- process ofwater splitting, where water molecules are separated into hydrogen and oxygen.
- This process is facilitated by the presence of enzymes or other catalysts that act as a bridge between theelectrical energy and the water splitting reaction.
- The hydrogen produced by the bionic leaf can then be stored and used as a source of energy for a variety of applications, such as powering vehicles or generating electricity.
- Additionally, the oxygen produced by the bionic leaf can be released into the atmosphere, whereit can help to mitigate the effects of climate change by reducing the levels of atmospheric carbondioxide.
- A flow chart of the working principle of bionic leaf is given below:

Sunlight is captured and directed to the bionic leaf.

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The bionic leaf contains a catalyst (typically a special type of bacteria or an artificial catalyst) and a water-splitting enzyme.

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Sunlight energy is used to split water molecules (H2O) into hydrogen ions (H+) and oxygen (O2)through a process called photolysis.

1

The hydrogen ions (H+) generated from water splitting combine with electrons from an external source (e.g., a wire) to form hydrogen gas (H2).

1

The oxygen gas (O2) produced during water splitting is released into the atmosphere.

1

The generated hydrogen gas (H2) can be collected and stored for later use as a clean andrenewable energy source.

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The bionic leaf also absorbs carbon dioxide (CO2) from the air or a supplied source.

 $\downarrow$ 

The absorbed carbon dioxide (CO2) is converted into carbon-based compounds, such as formicacid or methane, through a reduction reaction.

1

The carbon-based compounds can be used as a fuel or converted into other useful chemicals.

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The bionic leaf operates in a closed-loop system, where the produced oxygen (O2) during watersplitting is reused by the catalyst in subsequent cycles.

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