

**Light Dependent Role Play
Script**

Narrator Speaks:	“The Sun, the greatest source of energy for our planet, is constantly sending down photons of light energy to Earth’s surface. Plants will take this light energy and convert it to chemical energy. It all starts with just a few small photons.”
Narrator Action:	Point to Sun
Sun Speaks:	“I am the Sun. I send out energy in the form of photons of light. This energy helps to drive the Light Dependent Reactions of Photosynthesis.”
Sun Action:	Hand a tennis ball photon to the Antenna Pigment.
Antenna Pigment Photosystem II Speaks:	“I am chlorophyll. As an Antenna Pigment, my job is to absorb light. I work like an antenna to absorb a photon from the Sun and transfer the energy it contains to another pigment in Photosystem II.”
Antenna Pigment Photosystem II Action:	Accept the photon from the Sun and pass it along to another Antenna Pigment (if one is present), or to the Chlorophyll Reaction Center. LAST ANTENNA PIGMENT PASSES BALL TO CHLOROPHYLL REACTION CENTER.
Chlorophyll Reaction Center (P680) Action:	Take 1 ball (photon) from Antenna Pigment and put in muffin pan (electron).
Sun Speaks:	“I am the Sun. I send out energy in the form of photons of light. “
Sun Action:	Hand a tennis ball photon to the Antenna Pigment.
Antenna Pigment Photosystem II Speaks:	“I am chlorophyll. As an Antenna Pigment, my job is to absorb light.
Antenna Pigment Photosystem II Action:	Accept the photon from the Sun and pass it to the Chlorophyll Reaction Center. (If no other Antenna Pigments are present.)
Chlorophyll Reaction Center (P680) Action:	Take 1 ball (photon) from Antenna Pigment and put in muffin pan (electron).
Sun Speaks:	“I am the Sun. I send out energy in the form of photons of light.”
Sun Action:	Hand a tennis ball photon to the Antenna Pigment.
Antenna Pigment Photosystem II Speaks:	“I am chlorophyll. As an Antenna Pigment, my job is to absorb light.”
Antenna Pigment Photosystem II Action:	Accept the photon from the Sun and pass it to the Chlorophyll Reaction Center. (If no other Antenna Pigments are present.)

Chlorophyll Reaction Center (P680) Action:	Take 1 ball (photon) from Antenna Pigment and put in muffin pan (electron).
Narrator Speaks:	“When the Antenna Pigment has received enough energy from the photons, an electron is raised to an excited energy state and has to leave the molecule. Chlorophyll Reaction Center, can we hear from you?”
Chlorophyll Reaction Center (P680) Speaks:	“I represent a special pair of chlorophyll molecules in Photosystem II that receives energy from the Antenna Pigments. As energy builds up, electrons become “excited” and will be transferred to the Primary Electron Acceptor. I now have to wait until water is split to replace my lost electron.”
Chlorophyll Reaction Center (P680) Action:	Give full pan to Primary Electron Acceptor.
Narrator Speaks:	It is here that we must examine what happens to the water molecule. Water Enzyme, tell us what happens.
Narrator Action:	Point to Water Enzyme.
Water Enzyme Speaks:	“I represent the enzyme that splits water. I break the bonds between the hydrogen and the oxygen in a water molecule. Electrons are released. One electron is transferred immediately to the Chlorophyll Reaction Center P680 to replace the one it has lost. The oxygen from the water forms oxygen gas that is released to the atmosphere. The molecule releases hydrogen ions that are needed later in the light reactions. “
Water Enzyme Actions:	Remove the muffin pan from the Water Enzyme Container and pass it to the Chlorophyll Reaction Center. Remove the oxygen balloons and lay them aside. Remove and hold the hydrogen protons. Move and stand next to the NADP+ Reductase Enzyme. (LATER IN THE ROLE PLAY, these hydrogen protons will be used in Photosystem I. When NADP+ Reductase Enzyme is speaking, take the hydrogen protons and place them in the NADP+ container.)
Narrator Speaks:	Now that the Chlorophyll Reaction Center has received an electron from the splitting of water, we will continue the action with the Primary Electron Acceptor in Photosystem II.
Narrator Action:	Point to the Primary Electron Acceptor in Photosystem II.
Primary Electron Acceptor Photosystem II Speaks:	I have received the excited electron from the Chlorophyll Reaction Center. The excited electron will be passed along to the Electron Transport Chain.
Primary Electron Acceptor Photosystem II Action:	Pass muffin pan to Electron Transport Chain Photosystem II.

Electron Transport Chain Photosystem II Speaks:	“As the Electron Transport Chain, I connect the two Photosystems. The excited electron will lose energy as it is passed from molecule to molecule down the chain. The energy will be used to form an ATP molecule.”
Electron Transport Chain Photosystem II Action:	Place 3 tennis balls into the ATP bucket. Hold the muffin pan until it is time to pass it to the Chlorophyll Reaction Center in Photosystem I.
ATPase Enzyme Speaks:	“I am an enzyme called ATPase. As an electron moves along the Electron Transport Chain in Photosystem II it loses energy. I use the energy to add a Phosphate to ADP to create an energy rich ATP molecule. The ATP molecule provides energy needed in the second stage of photosynthesis, the light independent reactions.”
ATPase Enzyme Action:	Place the phosphate sign into the ADP container and pull out the ATP sign.
Narrator Speaks:	Now we will examine what happens in Photosystem I. A very similar process is occurring here. Keep in mind that both Photosystems are running at the same time. We now pick up the action with the Sun in Photosystem I.
Narrator Action:	Point to Sun dramatically!
Sun Speaks:	Here I am, the Sun again! I’m sending down my photons to supply energy to another phase of the light dependent reactions.
Sun Action:	Hand a tennis ball photon to the Antenna Pigment.
Antenna Pigment Photosystem I Speaks:	“I am chlorophyll. As an Antenna Pigment, my job is to absorb light. I work like an antenna to absorb a photon from the Sun and transfer the energy it contains to another pigment in the photosystem.”
Antenna Pigment Photosystem I Action:	Accept the photon from the Sun and pass it along to another Antenna Pigment (if one is present), or to the Chlorophyll Reaction Center. LAST ANTENNA PIGMENT PASSES BALL TO CHLOROPHYLL REACTION CENTER.
Chlorophyll Reaction Center (P700) Action:	Take 1 ball (photon) from Antenna Pigment and put in muffin pan (electron).
Sun Speaks:	“I am the Sun. I send out energy in the form of photons of light. “
Sun Action:	Hand a tennis ball photon to the Antenna Pigment.
Antenna Pigment Photosystem I Speaks:	“I am chlorophyll. As an Antenna Pigment, my job is to absorb light.”
Antenna Pigment Photosystem I Action:	Accept the photon from the Sun and pass it to the Chlorophyll Reaction Center. (If no other Antenna Pigments are present.)

Chlorophyll Reaction Center (P700) Action:	Take 1 ball (photon) from Antenna Pigment and put in muffin pan (electron).
Sun Speaks:	“I am the Sun. I send out energy in the form of photons of light.”
Sun Action:	Hand a tennis ball photon to the Antenna Pigment.
Antenna Pigment Photosystem I Speaks:	“I am chlorophyll. As an Antenna Pigment, my job is to absorb light.”
Antenna Pigment Photosystem I Action:	Accept the photon from the Sun and pass it to the Chlorophyll Reaction Center. (If no other Antenna Pigments are present.)
Chlorophyll Reaction Center (P700) Action:	Take 1 ball (photon) from Antenna Pigment and put in muffin pan (electron).
Chlorophyll Reaction Center (P700) Speaks:	“I represent a special pair of chlorophyll molecules in Photosystem I that receives energy from the Antenna Pigments. As energy builds up, electrons become “excited” and will be transferred to the Primary Electron Acceptor.
Chlorophyll Reaction Center (P700) Action:	Hand pan to Primary Electron Acceptor.
Narrator Speaks:	Let’s observe what is happening in Photosystem I. The Chlorophyll Reaction Center has lost an electron. The electron will be replaced by an electron passing down the Electron Transport Chain from Photosystem II.
Narrator Action:	Point to the Electron Transport Chain Photosystem II.
Electron Transport Chain Photosystem II Speaks:	If you’ll remember, the electron lost energy that was used to produce ATP in Photosystem II. The electron will now pass to the Chlorophyll Reaction Center in Photosystem I to replace its lost electron.
Electron Transport Chain Photosystem II Action:	Pass muffin pan to the Chlorophyll Reaction Center P700.
Narrator Speaks:	The chlorophyll molecule has regained an electron and is now stable. We will now resume the action at the Primary Electron Acceptor in Photosystem I.
Primary Electron Acceptor Photosystem I Speaks:	“I received the excited electron from the Chlorophyll Reaction Center in Photosystem I. The excited electron will be passed from here to a molecule in the Electron Transport Chain.”
Primary Electron Acceptor Photosystem I Action:	Pass the electron (muffin pan) to the Electron Transport Chain Photosystem I.

Electron Transport Chain Photosystem I Speaks:	“I represent the Electron Transport Chain in Photosystem I. I received an excited electron from the Primary Electron Acceptor. The electron and all its energy is transported to NADPH Enzyme. This provides energy so that an enzyme can create NADPH.”
Electron Transport Chain Photosystem I Action:	Put the entire muffin pan into the NADPH Enzyme container.
NADP+ Reductase Enzyme Speaks:	“I am the Reductase enzyme. I received the electron from the Electron Transport Chain in Photosystem I. I am the last stop in the light dependent reactions. The electron provides energy so that I can create NADPH using hydrogen ions from water. NADPH will provide energy for the next stage of photosynthesis, the light independent reactions.”
Water Enzyme Action:	Take the hydrogen ion and place it in the NADPH Enzyme container.
NADP+ Reductase Enzyme Action:	Combine the purple (or other color balloon) with the Hydrogen ion (white balloon) to create a NADPH molecule model.
Narrator Speaks:	The light dependent reactions are now complete. We have observed the movement of electrons as they gain and lose energy to produce two important compounds. ATP and NADPH come forward. You will now be used in the light independent reactions.
ATPase Enzyme Action:	Come forward with ATP sign.
NADP+ Reductase Enzyme Action:	Come forward with NADPH sign.
ATPase Enzyme and NADP+ Reductase Enzyme Speak Together	We are products of the light dependent reactions which are now complete. We will now be used in the light independent reactions, also known as the Calvin Cycle.