

Name _____ Date _____ Period _____

Steps of the Light Reactions and the Calvin Cycle

Review the steps of the Light Reactions and the Calvin Cycle in your notes, vocabulary list, and in Chapter 6. Use each of the terms below just once to complete the passage.

ATP synthase	electrons	photosynthesis
Calvin Cycle	electron transport chain	protons
chemiosmosis	NADPH	stoma
chlorophyll a	oxygen gas	stroma
chlorophyll b	photosystem	thylakoid

PHOTOSYNTHESIS can be divided into two parts: The Light Reactions and the **CALVIN CYCLE**. The light reaction begins with the absorption of light energy by **CHLOROPHYLL A** which is assisted by another pigment **CHLOROPHYLL B** found in the chloroplasts of plant cells. The **ELECTRONS** in these pigments get excited and move through an **ELECTRON TRANSPORT CHAIN** where the final electron acceptor produces **NADPH**. Also occurring in the **THYLAKOID** membrane is **CHEMIOSMOSIS** and a process where water molecules are split to produce **PROTONS**, electrons, and **OXYGEN GAS**. The protons collect inside the thylakoid and exit to the **STROMA** through carrier proteins, an enzyme called **ATP SYNTHASE**, which makes ATP. The electrons are sent to the **PHOTOSYSTEMS** and become available to replace those that were used to make NADPH. The O₂ is released by the plant through structures under the leaf called **STOMA**.

ADP	Calvin cycle	heterotrophs	NADP+	roots	sun
amino acids	carbohydrates	leaves	organic	stems	
atmosphere	carbon fixation	lipids	phosphate	stomata	
ATP	fruits	NADPH	proton	stroma	

In the **STROMA** of chloroplasts, the **NADPH** and **ATP** from the light reactions become reactants in the **CALVIN CYCLE**. Carbon dioxide from the **ATMOSPHERE** enters the leaf through tiny openings called **STOMATA**. In this process called **CARBON FIXATION**, CO₂ joins with various carbon compounds that receive **PHOSPHATES** from ATP and a **PROTON** from NADPH. After several turns of the cycle **ORGANIC** molecules are formed. The **ADP** and **NADP+** are recycled and sent back to the light reactions to be used again. The Calvin Cycle can produce not just glucose, but also **AMINO ACIDS**, **LIPIDS**, and other **CARBOHYDRATES**. Excess starches are stored by the plants in its **ROOTS**, **FRUITS**, **STEMS**, and **LEAVES**.

HETEROTROPHS may come along and eat the plant, thus indirectly gaining energy from the **SUN**.

Write the simple chemical equation for photosynthesis: