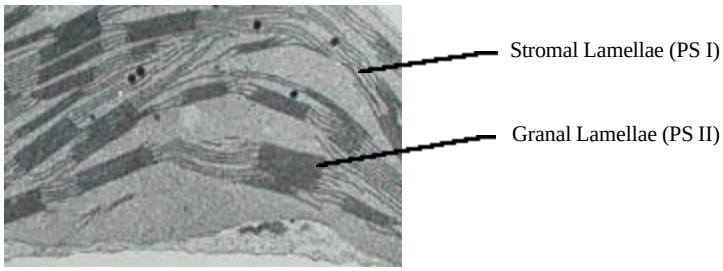
BIOSCI 1820
Quiz #4
MAR 2002

KEY

I. The following depicts an electron micrograph of a section through a chloroplast. Whith a line and label, please indicate precisely the (A) STROMAL LAMELLAE and (B) GRANAL LAMELLAE. Also, indicate in which lamellae Photosystem I is located, and in which lamellae Photosystem II is located.

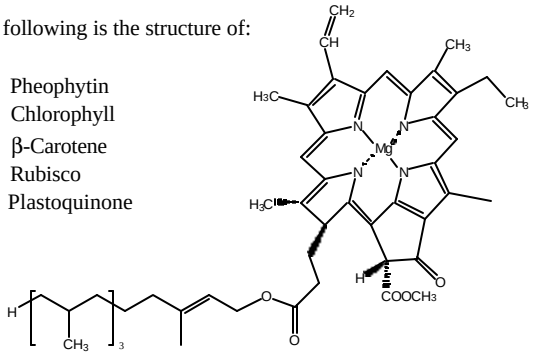


II. Ribulose-1,5-Bisphosphatase-oxygenase is activated by:

A. High magnesium and low pH
B. Low magnesium and low pH
C. High magnesium and high pH
D. Low magnesium and high pH
E. It is an unregulated enzyme

III. The following is the structure of:

A. Pheophytin
B. Chlorophyll
C. β-Carotene
D. Rubisco
E. Plastoquinone



IV. Short Answer:

A. Plants must "choose between making starch and sucrose. Based on their structures, and although it can yield less energy, what advantage do you think sucrose has over starch?

Sucrose is more water-soluble, & can therefore be transported through the plant more easily.

B. The substance dichlorophenyldimethylurea (DCMU) is an herbicide that inhibits photosynthesis by blocking electron transfer between plastoquinones in Photosystem II. What effect would DCMU have on cyclic electron transfer?

No effect, since cyclic transport doesn't utilize the plastoquinones.

C. Through genetic engineering, it was possible to create a plant that could not do photorespiration (Nature, 1996). The resulting plants were found to be highly sensitive to extreme sunlight (i.e. they died prematurely). Why do you think this is so?

In extreme sunlight, a large amount of O_2 is produced which can become toxic. The authors speculated that the plants died due to O_2 toxicity (which is usually used up by photorespiration.)

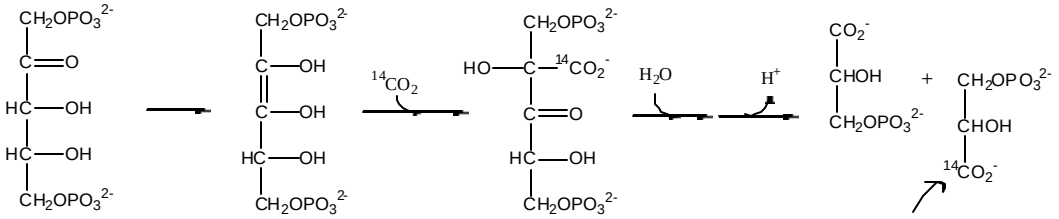
V. The net reaction for photosynthesis can be described as:

$$CO_2 + H_2O \xrightarrow{h\nu} [CH_2O] + O_2$$

Which reactant will be reduced? CO_2 (will become CH_2O)

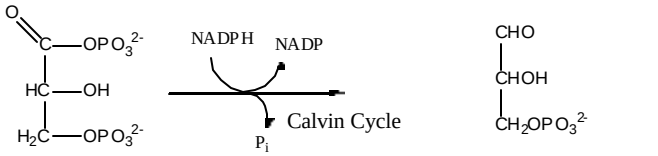
Which reactant will be oxidized? H_2O (will become O_2)

VI. A molecule of $^{14}CO_2$ (radioactive carbon dioxide, in which the carbon is radioactive) is added to Rubisco. Draw the structure(s) of the product(s) and indicate where the radioactive carbon will reside.

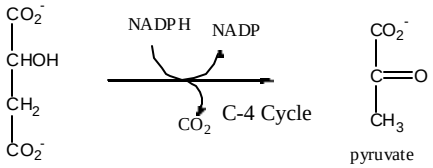


^{14}C in $^1/_2$ of the products!

VII. Draw the structures of the products of the following reactions:



glyceraldehyde-3-phosphate



pyruvate