1. In a chloroplast, the stacks of thylakoids (grana) are where:

   ☐ the light-dependent stage happens

   ☐ the Calvin cycle happens

   ☐ DNA is stored

   ☐ respiration happens

2. Water is split in the light-dependent stage by _____.

   _____

3. In fixation, the enzyme rubisco:

   ☐ breaks down glucose to release CO_2

   ☐ makes ATP from ADP and phosphate

   ☐ joins CO_2 to RuBP to make GP

   ☐ splits water to release oxygen

4. A limiting factor is:

   ☐ the product of photosynthesis

   ☐ the factor in shortest supply that holds back the rate of photosynthesis

   ☐ the factor that is always present in excess

   ☐ the colour of the leaf

5. The light-dependent stage produces:

   ☐ only oxygen, nothing else

   ☐ ATP and reduced NADP

   ☐ glucose directly

   ☐ carbon dioxide

6. Cyclic photophosphorylation:

   ☐ happens in the stroma

   ☐ uses photosystem I only and makes only ATP

   ☐ uses both photosystems and makes ATP and reduced NADP

   ☐ splits water

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_____

8. Adding carbon dioxide can raise the rate of photosynthesis when CO_2 is the limiting factor.

   ☐ True ☐ False

9. The light-dependent stage happens in the stroma, and the Calvin cycle in the thylakoid membranes.

   ☐ True ☐ False

10. Photolysis splits carbon dioxide, releasing oxygen as a by-product.

    ☐ True ☐ False

1. **the light-dependent stage happens**

   The thylakoid membranes hold the pigments and carry out the light-dependent stage; the stroma runs the Calvin cycle.

2. **photolysis**

   Photolysis releases electrons, H^+ and oxygen – the oxygen we breathe is a by-product.

3. **joins CO_2 to RuBP to make GP**

   Rubisco catalyses carbon fixation: CO_2 + RuBP $\rightarrow$ 2 GP.

4. **the factor in shortest supply that holds back the rate of photosynthesis**

   The limiting factor is whichever requirement is in shortest supply, capping the overall rate.

5. **ATP and reduced NADP**

   It uses light to make ATP and reduced NADP, which power the Calvin cycle.

6. **uses photosystem I only and makes only ATP**

   Cyclic photophosphorylation uses PSI alone and produces ATP only (no NADP reduced, no water split).

7. **rubisco**

   Rubisco is the most abundant enzyme on Earth – it fixes nearly all the carbon in the living world.

8. **True**

   Only the factor in shortest supply limits the rate, so increasing it speeds things up.

9. **False**

   False. The light-dependent stage needs the pigments in the thylakoid membranes; the Calvin cycle uses enzymes dissolved in the stroma.

10. **False**

    False. Photolysis splits water using light energy; the oxygen released comes from water, not from carbon dioxide.

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