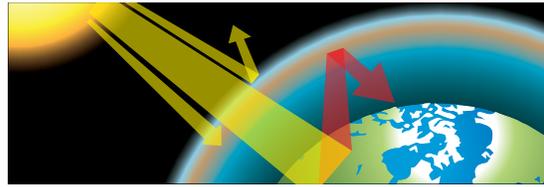


We use many forms of energy in our everyday life to warm our homes, cook our meals and fuel our cars. Much of this energy produces greenhouse gases. These are the gases that trap heat in the atmosphere that are contributing to climate change.

One way to reduce greenhouse gases is to make use of alternative energy. Let's explore how solar energy can be used to make a heat source.

Importance of Sunlight

- Light is a form of energy.
- The light energy that we receive from our Sun is, without a doubt, the most important element to all life on Earth.
- Sunlight supplies plants with energy which they use (through the process of photosynthesis) to make food (sugar).
- Animals then eat the plants to produce energy.
- Sunlight delivers heat energy that drives ocean currents, wind and on a larger scale, weather and climate systems!
- In fact, nearly all energy on Earth originates from sunlight. Powerful stuff!
- Unless disrupted, light travels in a straight line to Earth.
- The Earth's atmosphere filters a portion of visible light so only about 74% of solar energy reaches the Earth's surface.

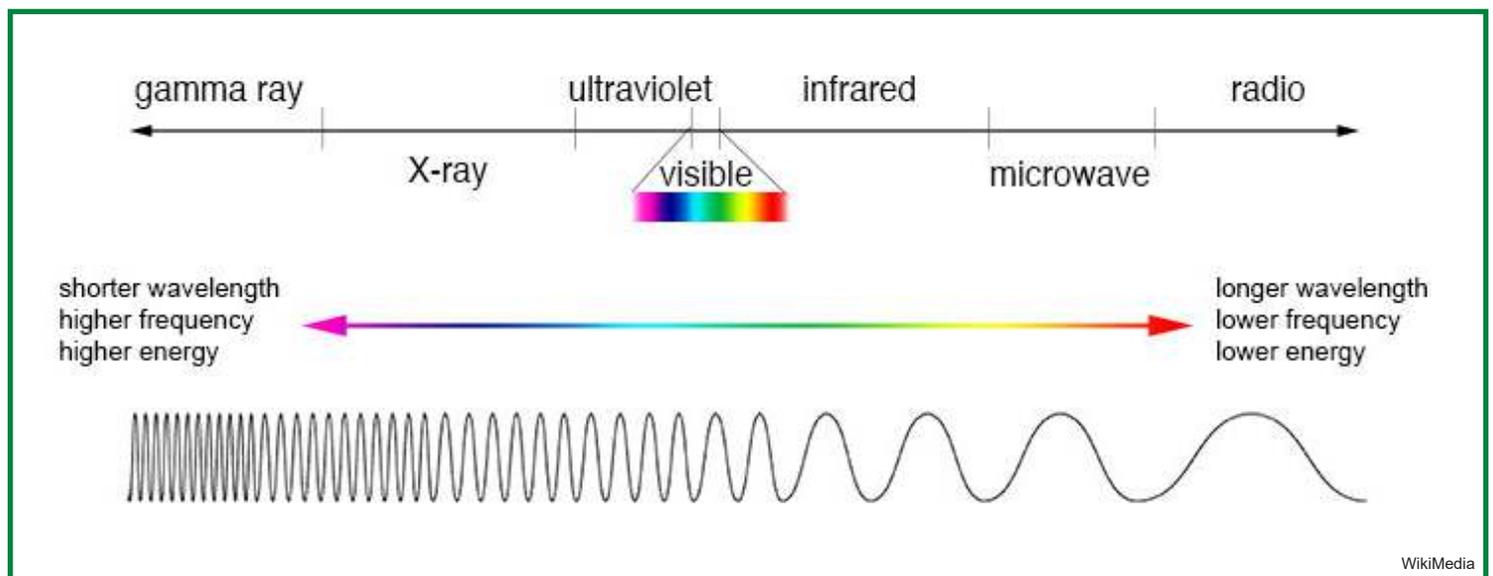


Electromagnetic Spectrum

- Most of the light in the universe is invisible to our eyes!
- The sun gives off many types of light which is referred to as the electromagnetic spectrum.
- Visible light, like the rest of the spectrum is transmitted as a wave. The length of the wave (distance from the peak of one wave to the peak of the next) determines the amount of energy.
- Earth receives energy from the Sun in the form of ultraviolet, visible, and near-infrared radiation. These have short wavelengths.
- This energy is absorbed by the land, oceans and atmosphere as heat
- This heat is then radiated back up in the form of invisible infrared energy. (This radiation now has a longer wavelength)
- The majority of the infrared radiation (90%) gets absorbed by certain atmospheric gases, known as greenhouse gases (GHG's).
- This results in the ever-increasing rise in temperature of the Earth's atmosphere.

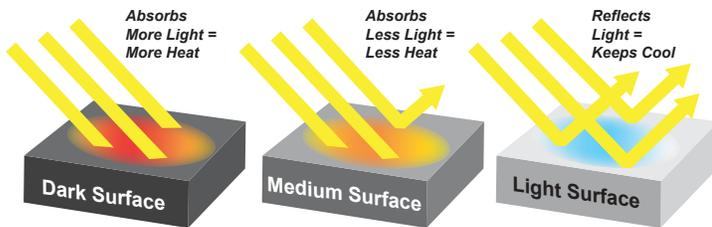
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How Light Makes Heat - Thermal Energy

- The molecules and atoms that make up matter are moving all the time.
- Light traveling through space to Earth will eventually come into contact with molecules in some type of material.
- The light energy is absorbed by the molecules and causes them to move faster, bumping into each other. This increased movement produces heat!
- This process continues as neighboring molecules bump into each other, setting more molecules to move faster until heat is spread throughout the material.
- This material could be anything: water, sand, air or the food in a solar oven.
- Heat is energy. Temperature is a measurement of that energy.
- Heat is called thermal energy.



What is Albedo?

- Albedo (al-bee-doh) is a measure of how much light is reflected from a surface without being absorbed.
- Lightly colored things, like snow, have a high albedo - they reflect most of the light, keeping them cool.
- Dark colored objects, such as the ground, have a low albedo. They absorb most of the light that comes in contact with them, causing them to warm up.
- If something has a low albedo, its molecules will end up moving faster than something with a high albedo.
- Dark colored materials (low albedo) are needed to produce maximum thermal energy.

More Resources

What Colors Absorb More Heat?

<https://sciencing.com/colors-absorb-heat-8456008.html>

Thermal Energy - Feel the Burn - SolarSchools.net

<https://www.solarschools.net/knowledge-bank/energy/types/thermal>

The 5 Most Common Examples Of Solar Power

<https://news.energysage.com/most-common-solar-energy-uses/>

Solar Energy to the Earth - Energy Education

https://energyeducation.ca/encyclopedia/Solar_energy_to_the_Earth

Word of the Week: Electromagnetic spectrum - EarthSky

<https://earthsky.org/space/what-is-the-electromagnetic-spectrum#:~:text=The%20electromagnetic%20spectrum%20is%20the.alternating%20electric%20and%20magnetic%20fields.>



Solar Shower



Mother Earth News



Solar Cooker

WikiMedia



Solar Thermal Power Plant

David Suzuki Foundation

Uses of Solar Thermal Energy

Solar thermal energy can be used for;

- heating homes and other buildings, often as in-floor heating systems.
- running air conditioning and refrigeration appliances (using solar driven heat pumps and solar chimneys) .
- heating water for homes - for showers, laundry, etc.
- heating indoor and outdoor swimming pools.
- industrial drying of wood, food products, etc.
- solar stills to make drinking water in areas where clean water is not available
- desalination which removes salt from ocean water
- producing electrical power by collecting and concentrating sunlight to produce the high temperature heat needed to produce steam. The steam is then used to power a turbine that produces electricity.
- cooking, using solar ovens or solar cookers

How exactly does light transform into heat - Scientific American

<https://www.scientificamerican.com/article/how-exactly-does-light-tr/>

Albedo - Encyclopaedia Britannica

<https://www.britannica.com/science/albedo>

Solar: A brilliant way to get energy - David Suzuki Foundation

<https://david Suzuki.org/story/solar-a-brilliant-way-to-get-energy/>

Energy storage gives renewables a jump-start- David Suzuki Foundation

<https://david Suzuki.org/story/energy-storage-gives-renewables-a-jump-start/>

VIDEO - Solar Thermal 101 - YouTube - Student Energy

<https://www.youtube.com/watch?v=FqjJGfusdE>

VIDEO - Concentrating Solar Power-Power Towers - KeepItCleanCreative

<https://www.youtube.com/watch?v=QTNU1JMhxA>