in terms of upper AND lower limits in the atmosphere?
6. What is the most abundant protein on the planet and why?