



SOLAR ENERGY

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THINK THROUGH IT ...

*‘Today,
when the energy sources and excesses of our industrial
age have put our planet in peril,
the world must turn to Sun to power our future.’*

— PM Narendra Modi at the launch of International Alliance in Paris. November 30, 2015




SOLAR ENERGY

IS THE RADIANT (LIGHT AND HEAT) ENERGY PRODUCED BY THE SUN.

The Sun releases tiny packets of energy called photons.

These photons travel from the Sun to the Earth in about 8.5 minutes.

Every hour, enough photons reach the Earth to satisfy the global energy needs for an entire year.

The solar energy that we receive from the Sun is in the form of light and heat.

How can one transform such energy into electricity?



While the light from the Sun makes plants grow, providing us with food, and the heat keeps us warm, we can't use either the Sun's light or heat directly to run our computer or car. This solar energy has to be converted into other forms of energy that we can use easily, such as electricity.

This can be done in two ways.

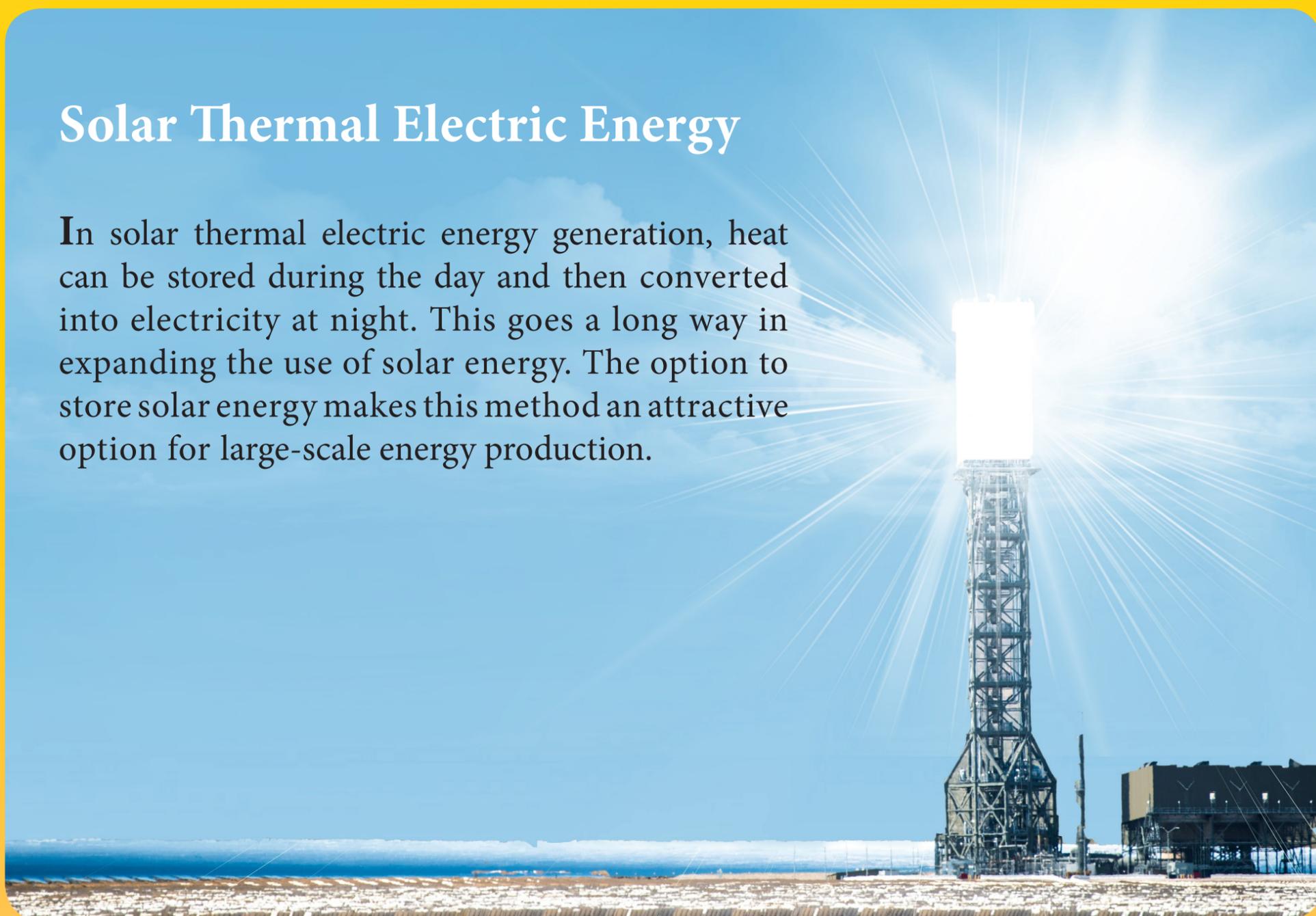
Photovoltaic Conversion

Photovoltaic conversion is done by solar cells called photovoltaic cells. A solar cell is a device that captures sunlight and transforms it into electricity. Several solar cells can be joined together to make a larger unit called solar module. Several solar modules, in turn, constitute solar panels. To channelise solar energy, solar panels are installed on rooftops. However, solar panels are only effective during daytime as storing electricity is still not a viable option.

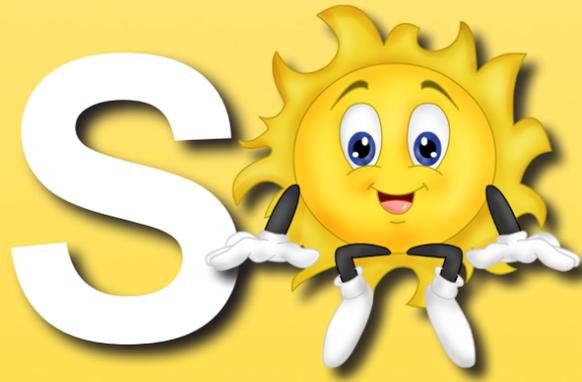


Solar Thermal Electric Energy

In solar thermal electric energy generation, heat can be stored during the day and then converted into electricity at night. This goes a long way in expanding the use of solar energy. The option to store solar energy makes this method an attractive option for large-scale energy production.



USES OF



LAR

ENERGY

Solar Transportation

Railroads, subways, buses, planes, cars and even roads can all be powered by solar energy.

The solar powered-aircraft Solar Impulse 2 made its way around the world in 2015-2016. Solar buses in China have emerged as an environment-friendly option without compromising the efficiency of mass transit in densely populated cities such as Beijing. Solar cars are not just an eco-friendly option but have even made their presence felt in racing competitions around the world.



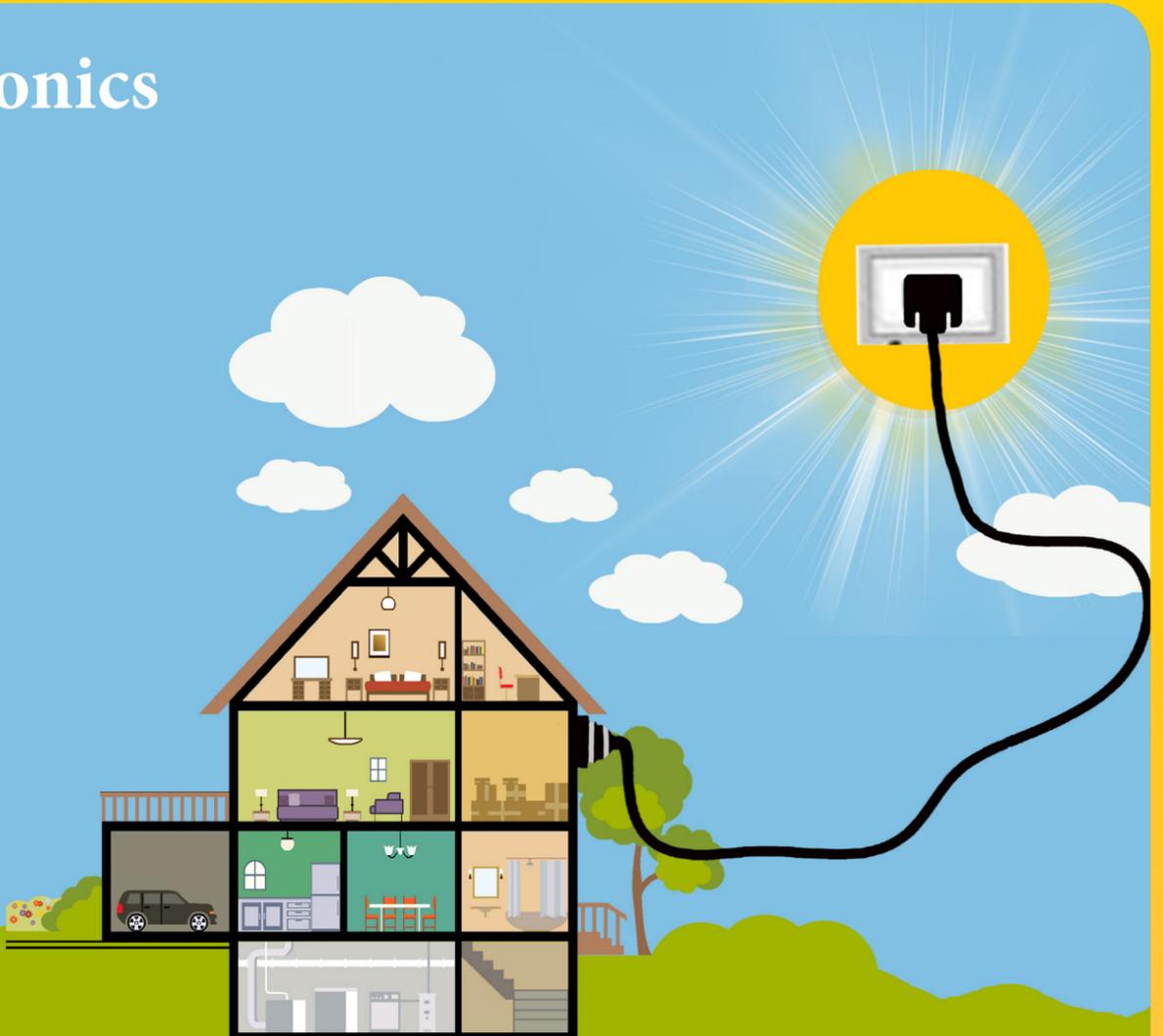
The world's first solar road that stretches for 230 feet opened in the Netherlands in November 2014. The road embedded with solar cells that are protected by two layers of safety glass, is built for bicycles though it is capable of handling heavier vehicles. It produced more than 3,000 kilowatt-hours of energy in the first six months—enough to power a single small household for one year.

Solar power for electronics

Imagine how cool it will be to charge your mobile phone or flashlight by simply exposing it to the Sun. That is exactly what solar-powered chargers do.

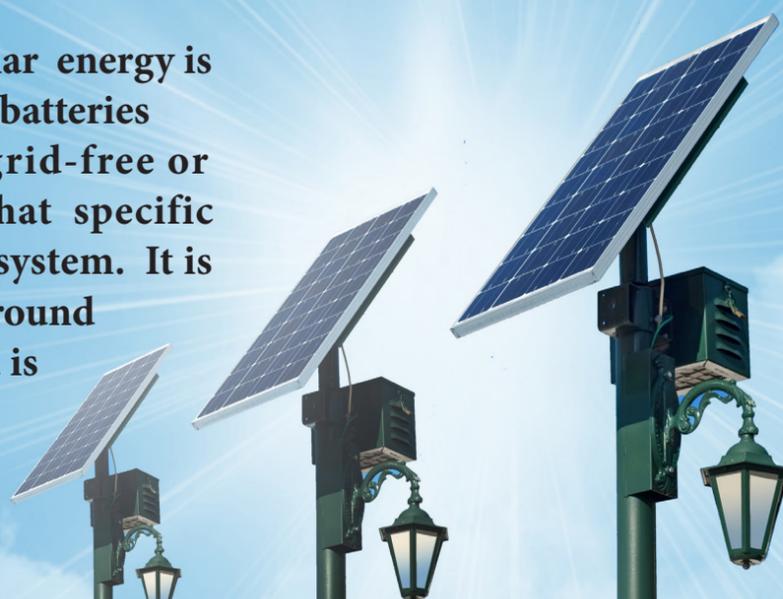
Solar cells also come in small chips. Such chips provide power for small gadgets such as digital watches and pocket calculators.

A range of products from mobile phones to speakers, air conditioners to freezers, thermostats to tablets can be recharged by solar power. This is just the beginning as more and more products can be powered by solar energy.



Solar Lighting

A basic, obvious, yet immensely useful way of channeling solar energy is solar lighting. Energy is collected from the Sun and stored in batteries to operate at night. Such lighting systems are called grid-free or stand-alone as they can generate their own electricity at that specific site without being connected to the larger electricity grid system. It is cost-efficient as it cuts down on construction costs of underground wiring. This is particularly useful in countries where the grid is unavailable or unreliable. Even in places where the grid system is operational, these solar lighting systems are an efficient back-up option. If, for some reason, the grid fails at specific locations, the lighting will still be available.



A practical variant of this in developing countries is the solar lantern. An economic alternative to places with no electricity, this option literally lights up homes. It provides 4-5 hours of high quality lighting service. The light source is a compact fluorescent tube which should last four years in normal operation.

The quality of light is better than the use of candles or kerosene lamps. In rural areas, solar lanterns can also be used to provide street lighting.

Solar cooker

Solar energy caters to one of the basic needs of human beings—food. Solar cookers convert sunlight to heat energy that is retained for cooking. Solar cooking is a viable option for large-scale cooking in countries with a natural abundance of solar energy.

A solar cooker needs an outdoor location that is sunny for several hours and protected from strong wind. Solar cookers don't work at night or on cloudy days.

On February 11, 2017, the Mira Bhayander Municipal Corporation of Mumbai organised an event called Maha Suryakumbh that saw the participation of 7,438 students from 59 private and civic schools in a solar cooking class. The event that sought to create awareness on solar energy, saw the students cook noodles in portable solar cookers.



TechNews



The efforts of textile designer Marianne Fairbanks and chemist Trisha Andrew have taken solar energy to textiles.

Soon, your window curtains with solar panels can charge your smartphone.

All it needs is a breeze to generate that level of power.

It can't get smarter and breezier than this!

BENEFITS OF SOLAR ENERGY



Solar energy is a renewable energy source. This means that we cannot run out of solar energy, as opposed to non-renewable energy sources (e.g. fossil fuels, coal and nuclear). Add to it, the benefit of solar energy being environment friendly.

The good gets better!

Solar energy is abundantly available. The surface of the Earth receives 1,20,000 terawatts of solar radiation (sunlight). This is 20,000 times more power than what is needed to supply the entire world.

There can never be too much of a good thing!

Solar energy is a sustainable source of energy. A sustainable source of energy should meet the needs of the present without compromising the ability of future generations to meet their needs. With so much of solar energy available, there is no way we can over-consume.

Solar energy is here to stay!

Good things don't make a big noise. There are no moving parts involved in most applications of solar power. As a result, there is no noise associated with the use of solar energy. Compare this to gadgets that run on other sources of energy such as generators and cars that run on fuel.

Solar energy—the silent winner!

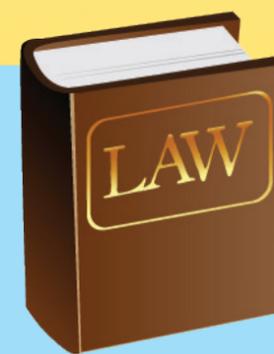


The Chinese city of Huainan, in 2017, has become home to the world's largest floating solar farm. The 40-megawatt power plant consists of 1,20,000 solar panels covering an area of more than 160 American football fields. A floating solar farm works more efficiently, because the presence of water cools the panels as they generate electricity.



SOME DRAWBACKS

- Solar energy can be a seasonal and at times even irregular source of energy. Sunlight cannot be accessed at night. Also, cloudy days are not good days to harvest solar energy.
- The dominant method of accessing solar energy as of now is through installation of solar panels. This requires a lot space that may not always be available.



The Energy Conservation Act, 2001 (amended in 2010) guides energy efficiency practices and programmes in India through various provisions.



SOLAR POWER INTERESTING FACTS

- In 1839, Alexandre Edmond Becquerel discovered the photovoltaic effect which explains how electricity can be generated from sunlight.
- In 1941, Russell Ohl invented the solar cell.
- It would take far less than 1% of the Earth's land area covered in solar panels to supply all of the world's electricity needs.
- Silicon solar cells generate the same amount of electricity over their lifetime as nuclear fuel rods—and are much safer!
- The amount of energy that goes into creating solar panels is paid back through clean electricity production within anywhere from 1-2 years.
- A solar panel can work for decades. Some installed in the 1970s are still generating electricity.
- Wind is a form of solar power, created by the uneven heating of the Earth's surface.
- The world's largest solar park, Shakti Sthala, is spread over five villages at Pavaguda in Karnataka's Tumakuru district.
- Diu is India's first energy surplus Union Territory to run completely on solar power.

ACTIVITY SHEET

Why talk about Solar Energy?

There are various forms of renewable energy, solar being just one of them. So what makes it the renewable form of energy that the future will mostly depend upon? The Earth's atmosphere, oceans and land masses absorb approximately 38,50,000 exajoules (EJ) of solar energy per year. This implies that the Sun provides the Earth with as much energy in an hour as the human civilisation uses every year. That is a huge potential. Let's figure out how we can tap into this renewable source available to us.

Solar energy is a free, renewable and clean source of energy. No worries about pollution, release of harmful gases or other by-products. However, it is 10 times costlier than conventional coal-based power.

Activity 1

Discuss with your friends, take help from the Internet, or just ask your teachers and find out:

| Pros of solar energy | Cons of solar energy |
|----------------------|----------------------|
| | |
| | |
| | |
| | |
| | |
| | |

Don't you think the advantages far outweigh the disadvantages? Also, the disadvantages are mostly technological barriers that can be overcome with advances. Discuss the impact in class.



Activity 2

List at least five uses of solar energy. You can take the help of the Internet. Mention if photovoltaic conversion or solar thermal electric energy is the appropriate technology for each use. The first one is done as an example.

| Uses of Solar Energy | Photovoltaic Conversion/ Solar Thermal Electricity |
|-----------------------|---|
| To heat water at home | Photovoltaic conversion |
| | |
| | |
| | |
| | |
| | |



Activity 3

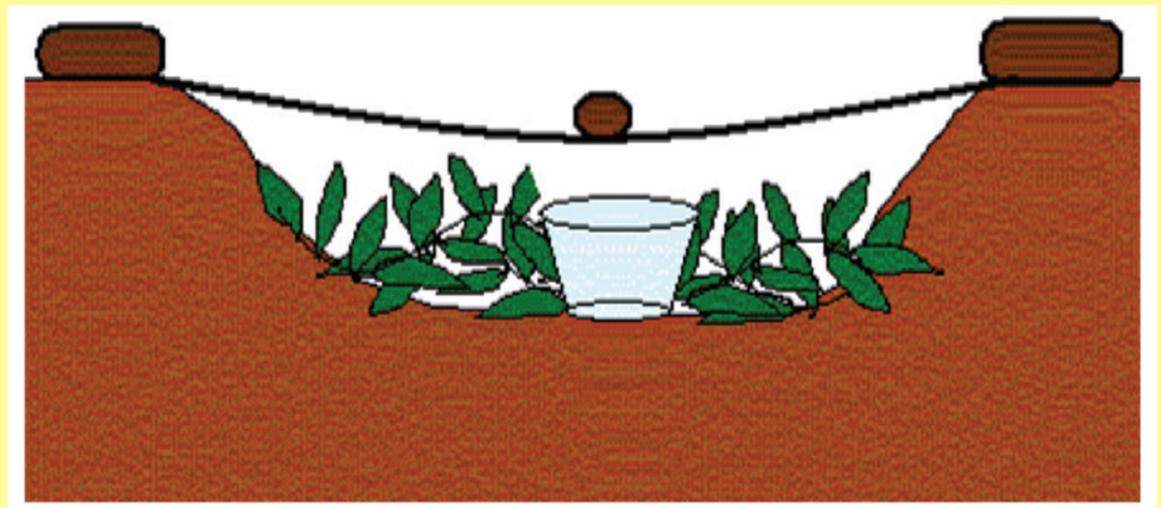
Now let's roll up our sleeves and get our hands dirty. We will do something as simple as collect water using solar power, a survival tactic!

Solar survival – Getting water from plants

This experiment will teach you how to draw water from plants using the power of the Sun. With just a shovel, a plastic sheet and a jar you will learn how you can get fresh water from virtually any vegetation.

Material you need:

- A shovel
- A clear plastic sheet
- A jar to collect water
- Any kind of plant matter
- Stones for weight



Procedure:**Step 1:**

Use a shovel to dig a hole in an open area which gets a lot of direct sunlight. The hole can be around 10 inches deep and 20 inches wide on each side. Now collect fresh green vegetation from your garden (weeds, leaves, mowed grass) or kitchen (vegetable peels) and place it in the hole.

Step 2:

Clear some space in the centre of the hole, make sure the base is flat and place your jar on this patch.

Step 3:

Cover the hole with a clear plastic sheet so you can see what happens inside. Weigh down the edges with the stones you collected so that the sheet does not flap around. Minimise the leakage of air inside.

Step 4:

Place a stone in the middle of the sheet, directly above the centre of the jar. This will make the sheet dip a little into the jar.

Note down your observations:

- Report your findings. (You would find some water collected in the jar).
- Calculate how much water you are able to collect in how much time.
- Try the same experiment in a sand pit without any vegetation. Report your findings.

Source - Activity Sheet. June 2011
www.cseindia.org

Lighten Up

- Why did the Sun go to school?
To get brighter.

- What did the baby light bulb say to the mommy light bulb?
'I love you watts and watts!'

- Why do transformers hum?
They don't know the words!

- What do computers like to eat?
Chips!

- How do you find a missing train?
Follow the tracks.

- What's the best way to charge a car battery?
With a credit card!

- How do energy conscious people feel about wind power?
They're blown away!

- What would a barefooted man get if he steps on an electric wire?
A pair of shocks!

- What would you call a power failure?
A current event!

- Why is wind power popular?
Because it has a lot of fans!

RIDDLES

• What has a head but never weeps, has a bed but never sleeps, can run but never walks, and has a bank but no money?

• I have rivers, but do not have water. I have dense forests, but no trees and animals. I have cities, but no people live in those cities. What am I?

• Many times you need me. The more and more you take me further, the more and more you leave me behind. What am I?

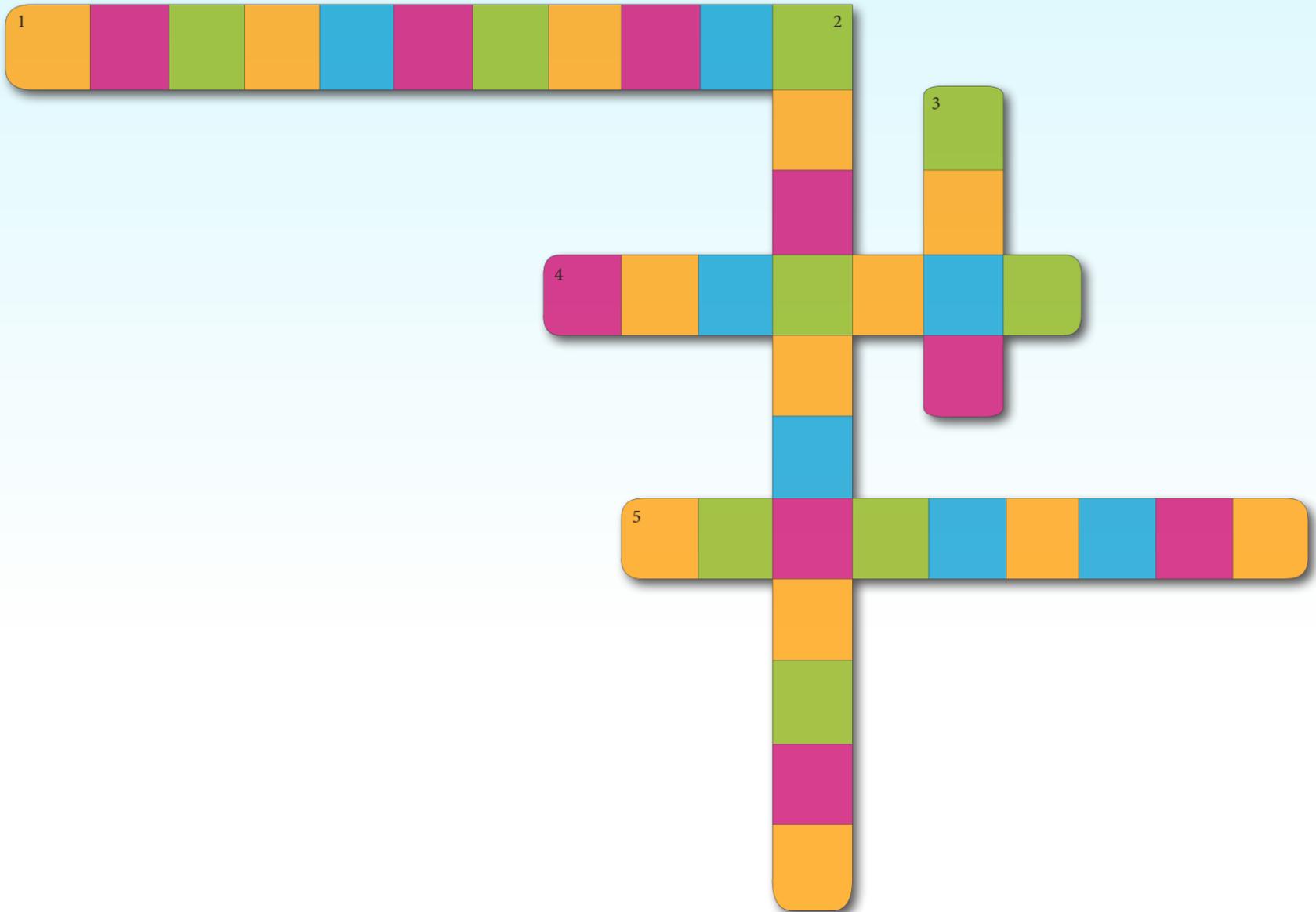
• People buy me to eat, but never eat me. What am I?

• If I drink, I die. If I eat, I am fine. What am I?

Read the
ANSWERS
on page 14



CROSSWORD PUZZLE

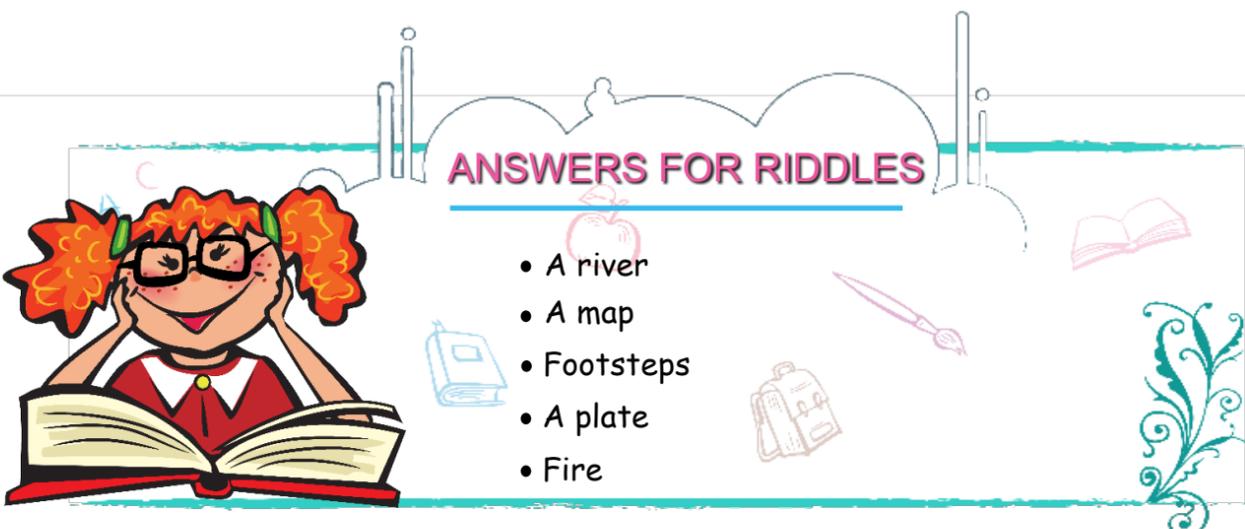


Across

1. The country which houses the world's first solar road.
4. Tiny packets of energy released by the Sun.
5. The type of energy that cannot be exhausted or can be replaced easily.

Down

2. The type of energy that meets the needs of the present without compromising the ability of future generations to meet their needs.
3. A form of solar power that is created by the uneven heating of the Earth's surface.



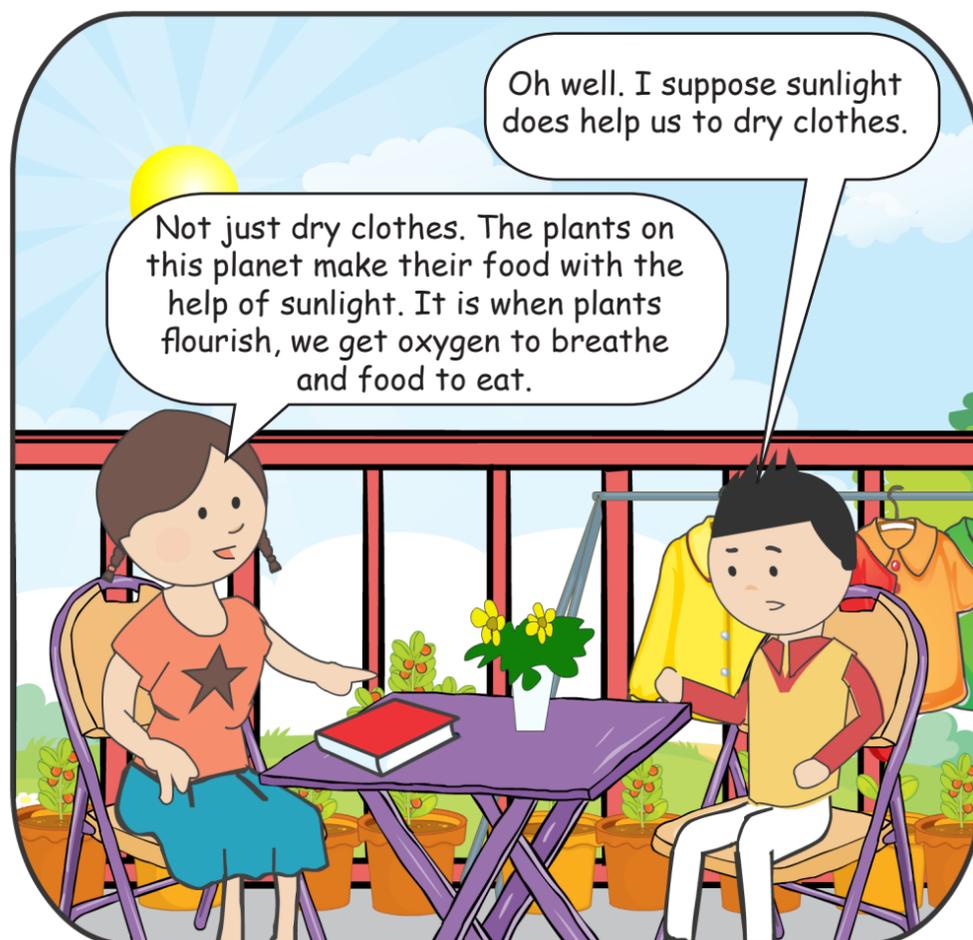
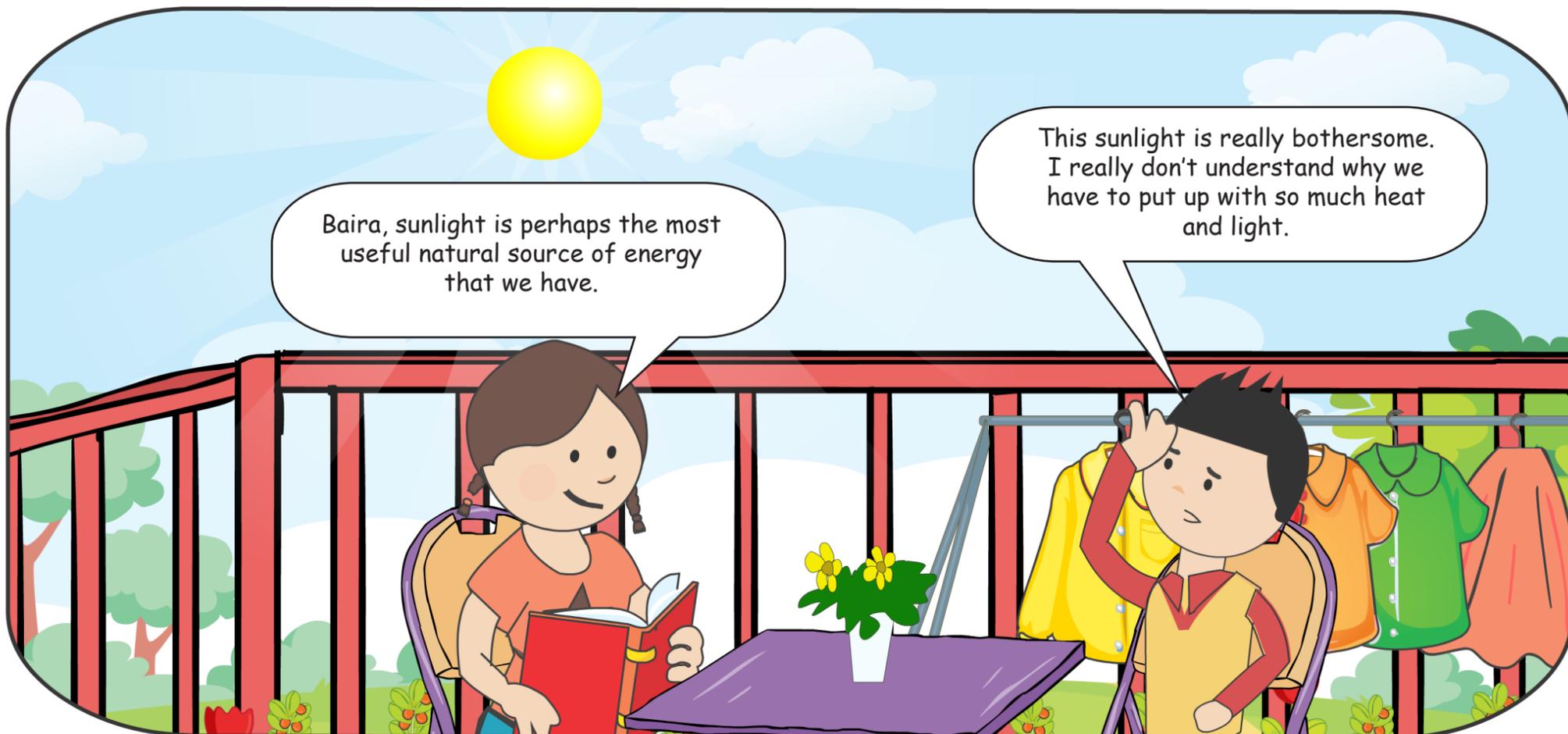
Crossword Puzzle
Answers –
Across
1. NETHERLANDS
4. PHOTONS
5. RENEWABLE
Down
2. SUSTAINABLE
3. WIND

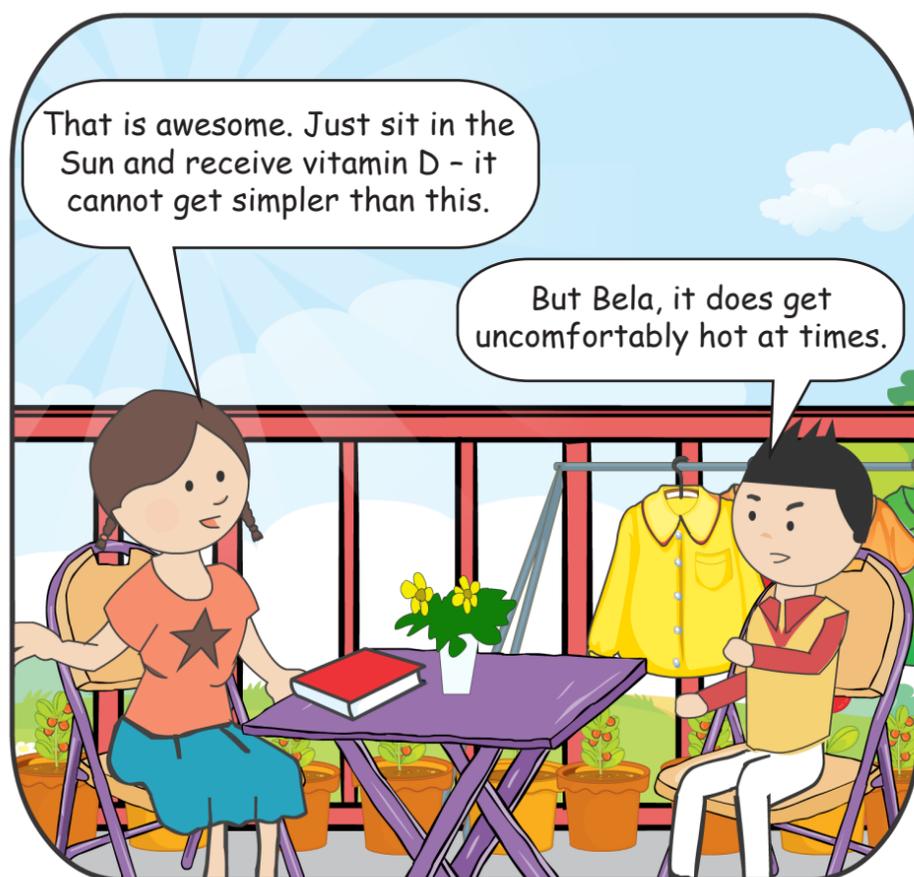
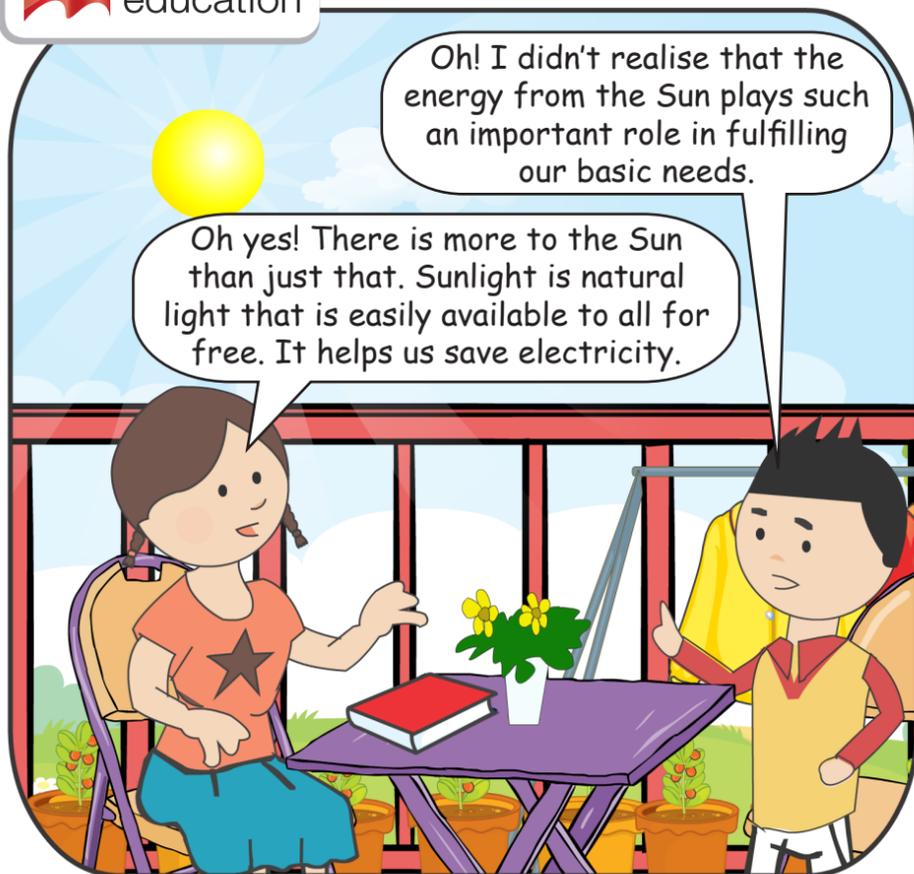


Comic Strip



BAIRA AND BELA





Current Events Updates January-March 2018

10 January

The government appoints renowned scientist Sivan K as the chairperson of Indian Space Research Organisation (ISRO).

14 January

- Former Union minister, Raghunath Jha, passes away in Delhi at the age of 78.
- Kerala MLA K.K. Ramachandran Nair passes away in Chennai at the age of 65.

15 January

- Veteran Bollywood actor, Ava Mukhrejee, passes away in Mumbai at the age of 88.
- Sarod maestro, Pandit Buddhadev Dasgupta, a Padma Bhushan awardee, passes away in Kolkata at the age of 84.

18 January

- India successfully conducts the 'first pre-induction trial' of its over 5,000-km range Agni-V intercontinental ballistic missile.
- Noted Kannada film actor-director-producer, Kashinath, passes away in Bengaluru at the age of 67.

21 January

The Union Law Ministry appoints Om Prakash Rawat as the next Chief Election Commissioner (CEC). He will succeed A.K. Joti.

22 January

Football star George Weah is sworn in as President of Liberia, in the country's first democratic transfer of power for more than 70 years.



23 January

Former Gujarat Chief Minister, Anandiben Patel, takes oath as the Governor of Madhya Pradesh.



24 January

Veteran actor of the south Indian film industry, Krishna Kumari, passes away in Bangalore at the age of 85.

27 January

Kannada actor, Chandrashekar, passes away in Canada at the age of 63.

6 February

- The world's most powerful rocket, SpaceX's Falcon Heavy, blasts off on its maiden test flight.



- India successfully test-fires its short-range nuclear capable ballistic missile Agni-1 with a strike range of over 700 km from a test range off the Odisha coast.

8 February

Former Bangladesh Premier and BNP Chairperson Khaleda Zia is sentenced by a special court to five years' rigorous imprisonment in a graft case.



9 February

Noted litterateur in Odia literature Chandrasekhar Rath passes away in Bhubaneswar at the age of 89.

11 February

- The UAE's Road and Transport Authority (RTA) showcases the world's first driverless pods at the World Government Summit on Sunday. These vehicles are meant to travel short to medium distances. Each vehicle will have a capacity to accommodate 10 passengers (six seated and four standing).
- Veteran Odia film actor, producer and director Parbati Ghosh passes away in Cuttack, Odisha at the age of 85.

12 February

Kannada writer and Jnanpith awardee Chandrashekhara Kambara is elected president of Sahitya Akademi.



14 February

Jacob Zuma, the President of South Africa, resigns after days of defying orders from the ruling African National Congress to leave office and on the eve of a no-confidence vote in Parliament.



Current Events Updates January-March 2018

24 February

Noted actor, Sridevi, passes away in a Dubai hotel at the age of 54.



2 March

Members of the Parliament of Armenia elect Armen Sarkissian to serve as fourth President of the country.



3 March

The Shape of Water wins the Oscar for best picture at the 90th Academy Awards.



6 March

Conrad Sangma takes oath as Meghalaya's 12th Chief Minister.

Sangma, NPP national president, is the state's 12th CM, along with 11 other cabinet ministers, of the state's first NPP-led government.



7 March

The 2018 Pritzker Prize is awarded to the Indian architect Balkrishna Doshi. Doshi, known for his low-cost housing designs, has learnt from some of the biggest architects of the 20th century, such as Le Corbusier and Louis Kahn.



8 March

Nationalist Democratic Progressive Party (NDPP) leader Neiphiu Rio takes over as Chief Minister of Nagaland.



9 March

- Pyarelal Wadali, of the famous Punjabi Sufi duo Wadali Brothers, passes away in Amritsar at the age of 75.

- Biplab Kumar Deb takes oath as the chief minister of Tripura.

14 March

- Stephen Hawking, the theoretical physicist, cosmologist, astronomer, mathematician and author of numerous books including *A Brief History of Time*, who overcame a debilitating disease, passes away at the age of 76.



- Bidhya Devi Bhandari is sworn in as the President of Nepal for a second term.



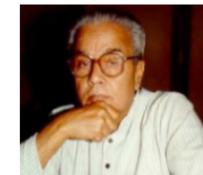
18 March

Vladimir Putin is re-elected as the President of Russia for the fourth time.



19 March

Renowned Hindi poet Kedarnath Singh, a recipient of the Jnanpith Award, passes away in New Delhi at the age of 83.



22 March

BrahMos, the world's fastest supersonic cruise missile, is successfully flight tested from Rajasthan's Pokhran test range.

23 March

Shri Thaawarchand Gehlot, Union Minister for Social Justice and Empowerment launches 'First Indian Sign Language Dictionary of 3000 words.' The dictionary has been developed by Indian Sign Language Research & Training Centre (ISLR&TC) under Department of Empowerment of Persons with Disabilities (DEPwD), M/o Social Justice & Empowerment.

27 March

Marathi writer Gangadhar Pantawane passes away in Aurangabad at the age of 80.