



Leafy Chefs

The Recipe of Photosynthesis!



Learning Outcomes



After this lesson, learners will be able to:

- Recall the process of photosynthesis in plants.
- Justify why nature, material cause, and chance cannot be the source of photosynthesis.
- Describe the interconnectivity between photosynthesis and the universe.
- Identify the Names of Allah reflected in the process of photosynthesis.
- Discuss the blessings bestowed by Allah through the gift of photosynthesis.
- Derive character lessons from photosynthesis.

1

First Step



Explore

What is photosynthesis? Photosynthesis takes place in the leaves of plants, algae, and some bacteria. It is a source of food for them. Plant cells need **chlorophyll**, sunlight, and **carbon dioxide** for photosynthesis. Plants take in water from the soil and carbon dioxide from the air. Photosynthesis starts when **chlorophyll absorbs energy from sunlight**. Light energy from the Sun is transformed into **sugar** and **oxygen** gas. The plants use some of the sugars and store the rest. The oxygen is released into the air.

Why is photosynthesis important? Photosynthesis is needed for life on Earth. Without it, there would be no green plants. Almost all living things depend on plants for food. Photosynthesis is also important because we get oxygen through it. Humans and other animals need to breathe in oxygen to survive.



Fascinating Facts



1. Year-round food factories: Evergreen trees, like pine trees, undergo photosynthesis all year, even in winter! Their needles are like mini-green factories that don't close when it gets cold.



2. Glow in the dark plants: Star Jasmine is a beautiful vine with small white flowers that emit a soft light in the dark, bringing a dreamy atmosphere to your garden.



3. Oxygen factories: Over half of the oxygen we breathe comes through algae! Algae work like underwater oxygen factories, bringing us fresh air.



4. Plants are connected to each other! Scientists discovered that plants are designed to release chemicals that connect them to each other. They work together as if they talk to each other.



5. Some plants respond to sound. Scientists discovered that when sweet pepper plants were exposed to specific sound frequencies, they were 60% sweeter.

Watch these videos on photosynthesis.



The video presents the concepts of photosynthesis through a secular lens. As you watch the video with students, ask them to reflect on their experience of preparing food. After viewing, pose this question for reflection: Do plants produce their food, or is it made for them through photosynthesis?

2

Second Step



Compare

Let's compare photosynthesis with the food we cook. Imagine a kitchen where, just like our homes, delicious dishes are being prepared. But this isn't an ordinary kitchen. It's inside a plant! Here, food is 'cooked' in a unique way. In our kitchens, we gather ingredients, follow a recipe, and use heat to transform those ingredients. We chop, stir, and sometimes even flip our food to get it just right. It takes practice to be good at it, and even the most famous chefs are always learning more! Now, peek into the 'kitchens' of plants. Instead of stoves and ovens, sunlight is needed. Water and air are their main ingredients, and photosynthesis is a fantastic recipe. Inside plants, through the help of the Sun, water and air are transformed into food! It's quite a sight! Something truly wonderful is happening. It's more impressive than any talented chef. So, the next time you see a plant, think about the incredible 'cooking' happening inside. Food is made in a way that's far more complex and fantastic than anything we do in our kitchens.



Watch this video to see that preparing a simple soup requires many skills.

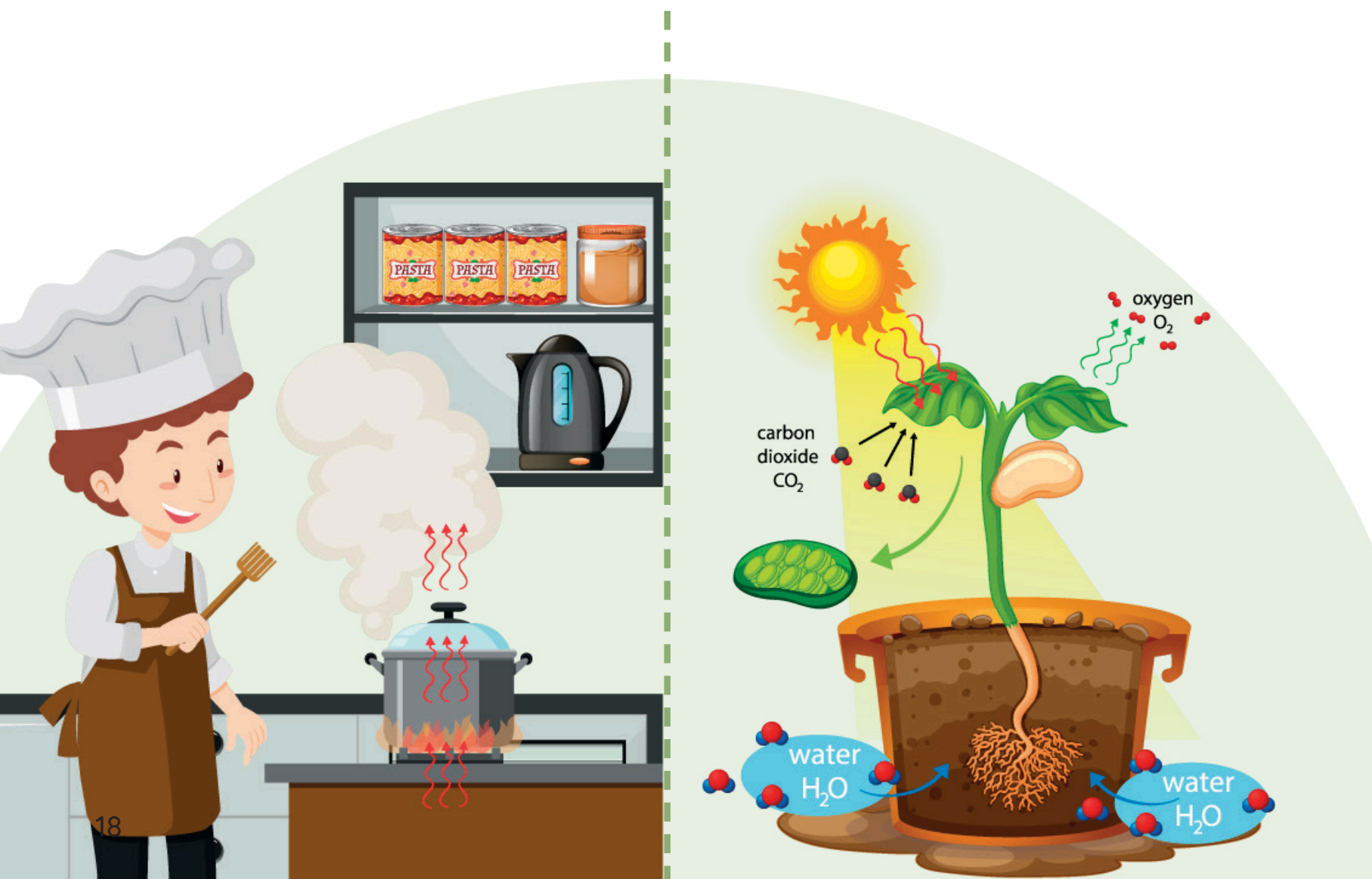


Watch this video to see this amazing chef appreciated for his wonderful dishes.



Teacher notes

You may use different analogies for photosynthesis. We use the kitchen analogy here since the emphasis is on food production. If the emphasis is on oxygen production in photosynthesis, it would be better to use an artificial oxygen-making device as an analogy.



3

Third Step



Question

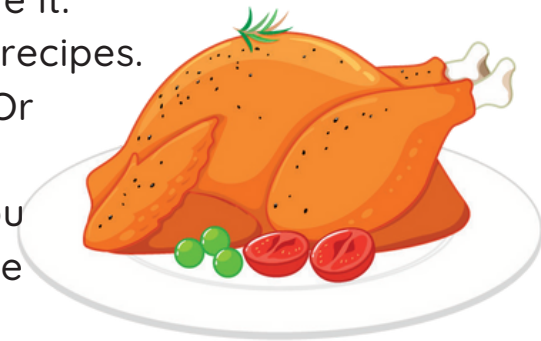
Let's find out if nature, cause or chance can make photosynthesis happen in leaves.

Nature - From the analogy of a chef cooking in the kitchen, can we say that a plate of roast chicken appeared 'naturally' in the kitchen? Since you found it ready to be eaten on the plate, can you say it was always there? Did it get there 'naturally'? Of course not! Someone had to prepare it.

Let's look at the 'natural laws' in the seed. They are like recipes.

But can you say the recipe will cook the roast chicken? Or do you think a cook is needed to prepare the chicken?

So, how can plants prepare food with a recipe? Don't you think there must be a cook who cooks the food inside the leaves?



Material Cause - What is the cause of photosynthesis? Is it chlorophyll? Is it the sunlight? Is it water in the soil? Is it the plant itself? These are essential, just like flour, eggs, and sugar for a cake. But do those cake ingredients in a kitchen bake themselves into a delicious dessert? Of course not! No matter how long those ingredients sit there, they won't transform themselves. Similarly, can chlorophyll, sunlight, and water, with the 'recipe' of photosynthesis, make sugar within a plant all by themselves? Do **plants** think, plan, and consult the Sun and the soil? We know that this doesn't happen.



Chance - Imagine finding a perfectly cooked chicken in your kitchen. Would you say it was pure luck? Or is it the work of someone who cares about you? What about the food we get through plants? Do plants just happen to give us delicious fruits and vegetables packed with everything we need to be healthy? Is that just a lucky accident? It's amazing that plants are taking our waste, something we can't use, and giving us the air we breathe! How did we get so lucky? Could all the tiny parts of a plant figure out how to make food from sunlight and water all by random chance?

Let's think together

Do plants have their own will, knowledge, or power?

- Even the best scientists can't make a leaf that works like a real leaf, bringing us oxygen! How do simple plants do it, then?
- Did a tiny seed teach a plant how to make oxygen? This is not possible because the seed itself has no knowledge or power.
- If we say plants make oxygen for us, does that mean they're more knowledgeable than scientists? That's not true.
- So, if plants don't have a mind, who's the amazing designer behind them?



4

Fourth Step



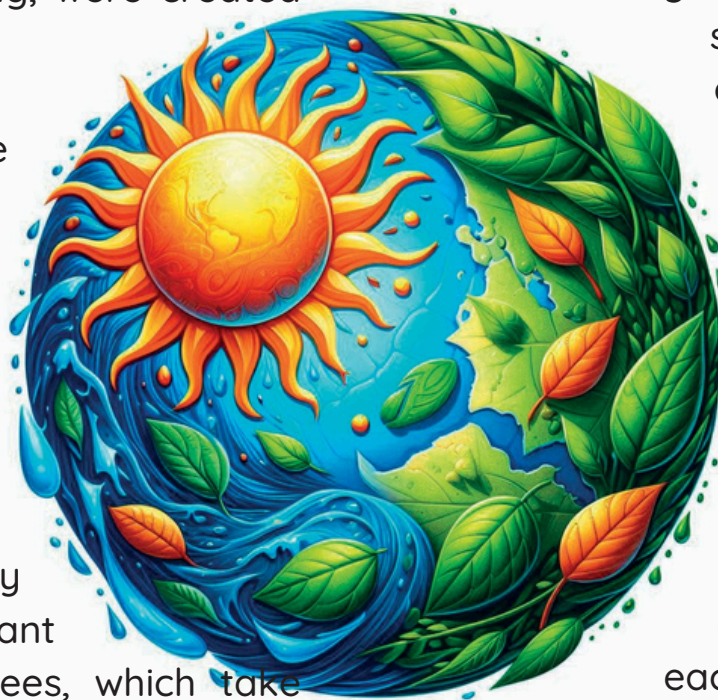
Connect

Interconnectivity You, photosynthesis, and the Universe Did you know you're connected to stars that exploded long ago? Essential minerals such as carbon, calcium, and iron, which are needed to make your blood healthy and your bones strong, were created during that explosion.

Plants need these special ingredients, too! They get them from the soil.

Without them, they couldn't grow or bring us food through photosynthesis.

The flower's pretty design and pleasant smell attract honeybees, which take the flower's nectar and thus help with pollination, an important step in making new seeds for the plant. Air, water, and sunlight also play a key role in photosynthesis. Everything working together like this shows us there must be one Creator behind it all. Think about it - the One who made a tiny leaf in connection with the Sun must have also made the whole giant universe!



Interdependency:

No One Can Survive on Their Own

The process of photosynthesis depends on various factors. It depends on sunlight, air, and water in the soil. Plants depend on tiny organisms inside the soil,

such as earthworms and other bacteria, that help maintain soil quality.

Humans

depend on plants for their food.

Other living beings depend

on plants and each other. When something depends on

different things, it cannot exist on its own. So, what does everything depend on?

Everything must depend on an Independent Being. This means that everything in the universe depends on a Self-Sustaining Creator. He is Allah.

What can we know about our Creator from photosynthesis?



The One who gives animals and humans the clean air we breathe must be very merciful. We do not have to worry about having to find oxygen!

The Bestower of Mercy

Ar-Raheem
الرَّحِيمِ

He gives us delicious and nutritious food through plants that make us happy and healthy.

The Benefactor

An-Nafi
النَّافِعِ

He knows how to make different and beautiful plants that are useful to all creatures. He creates amazing environments for life to flourish.

All-Aware

Al-Khabeer
الْخَبِيرِ

He decides precisely how much oxygen every person and animal needs and ensures plants give us enough!

The Reckoner

Al-Haseeb
الْحَسِيبِ

He provides all living things with the perfect food to grow strong.

The Nourisher

Al-Muqet
الْمُقِتِّ

5

Fifth Step



Appreciate

Let's imagine life without photosynthesis to appreciate how incredible it is. What if plants suddenly stopped bringing us food? What if all the green leaves withered away? The world would become dull and grey without all those beautiful colors. Even worse, we wouldn't have any oxygen to breathe! Without plants, the air would fill up with carbon dioxide, which is not good for us in large amounts. We'd run out of food quickly! Since plants are connected to animals, they would slowly disappear. Doesn't this make you appreciate how amazing photosynthesis is? Plants work like tiny kitchens in which our food is cooked. Just like we're grateful for chefs who make delicious food, we should thank the amazing Creator who designed photosynthesis to give us food. He takes the carbon dioxide, which can be harmful and turns it into oxygen. The best part is that we get this special gift for free!



Let's do Dhikr, Fikr and Shukr.

Dhikr Fikr Shukr



Remember that plants do not make food. Only Allah creates food through photosynthesis.

Think about the amazing process through which Allah creates food and oxygen for living beings.

Thank Allah for the precious and free gifts of oxygen and food given to us through photosynthesis.

Character Lessons

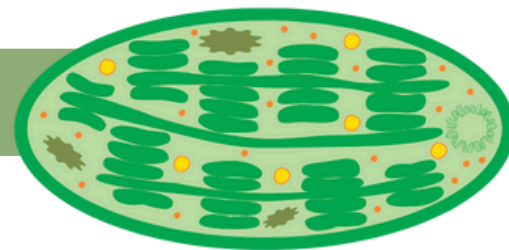
Purification:

Plants act like air cleaners! They take in carbon dioxide and help make the air better to breathe. Like plants, we can keep our community clean and pure by choosing kind words and helpful actions.



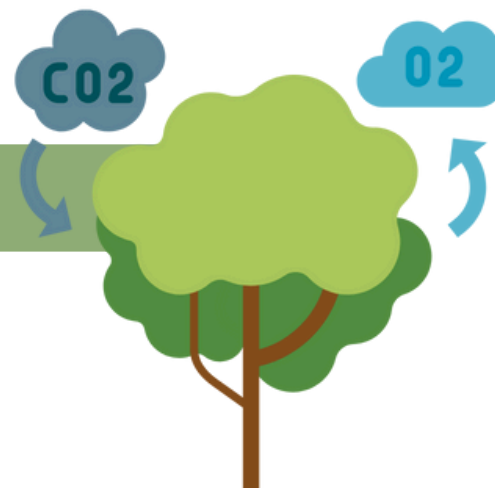
Making small, consistent changes:

Photosynthesis happens in many small steps, but all those tiny steps lead to something amazing. This reminds us that even small, good daily choices can add to positive changes in our lives.



Turning Negatives into Positives:

Just as carbon dioxide, a gas that is harmful to us, is turned into oxygen that we need to breathe and live, we too can learn to turn challenges into opportunities. This shows us that even in harsh or 'negative' situations, we can discover ways to bring out something good or valuable, making the most of what we're given.





Connect with Qur'an

In the following verse, the Qur'an invites us to reflect on food.

فَلْيَنْظُرِ الْإِنْسَانُ نَبْطَهُ إِلَىٰ مَا أَمْرَهُ عَمَلَهُ

“Then let mankind look at his food.”

Surah at a baSa, 80:24

As we study food, we can conclude that

إِنَّ اللَّهَ هُوَ الرَّزَاقُ ذُو الْقُوَّةِ الْمَمْتِينِ

“Allah alone is the Supreme Provider—Lord of all Power,
Ever Mighty.”

Surah al D hariyat , 51:58

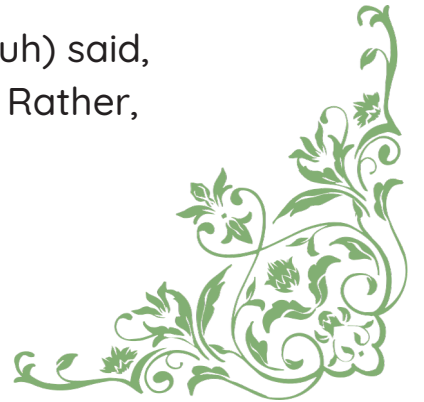
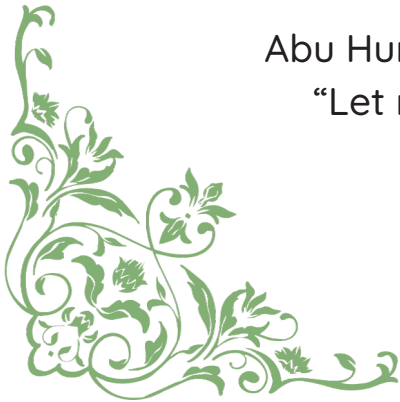
Watch this video about the blessings of plants to appreciate their
Creator and the universe.



Hadith

Abu Huraira (ra) narrated that the Prophet (pbuh) said,
“Let not one of you say: I have grown crops. Rather,
let him say: I have sown crops.”

Sahih ibn ibbaan





Du'a

Sunlight shines on plants so green,
A special gift, a wondrous scene!
Photosynthesis is a miracle, we believe
It brings clean air for us to breathe,
Plants and the Sun, a special pair,
Bring us oxygen and food to share.
Fruits are so yummy, the air so sweet,
Thank You, Allah, for this special treat!



A c t i v i t i e s

Explore

Leaf Discs and Bubbles Experiment

Materials:

- Fresh leaves (spinach works well)
- A hole punch
- A clear plastic cup or a small glass bowl
- Water
- Baking soda (1/2 tsp)
- A plastic syringe (without the needle) or a straw
- A source of light (sunlight or a lamp)



Instructions:

1. **Prepare the Solution:** Fill the cup or bowl with water and mix in 1/2 tsp of baking soda. The baking soda provides carbon dioxide, which helps photosynthesis happen.
2. **Punch Out Leaf Discs:** Use the hole punch to make leaf discs from the fresh leaves. You might need an adult's help with this part.
3. **Get the Leaf Discs to Sink:** Put the leaf discs into the syringe and then fill the syringe with the baking soda solution. Put your finger over the end of the syringe, push the plunger to remove most of the air, and pull it back to suck in the solution and the discs. This step makes the leaf discs sink to the bottom of the syringe because it removes the air from them.
4. **Transfer to the Cup:** Carefully squirt the leaf discs and the solution into the clear cup or bowl. Make sure the discs are at the bottom.
5. **Light it up:** Place the cup or bowl in a well-lit area or under a lamp.
6. **Observe:** Watch the leaf discs over time. Initially, they should stay sunk at the bottom. But as photosynthesis occurs, you will see oxygen bubbles, and the leaf discs will eventually float to the top.

Discussion and Reflection:

- Why do you think the leaf discs begin to float?
- Where do the bubbles come from?
- What does this experiment show about light's role in photosynthesis and plants' importance in bringing us oxygen?

Safety Tips:

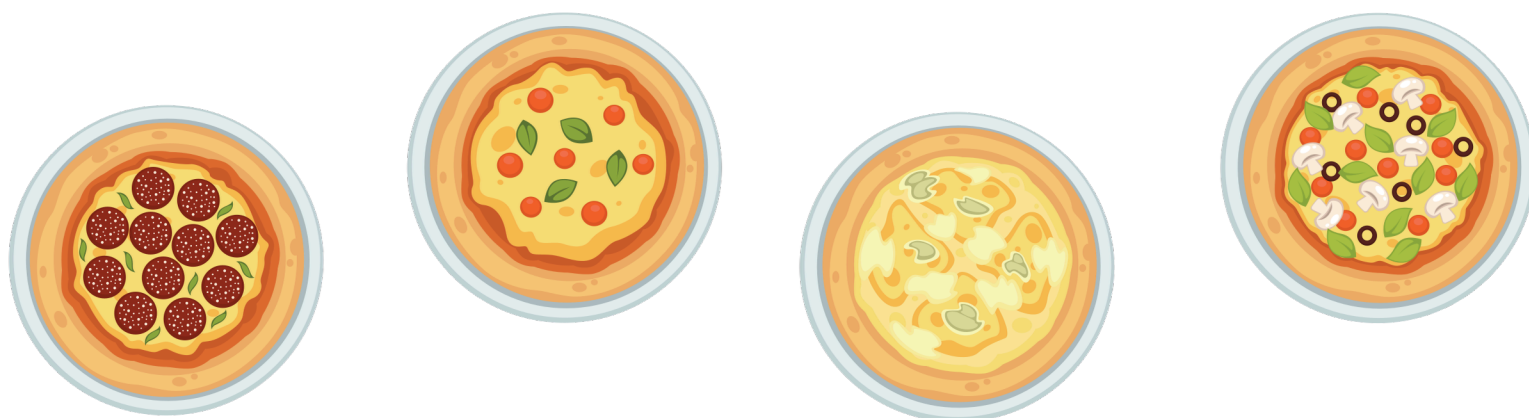
- Ensure adult supervision throughout the experiment, especially when using the hole punch and syringe.
- Be gentle with the leaves and do not ingest any materials.

Compare

Mini English Muffin Pizzas

Ingredients:

- 4 English muffins
- Tomato sauce or pizza sauce (1 cup)
- Shredded mozzarella cheese (1 cup)
- Toppings of choice (such as pepperoni slices, chopped vegetables, ham, pineapple)
- Baking sheet
- Toaster oven or regular oven (to be used by an adult or with adult supervision)





Instructions:

1. **Prepare the Muffins:** Cut the English muffins in half to make two round ‘pizza bases’ for each muffin.
2. **Toast the Muffins:** Lightly toast the English muffin halves in a toaster. This step helps the ‘pizzas’ hold up better under the sauce and cheese. Make sure an adult is supervising or handling the toaster.
3. **Add Sauce:** Spread a tablespoon of tomato sauce or pizza sauce on each toasted muffin half. Not too much, just enough to cover the surface.
4. **Add Cheese:** Sprinkle a generous amount of shredded mozzarella cheese over the sauce on each muffin half.
5. **Add Toppings:** Add whatever topping you like, but remember to keep the toppings manageable.
6. **Bake the Mini Pizzas:** Place the English muffin pizzas on a baking sheet. An adult should then bake them in a preheated oven (375°F) or a toaster oven for about 10 minutes or until the cheese is melted and bubbly.
7. **Cool and Serve:** Allow the mini pizzas to cool for a few minutes before serving. This is important to prevent burns from hot cheese.

Safety Tips:

- All cooking steps, especially those involving the oven and toaster, should be done by an adult or under strict adult supervision.

Question

Think. Pair. Share

Select one question, discuss it, and present your answers to the class.

1. Is it through luck that plants bring us oxygen, or is there a reason behind the process?
2. Why do you think it's hard for scientists to make something that works like a leaf, even with all their knowledge and tools?
3. Photosynthesis involves precise steps and conditions, much like following a recipe. How do plants 'know' how to execute these steps perfectly without a conscious mind?
4. Photosynthesis involves precise coordination between the Sun, water, and plants. Does nature have a role in this precise coordination? Give reasons.

Connect

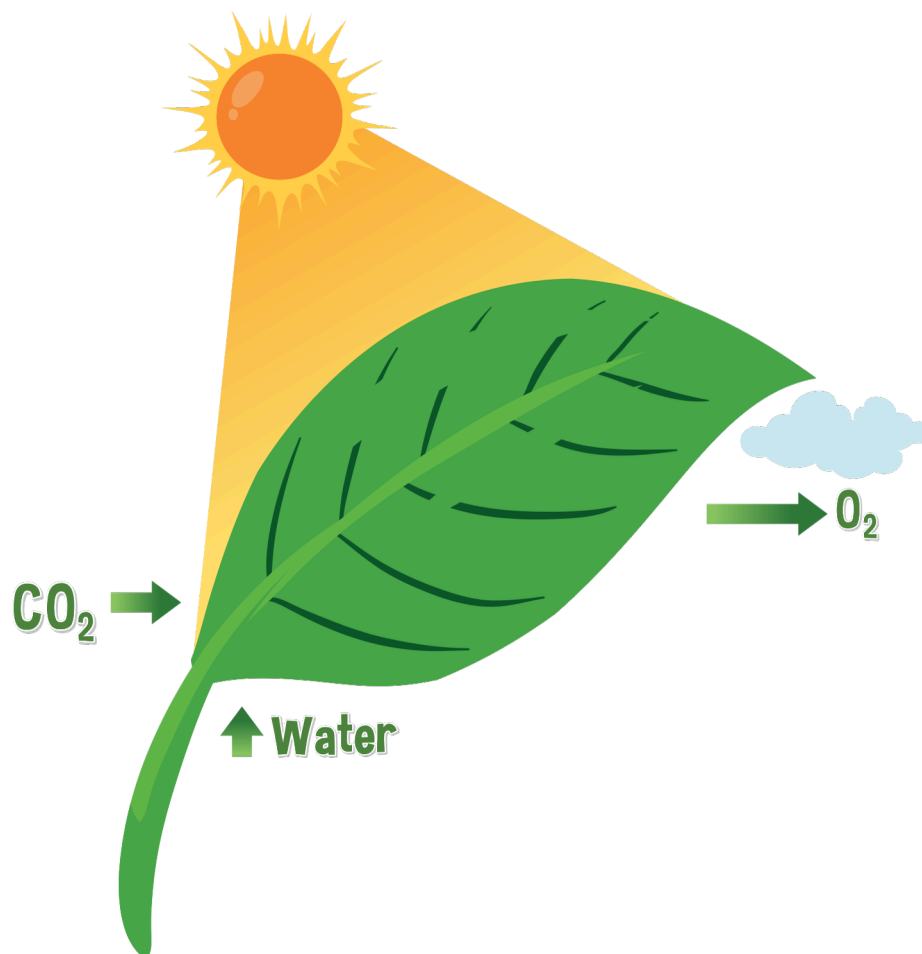
Make a list of ten things on which photosynthesis is dependent. Then, draw and label a diagram to show the interconnectivity.

- | | | | |
|---|-------|----|-------|
| 1 | ..... | 6 | ..... |
| 2 | ..... | 7 | ..... |
| 3 | ..... | 8 | ..... |
| 4 | ..... | 9 | ..... |
| 5 | ..... | 10 | ..... |

Divine Names

Read the Divine names and list a few things that remind you of each name.

Ar-Raheem الرحيم الرحيم	An-Nafi' النافع النافع	Al-Khabeer الخبير الخبير	Al-Haseeb الحسيب الحسيب	Al-Muqit المقيت المقيت



Appreciate

Glorification Game

Let's play the game described at the start of this book.

Think of five things about photosynthesis that make you appreciate Allah's power.

Say 'SubhanAllah' for each one to show your amazement and appreciation.

What I learned

Think about the character lessons you have learned from photosynthesis.

Complete these sentence stems:

- I used to think...

- Now, I think...