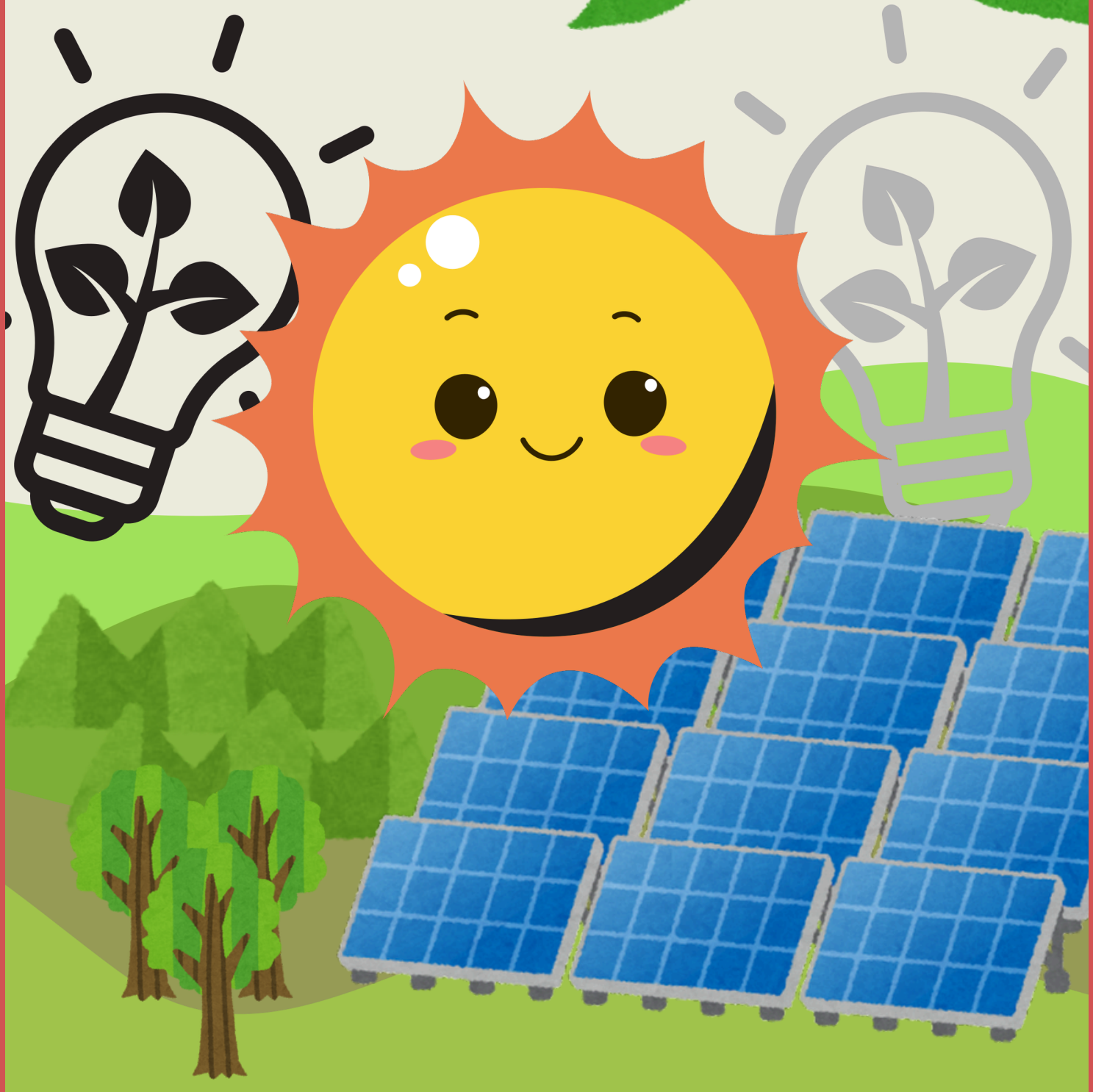
STEAMlab
Science | Technology | Engineering | Arts | Mathematics

MYSTERIES OF THE SUN



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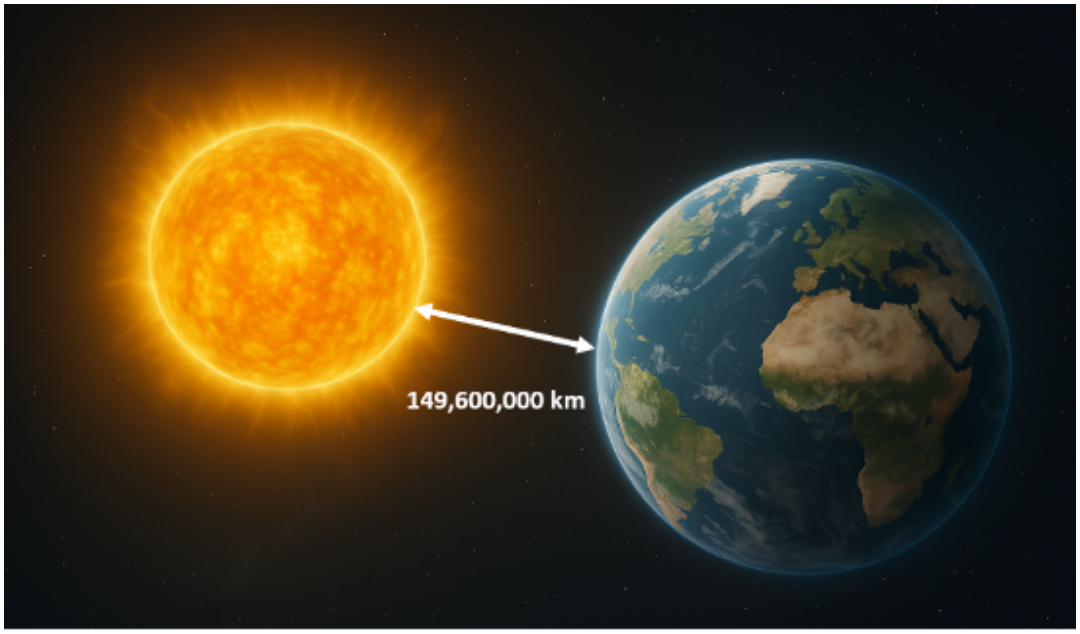
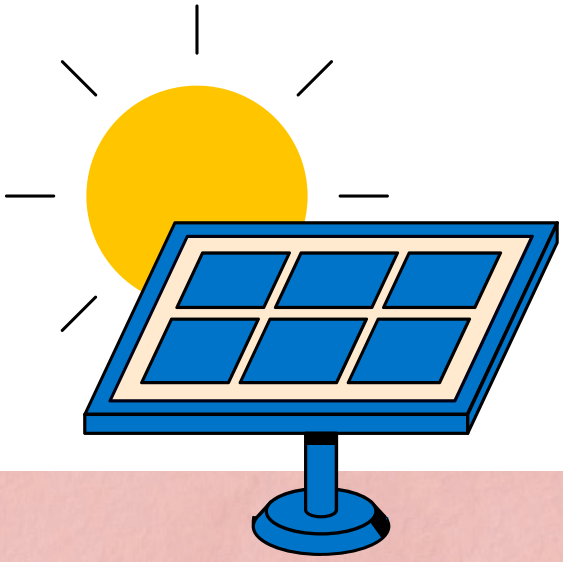
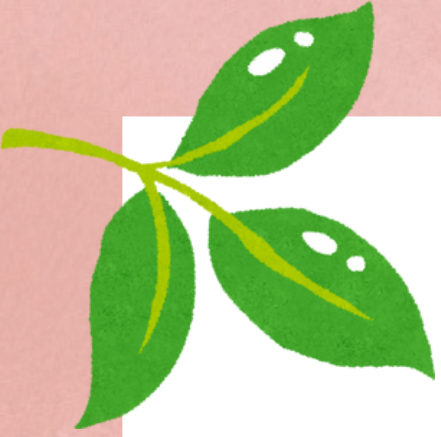


Since ancient times, humanity has been on a continuous journey to explore the Sun. Did you know? The Sun is approximately 149.6 million kilometers away from Earth! It resembles a blazing fireball, with a core temperature soaring to 15 million degrees Celsius! Unimaginably hot!



For billions of years, life on Earth has been sustained by the warmth of the Sun. It provides essential light and heat, drives our winds and weather patterns, and governs the cycles of day and night as well as the changing seasons, all of which shape the rhythm of our lives.

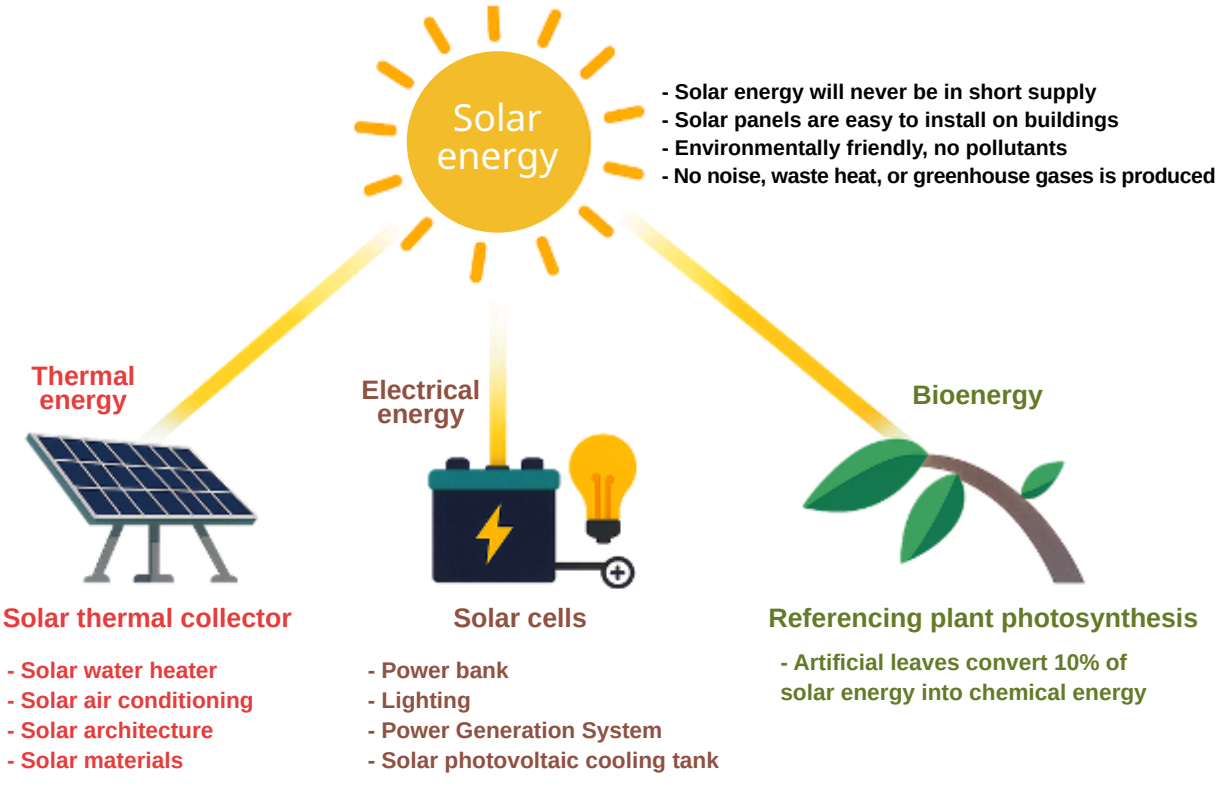
So, next time you look at the Sun, take a moment to reflect on its importance to our lives!



What if the Sun disappeared? How would Earth be transformed? Try drawing your vision of that world.

The Importance of Solar Energy

Earth's resources are finite—natural gas, oil, and coal will eventually be depleted. Moreover, their use generates significant environmental pollution. Therefore, developing clean, renewable energy sources is of critical importance.

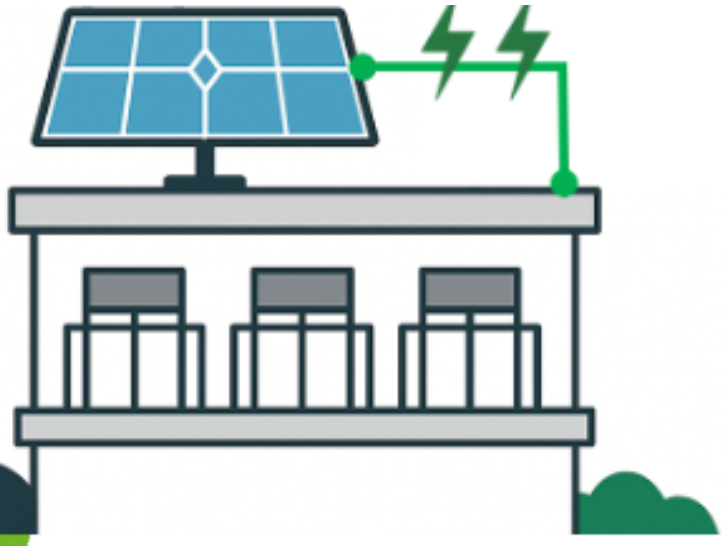


Solar energy is one such renewable resource that is both distant in origin and readily accessible in application. Simply put, solar energy involves converting sunlight into heat and electricity. It can be harnessed to heat homes, produce hot water and generate electricity.

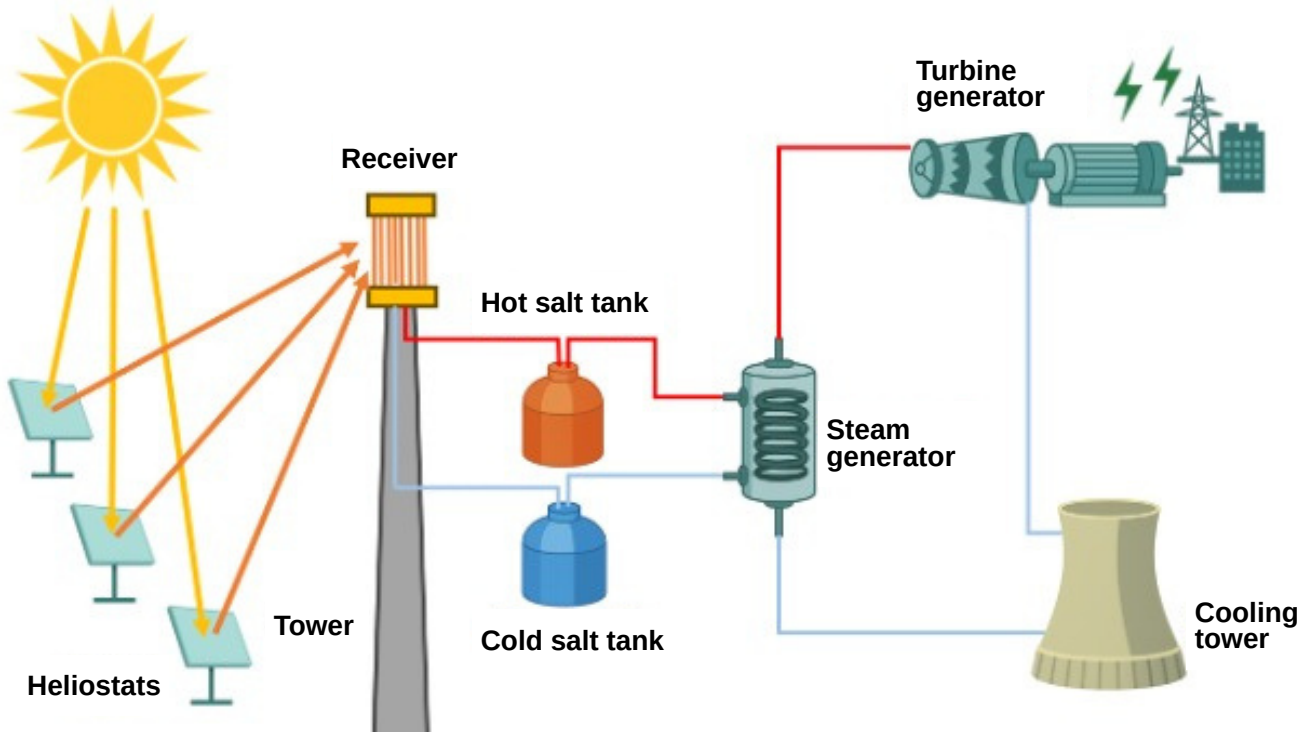
There are two primary methods of solar power generation:

- Photovoltaic (PV) Technology: This method uses specialized panels to directly convert sunlight into electricity.

Solar panel system, including cables, inverters, safety devices and related equipment



2. Concentrated Solar Power (CSP): This approach utilizes sunlight to heat a fluid, producing steam that drives a turbine to generate electricity.



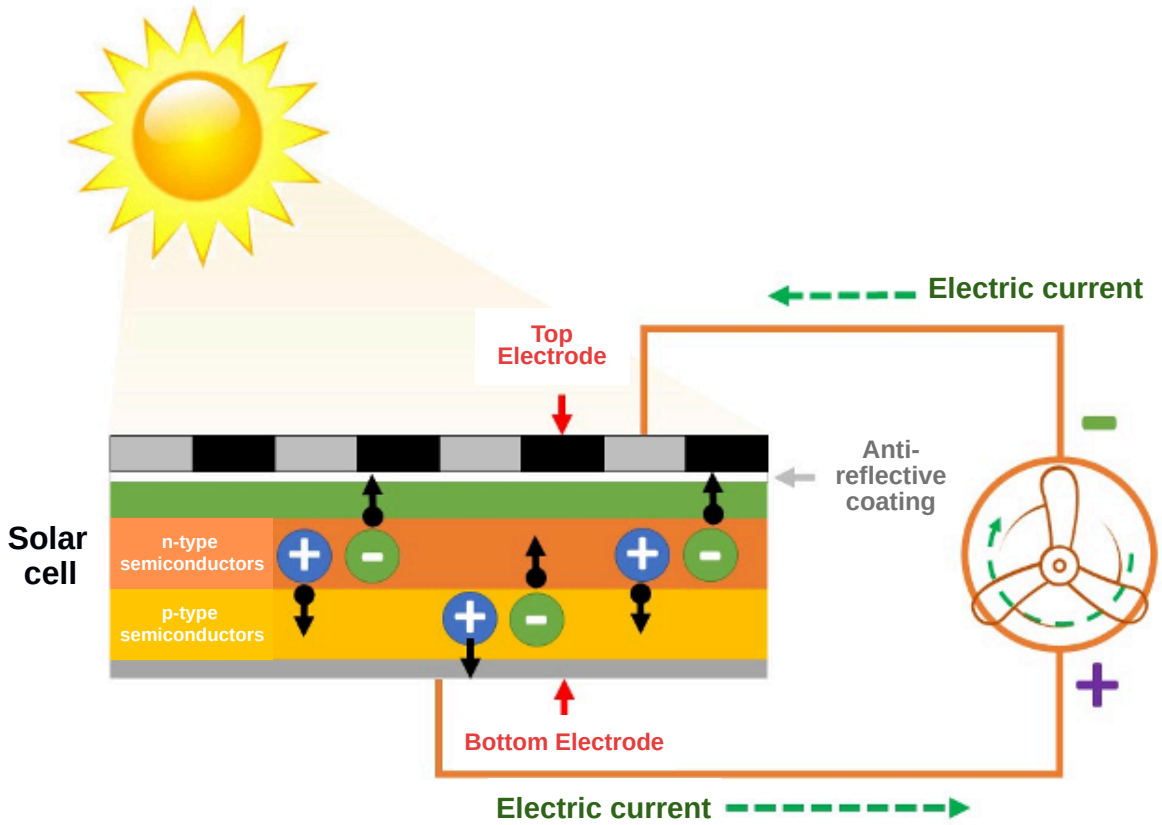
Adopting solar energy not only conserves finite resources but also protects the environment, contributing to a healthier and more sustainable planet.

Solar Cells

A solar cell is a special device that converts light energy into electricity. This process is known as the photovoltaic effect, which occurs when sunlight strikes the cells and generates electrical energy.

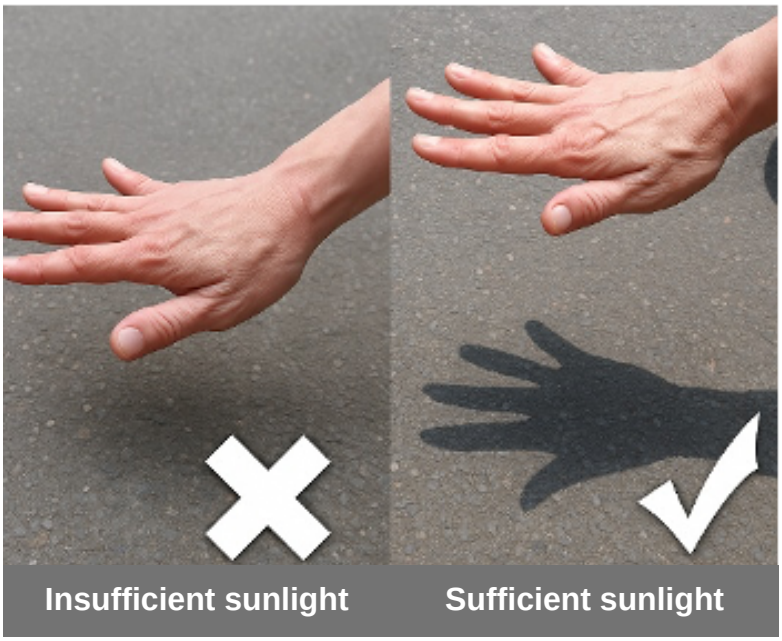
Solar cells are made from photovoltaic semiconductor materials, with added elements of ‘‘Boron’’ and ‘‘Phosphorus’’.

Boron: Creates a p-type semiconductor
Phosphorus: Creates an n-type semiconductor



When p-type and n-type semiconductors are combined, and sunlight strikes the photovoltaic semiconductor layer, electrons within the semiconductor begin to move, generating an electric current.

How to determine if sunlight is sufficient?



A simple method is to observe the shadow cast by your hand under sunlight:

- If the edges of the shadow are sharp and well-defined, sunlight intensity is sufficient for effective solar energy generation.
- If the shadow edges are blurry or faint, sunlight is insufficient and the solar panel will produce limited electrical output.

Test your knowledge

1. The Sun provides life on Earth with (☐light / ☐heat / ☐energy) and sunlight enables green plants to carry out (☐ photosynthesis / ☐ electricity generation). This process releases (☐oxygen / ☐carbon dioxide / ☐food).

2. Natural gas, oil and coal are classified as (☐renewable energy / ☐non-renewable energy). These energy (☐do / ☐do not) cause environmental pollution. Solar energy is (☐renewable energy / ☐non-renewable energy) and (☐does / ☐does not) cause environmental pollution.

3. Solar energy can converts sunlight into (☐ thermal energy / ☐ electricity). Humans use solar energy to power buildings for (☐ electricity / ☐ lighting / ☐sterilization).

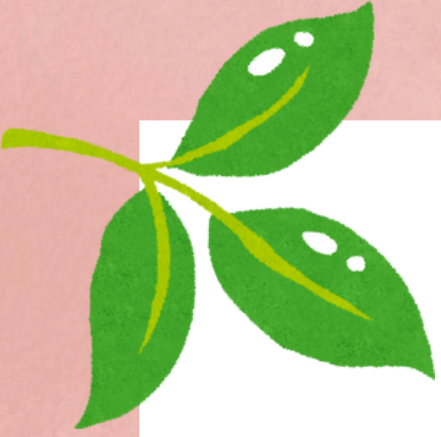
4. Which of the following is a benefit of solar energy?
☐ Reduce pollution / ☐ Renewable / ☐ Requires large amounts of water to operate

5. Match the images below with corresponding descriptions:

- Solar cell
- Solar power plant
- Sunlight

Identify whether each statement is an Advantage or a Disadvantage:

	Advantage	Disadvantage
1. Although the level of solar irradiation is influenced by weather and geographical factors, solar energy will never be in short supply.		
2. It can only be collected during daytime hours and under clear weather conditions.		
3. Solar panels can be installed on most existing buildings.		
4.Solar energy collection devices must cover a considerable area to capture sufficient power.		
5. The large surface area of solar panels results in high manufacturing costs, making the overall cost of solar power generation relatively expensive.		
6. Solar energy produces no noise, waste heat, or greenhouse gases, and does not consume natural resources.		
7. Generating every 1,200 kWh of electricity from solar energy reduces carbon dioxide emissions by approximately 1 metric ton compared to fossil fuel combustion.		
8. In urban areas with dense high-rise buildings, shadows are prevalent, making it difficult to collect sufficient sunlight.		



If you were going to design a solar-powered device, what would it be? Briefly describe its function.

I would design a solar-powered device called _____

_____ , and its function is

_____

_____

_____