Applications for A/P biology classes

Building the glucose molecules in 3D from models and LEGOs

1. The glucose molecule from models
    a. Make the 5 carbon/1 oxygen ring.
    b. Note that two of the four bonds on each of the carbon atoms and that both bonds for the oxygen atom have been used.
    c. Add one carbon atom to the ring. This has three empty bonds; fill them with one OH- and two H+ groups.
    d. Add one OH- and one H+ to each of the remaining carbon atoms. When these are added note that they can be put in place such that the OH- groups are close to each other or far apart
    e. How many carbon, hydrogen and oxygen atoms make a glucose molecule
2. Return to photosynthesis equation and create six CO_2 and six H_2O molecules from LEGO standard blocks
    a. Carbon atoms = 8-pegged black standard pieces, Oxygen atoms = 8-pegged red standard pieces, and Hydrogen atoms = 2-pegged small white pieces
    b. Create ring using five carbons and one oxygen
    c. Create the CH_2OH and add it to the ring
    d. Note you have four carbon blocks that still need to bind to tow atoms each
    e. Add an OH- and H+ group to each black piece
    f. Note you are left with 12 oxygen blocks (atoms) which can be made into six oxygen molecules, thus balancing our chemical equation
3. Macro-molecules with your 3-D LEGO creations
    a. Divide the class in half
    b. Show how one would connect two glucoses together, then link a third in a manner such that molecules always stay facing in the same direction
    c. The macro-molecule, starch, is thus created
    d. Note that a water (H_2O) molecule is released as two glucoses are bound together
    e. The second group binds the glucose molecules using adaptors such that every other glucose faces in the opposite direction
    f. Water is still released as two glucose molecules bind together
    g. The molecule, cellulose, is now created
    h. Student groups observe these two macro-molecules noting the tighter (packed) fitness of cellulose vs. starch
4. Research question
    a. Does the oxygen released by plants during the process of photosynthesis come from carbon dioxide or water?
    b. How did scientists answer this question?