

# 12

## SOURCES OF ENERGY

### 12.1

We need energy to perform physical activities as walking, running, picking up things, removing things etc.

In our earlier classes we have learnt about different type of energies as chemical, electrical, sound, light and heat energies. We know that one type of energy can be transformed to another type.

Write a list of the uses of the given energies in your daily life.

We find that most of the energy used by us is electrical energy. Have you ever wondered from where we get this electrical energy? How this electrical energy is produced and distributed from the distributing centres to far off places.

Come we will do an experiment to find from where we get electrical energy.

### 12.2 Hydroelectrical Energy



#### Activity 1

**Materials required** - Empty matchbox, four small plastic spoons, one empty refill.

Make cuts on four sides in the horizontal part of the match box. Fix the four spoon on this cuts as shown in figure 12.1 (a). Make a small hole in the centre of the match box and insert the empty refill in it. Place this apparatus under water falling from a tap as shown in 12.1 (b).

What happen when water falls on the spoons?

Some what similar arrangement is there in

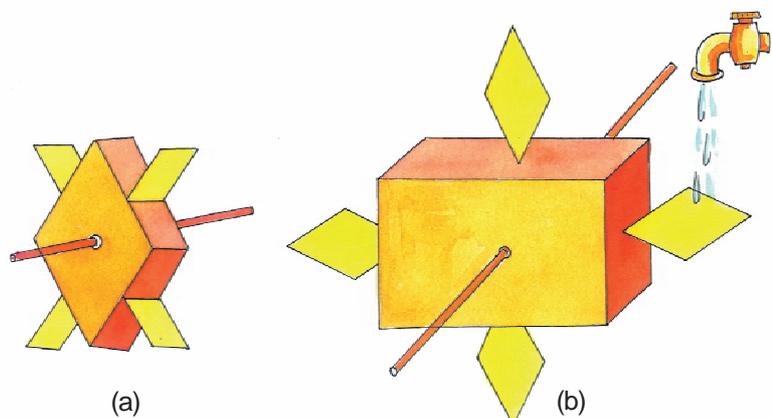


Fig 12.1 Movement of turbine with falling water

dams, where the accumulated water is made to flow with a force such that the turbines on its way turn or rotate. This turbine is connected by a shaft to generators which produce electricity (fig 12.2).

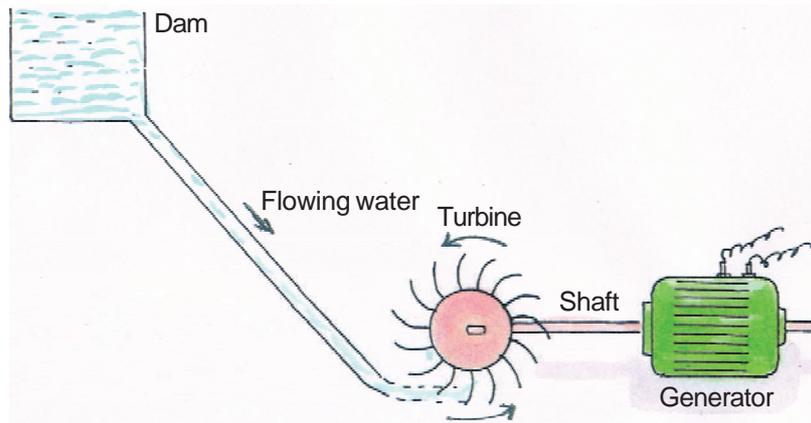


Fig 12.2 Production of hydroelectricity

In Chhattisgarh hydroelectricity is produced at Hasdev Bango and Gangrel dam projects.

### 12.3 Tidal Energy

Another example of the use of the energy in flowing water is the use of the high and low tides of the sea to produce electrical energy.

For this dams are made at the mouth of sea bays. At high tide the level of the water increases and water flows into the dam which makes the turbines placed on the way, rotate (fig 12.3 a). In the same way at low tide water flows from the dam to the sea, which again makes the turbine rotate (fig 12.3 b)

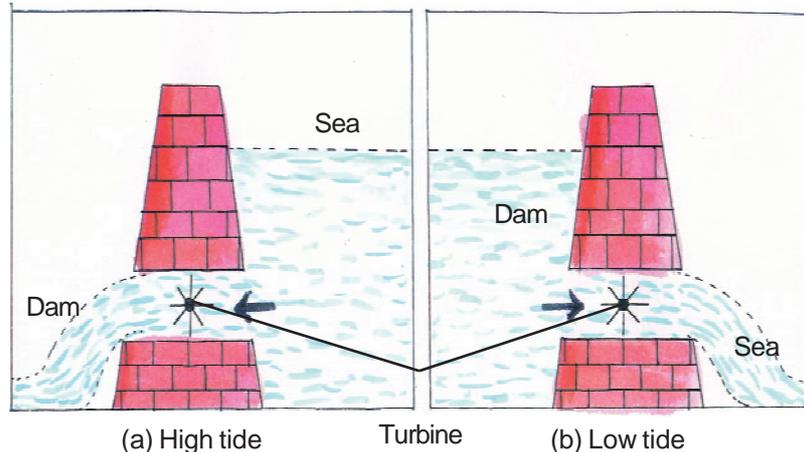


Fig 12.3 Tidal energy

The turbines are connected to the generator and they produce electrical energy. The source of electrical energy here is tidal energy.

In India places for tidal energy has been discovered. These are at Bay of Kutch in Gujarat and the Eastern border near West Bengal.

### 12.4 Wind Energy

You must have seen bits of paper, leaves flying in strong wind. Can you get energy from strong flowing wind? Let us know this by an activity.



## Activity 2

**Materials required** - Paper, pin, straw or stick.

Take a square shaped paper and fold it diagonally. You will find the mark of the folds as shown in figure 12.4.

Now cut the paper at the marks to half of the length (fig 12.4 b). Take one end of each cut and paste it at the centre to form a structure (fan) as shown in fig 12.4 c. At the centre make a hole with a pin and attach it to a straw or stick. Hold this 'fan' in your hand and run, or place this fan on the way of the wind coming through a window. What do you see ?

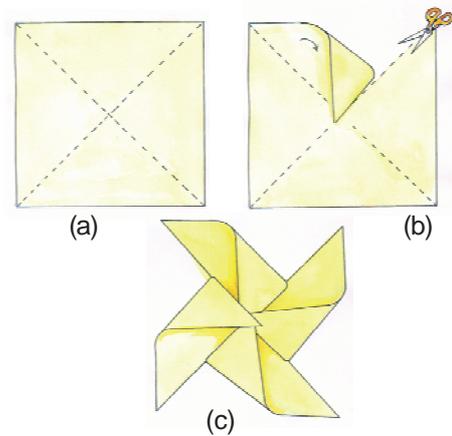


Fig 12.4 Making paper fans



Fig 12.5 Wind farm

Flowing wind is also a source of energy which is called **wind energy**. The direction and speed of wind varies from place to place and from time to time but at some places the direction and speed remains constant.

At these places big fans (wind mills) called **turbines** are built and electricity is produced by the generator attached to the wind mill. The places where these wind mills are constructed are called '**wind farms**' (fig 12.5).

In India, places like Gujarat, Rajasthan, Western Madhya Pradesh, sea shore areas, Southern Tamilnadu, Islands of Bay of Bengal and Arabian sea and some places of Karnatak are found suitable for 'Wind Farms'.

Why are these places only suitable for the installation of wind farms? Discuss.

## 12.5 Steam Energy

Have you heard about trains being run by steam engines? You must have seen steam coming out while cooking and boiling water.

Can steam be a source of energy? Let us perform an activity.



### Activity 3

**Materials required** - Fan made in Activity 1, tea kettle, stove to boil water.

Fill the tea kettle with water and heat it. Put the lid on. After some time steam will come out of the nose of the kettle. Place the fan as shown in fig 12.6 on the way of the steam. What do you find?

In the same way in special plants which are called **boilers**, water is heated by burning coal and then steam is produced. The power of the steam

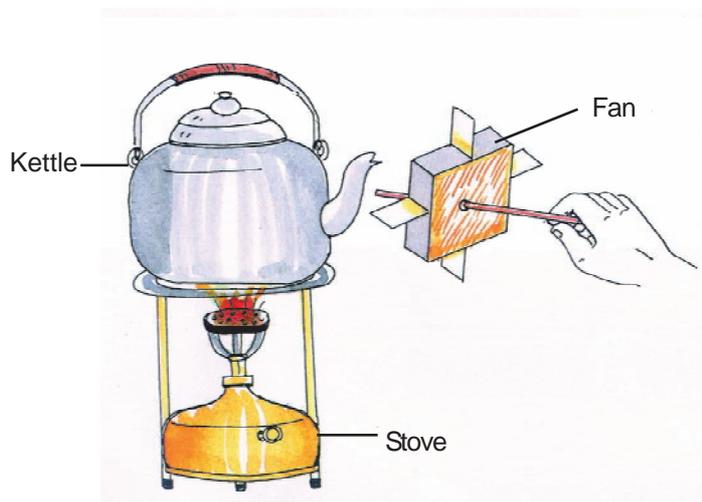


Fig 12.6 Turning of the turbine by steam



Fig 12.7 Thermo-electric plant

turns the turbine and electricity is produced by the generator attached to it (fig - 12.7). This is called **Thermoelectric plant**. In our state Chhattisgarh Thermoelectric plant is in Korba district.

## 12.6 Nuclear Energy

One more source to obtain energy has been developed. We know that the mass of an atom is centred in its nucleus and most of the energy is in the nucleus. When some heavy atom as uranium is broken into smaller sized atom, a large amount of energy is liberated. This process is called fission and the energy produced is called **nuclear energy**.

This nuclear energy is produced in special plants called nuclear reactors. Here nuclear energy is converted into electrical energy. In our country nuclear reactors are working at Tarapur, Kalpakam, Kota and Narora. About 100 km away from Mumbai, the nuclear energy plant at Tarapur is India's completely native nuclear reactor.



### NOW ANSWERS THESE

1. How is electrical energy produced in dams?
2. What do you understand by Tidal energy?
3. What is Nuclear energy?
4. What material is used in a Thermoelectric plant to produce electricity?

## 12.7 Fossil Fuels

In our daily life, to run our vehicles and to make our food which things are used for obtaining energy?

Coal, wood, cooking gas, petrol, diesel, kerosene are called fuels. From where do we get these? Come, let us find out.

Due to the changes long ago in the earth, plants and trees got buried and slowly layers of soil were formed on them. Due to high pressure and temperature these remains of plants

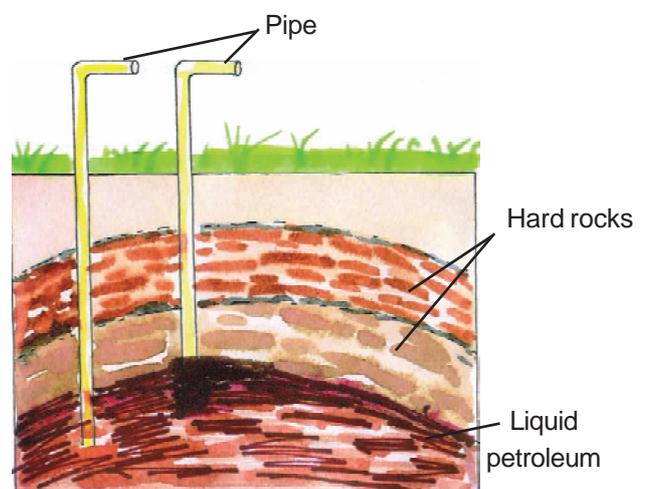


Fig 12.8 Petroleum well

and animals got converted to coal. Formation of the coal in this way takes thousands of years.

In the same way the buried remains of dead animals changed to petroleum due to high pressure and temperature. That is why we call them fossil fuels.

**Fossil** - Word is used for those remains of dead animals and trees that are preserved in nature for thousands of years.

Petroleum is found deep below in the earth pressed between the rocks. This is obtained by digging wells and pumping it out through pipes (fig 12.8).

The petroleum pumped out from the earth cannot be used directly to get energy. So this petroleum is sent to the refinery where it is changed and purified to get useful products as petrol, diesel, kerosene, and petroleum gas.

From the wells where we get petroleum, natural gas is also obtained. Natural gas is mainly methane gas which can burn easily to provide heat. This gas can be compressed and used for driving the vehicle. This is called CNG (Compressed Natural Gas). In some of our main cities vehicles run on CNG. Vehicles which are run on CNG produce very less pollutants as compared to other vehicles.

We all know about the cooking gas used by us in our homes. Actually this is the liquid form of petroleum gas which mainly contains butane. Other than butane it has two more gases -Propane and ethane. These are liquified and filled in cylinders. It is called LPG - Liquified Petroleum Gas.

LPG is a highly inflammable odourless gas. So for safety purposes a very strong smelling gas is added to this, so that if there is any leakage, it can be identified.

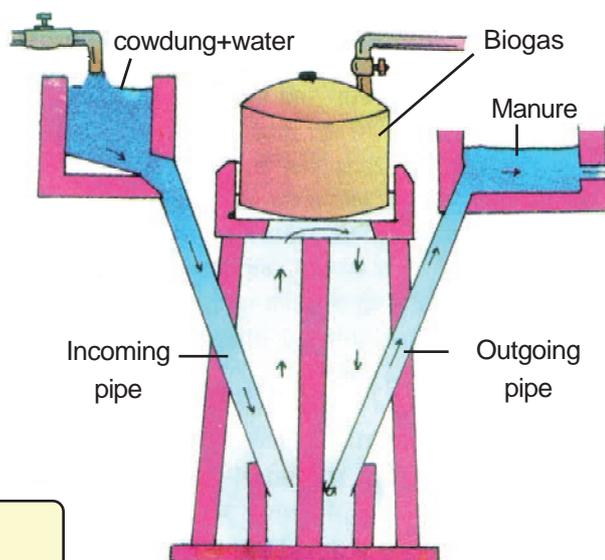


Fig 12.9 Bio-gas plant

In villages cowdung cakes are used as fuels. Can cowdung be used in any other form to get energy from it?

In many areas cowdung is used to get energy, in form of a gas. For this cowdung is dissolved in water and put in specially prepared covered pits. In this pits this

mixture, in the absence of air is reduced to form methane, carbondioxide and some other gases. This mixture of gases is known as Bio-gas.

The produced gas is collected in the dome covering the pit and taken out through the pipes attached to the dome (fig 12.9)

The following are the uses of Biogas -

1. Like LPG, it is also used as a cooking gas.
2. To produce light.
3. It's use lessens, the use of wood.
4. After the removal of gas the left off material is used as manure.
5. There is no environmental pollution by its use.



### NOW ANSWER THESE -

1. What are the main products of petroleum?
2. What is the other name for cooking gas ? What are its constituents ?
3. Bio-gas is a mixture of which gases?

Copy the following table 12.1 in your copy and fill it accurately.



### TABLE 12.1

S.No.	Solid fuel	Liquid fuel	Gaseous fuel
1.	.....	.....	.....
2.	.....	.....	.....
3.	.....	.....	.....
4.	.....	.....	.....
5.	.....	.....	.....

Will the store of coal be always there?

Will the source of wind energy end?

These are sources of energy from which we can continuously get energy and they will not get extinct also. But on the other hand there are sources which are rapidly getting finished.

Make table 12.2 on your copy and list the different sources of energy -

**TABLE 12.2**

S.No.	Sources which are becoming extinct	Sources which will not become extinct
1.	..... Coal .....	..... Wind .....
2.	.....	.....
3.	.....	.....
4.	.....	.....

Energy sources as wood, coal, petrolum can be said to be non renewable sources and energy sources as wind, water are renewable sources.

Renewable sources are present in plenty and their use doesnot harm the environ-ment. But we can not depend on the nonrenewable sources of energy in distant future to obtain energy. Moreover their uses are harmful to the environment also. Therefore we must find other sources of energy, before these sources are completely exhausted.

## 12.8 Solar Energy

Can sun be a source of energy? Can the energy received from the sun be used for cooking? Let us do an experiment.



### Activity 4 (Demonstration by teacher)

**Materials required** - Convex lens, some dry leaves and paper.

With the help of the lens, focus the sunlight on the dry leaves. What happens if you hold it so, for some time? In the same way focus on the paper also. You find that the energy obtained from the sun has the power to provide heat to any material. The energy from the sun in form of light and heat is called solar energy.

Let us do one more experiment.



### Activity 5

**Material required** - Two test tubes, black rough paper, water and glue.

Stick the black paper on the outside of one test tube with glue. The paper must be tightly fixed on the test-tube and must not move. Let the other test-tube remain as it is.

Now fill both the test tubes with water and place both the test tubes in sun. See that the light does not fall directly on the water. After 30 minutes pour the water of each test tube separately on your hands.

What difference do you find in the temperature of the water in both test tubes?

What is the cause? Black surface is a good absorber of heat. This principle can be used in the following apparatus which use solar energy.

### 1. Solar Cooker

It is big box made of metal. The inside wall of this box is painted black and a mirror is placed on the lid, which can be adjusted to focus the sun rays to the inside of the box.

The inner walls of the box absorb heat and get heated. To stop the heat to escape from the box another cover of glass is placed on the lower part of the box. Inside the box there are small metal boxes painted black on the outside. The food items can be placed in these small boxes. (fig 12.10)

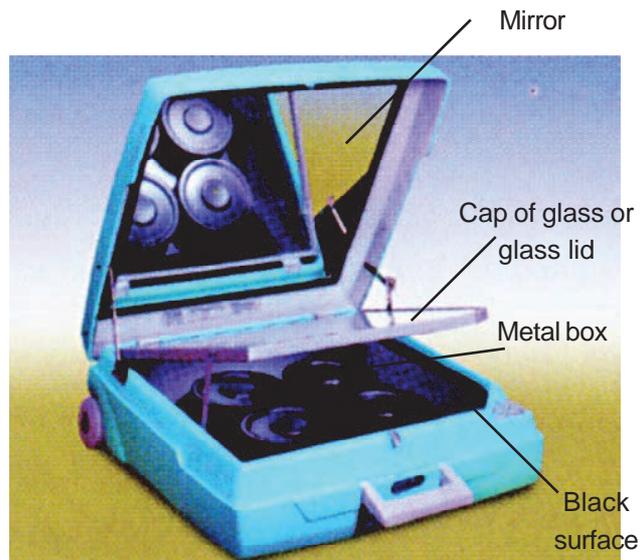


Fig 12.10 Solar Cooker

### 2. Solar water heater

Water is heated by this apparatus, so it is called solar water heaters. This is a box of insulated material with a long pipe of copper which is painted black.

Water passing through the pipe gets heated and it is collected at the other end in tanks (fig 12.11)



Fig 12.11 Solar water heater

Visit places where these apparatus are used and observe its function.

Presently the new form of solar energy apparatus - 'Solar cell' is used. In this solar energy is converted to electrical energy. These cells are made of silicon materials.

Solar batteries are also a type of stored solar energy which is used to run vehicles and machines. Discuss about other uses of solar energy and apparatus using solar energy in your class.



### NOW ANSWER THESE -

1. Why is the solar cooker box painted black?
2. In the solar water heater, energy is transformed into which form?
3. What is the solar cell made of?
4. Why are the pipes of solar water heater made up of copper ?

### **BIO DIESEL**

*You must have heard of bio-diesel. This is the recent source of energy which is being used widely. It is an oil obtained from the seeds of a plant named 'Ratanjoth'. It can be used along with petrol and diesel. Chhattisgarh government is using the waste lands to grow Ratanjoth. Chhattisgarh biofuel authority has been established for this purpose. Chhattisgarh is the pioneer to the use of biodiesel.*

### 12.9 Which is the primary source of energy?

We have learnt about many different sources of energy. Is there any primary source of energy for all these?

Think :-

1. How do plants prepare their food?
2. From where does water come in the rivers?
3. Why does the wind blow? Give reason.

We know that plants make their food through photosynthesis in presence of sunlight. That is energy is stored in plants with the help of sun. The biodiesel from Ratanjoth is also obtained by the same process. In the same way water on earth evaporates due to the heat of sun and forms clouds. Rains fall from the clouds and the rivers are filled with water, which will be collected by making dams. This collected water in the dams is used in hydroelectric plants.

Let us see how wind energy is connected to the sun.

The solar energy heats up the land and water on earth to different temperatures. Due to this difference in temperatures flowing currents are formed in the air which flow between the hot & cold regions. These flow very fast and are called winds. In this way sun is the source for wind energy also.

Petroleum and coal are the remains of plants and animals which are a modified form of energy from the sun.

In this way most of the energies are formed due to the sun or we can say, 'solar energy is the principal source of energy'.

In the newspaper, T.V. etc. we find appeals to take some precautions as.

-  Save oil its every drop is precious.
-  Check your vehicles regularly.
-  Save electricity.
-  Cover the utensils while cooking.
-  Use pressure cookers
-  Check the pressure of air in tyres.

Why do you think such precautions are necessary?

The articles used in our homes as bulbs, tubelights, fridge ,cooler etc. consumes much energy. The consumption of different forms of energy is continuously increasing in arrangements of light on roads, in transport, agriculture and factories.

The energy received from different sources are also not sufficient to fulfill our increasing necessities of energy. So we must control and balance the use of the available energy sources.



### NOW ANSWER THESE

1. What can you do to conserve or save electrical energy in your homes?
2. Biodiesel is obtained from which plant?
3. In future, from which other sources can we obtain energy?



### WE HAVE LEARNT

-  The electricity produced from water is called hydro electric energy.

- Windmills run due to strong winds from which electricity is produced. This energy is called wind energy.
- It takes thousands of years to form coal and petroleum. They are called fossil fuels.
- Petroleum is obtained from the earth through pipes. Many products are obtained from them as petrol, diesel, kerosene etc.
- Cooking gas has 'butane' and natural gas has 'methane' in it.
- Energy can also be obtained from the sun. It is called solar energy.
- Black surface is a good absorber of heat. This principle is used in solar cookers and solar water heaters.
- Cowdung mixed with water is used to make a gaseous fuel, which is called Bio Gas.
- Fuels can be solids, liquids or gases.
- Wood, Coal and Petroleum are non renewable sources of energy and solar energy, wind energy, hydro energy are renewable sources of energy.
- Biodiesel is good source of Bio-energy.
- Demand for energy is increasing continuously so we must use it carefully in a balanced manner.



## QUESTION FOR PRACTICE

1. Choose the correct alternative :-
  - (1) Out of these, this is a non renewable source of energy -
 

(a) Wind energy	(b) Petroleum
(c) Tidal energy	(d) Solar energy
  - (2) The fuel used in heavy vehicles as buses & trucks are -
 

(a) Turpene	(b) Biogas
(c) Diesel	(d) Kerosene
  - (3) The energy converters in a solar cell is made of -
 

(a) Aluminium	(b) Carbon
(c) Plastic	(d) Silicon
  - (4) The energy received from the battery is :-
 

(a) Chemical energy	(b) Heat energy
(c) Electrical energy	(d) Mechanical energy

- (5) It is not a product of petroleum :-  
 (a) Petrol (b) Bio diesel  
 (c) Kerosene (d) Diesel

**2. Fill in the blanks :-**

- ..... energy is mostly used in our homes.
- Solar cooker is based on ..... energy.
- Coal is a source of ..... energy.
- Mixture of cowdung and water treated in special plant produce ..... gas.
- The liquid fuel in our homes is .....

**3. Match the following :-**

- |                 |                   |
|-----------------|-------------------|
| 1. CNG          | Electrical Energy |
| 2. Sea          | Solar energy      |
| 3. Solar cooker | Wind energy       |
| 4. Wind Farm    | Natural gas       |
| 5. Dams         | Tidal energy      |

**4. Answer the following questions :-**

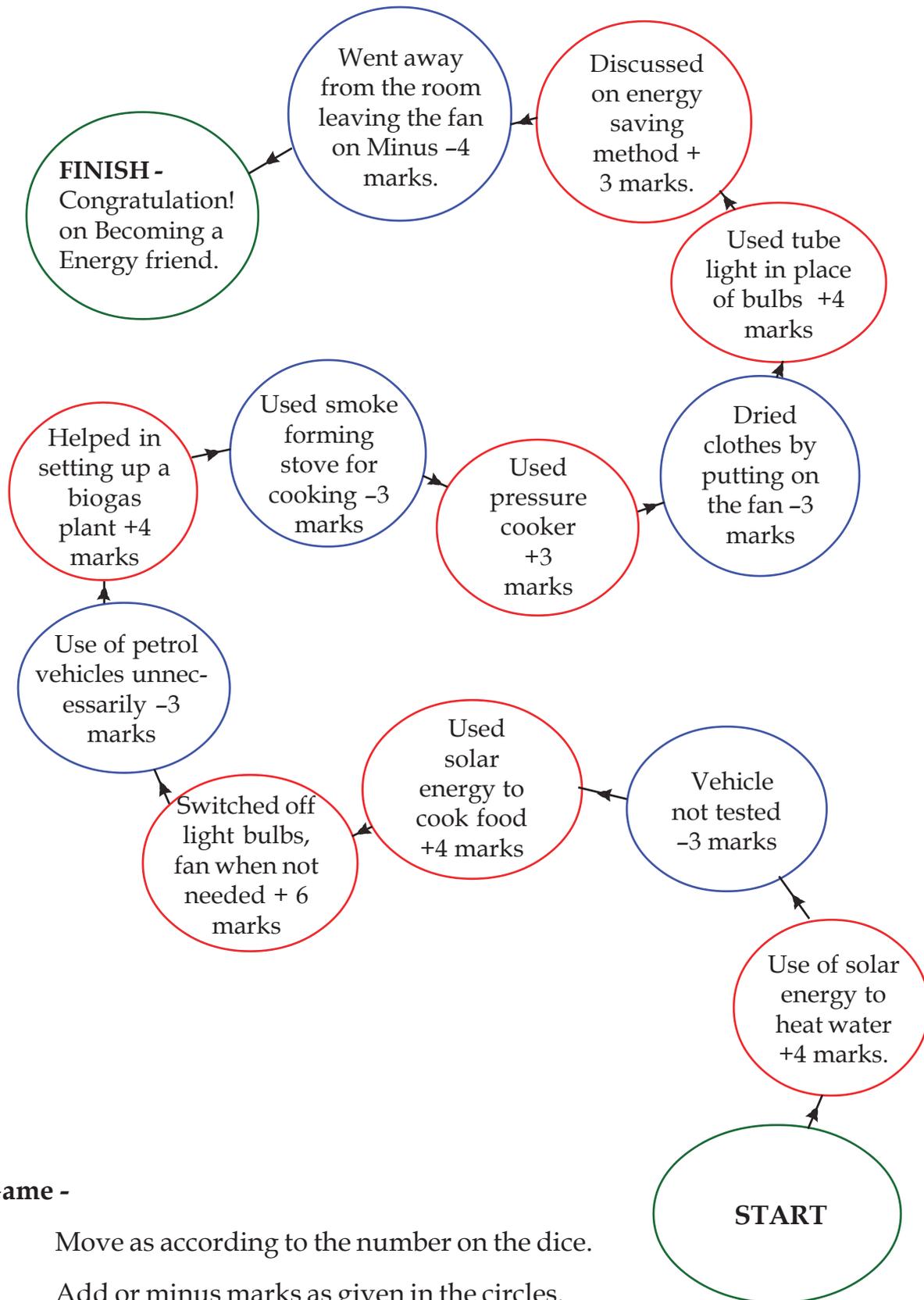
- Write names of four sources of energy.
- What are the benefits of solar energy? Give two examples of its use in daily life.
- How is hydroelectricity produced? In Chhattisgarh where are the projects for hydroelectricity situated?
- Write the names of the different products of petroleum.
- What is Biogas ? How is it produced?
- List down the various sources of energy used in your surrounding and categorize them as renewable and non-renewable sources of energy ?
- What are the main gases present in LPG?
- According to the available resources what kind of power station would you like to install in your area. Explain.



**TRY TO DO THIS ALSO**

- Discuss with your friends and teachers about the misuse of energy.
- Collect articles from newspaper about the different types of energies, their uses, preservation and precautions in their use.
- Play the given game with four friends and discuss about the things given in it.

## ENERGY GAME



**Game -**

1. Move as according to the number on the dice.
2. Add or minus marks as given in the circles.
3. The players who reaches the end with maximum marks is the winner.

