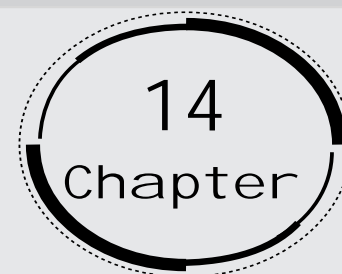


# Sources of Energy



## 1. What is a good source of energy?

Solution:

A good source of energy has the following properties:

- Be economical
- Easy storage and transportation
- Easy availability
- Work done per unit volume or mass should be large.

## 2. What is a good fuel?

Solution:

A fuel is said to be good when it is easily available and when it produces a large amount of heat energy when burnt.

## 3. If you could use any source of energy for heating your food, which one would you use and why?

Solution:

For heating and cooking, natural gas can be used for the below given reasons:

- It is easy for using
- It is easily available
- Easy transportation
- It does not produce huge amount of smoke when burnt
- It is highly inflammable.

## 1. What are the disadvantages of fossil fuels?

Solution:

Following are the disadvantages of fossil fuels:

- Fossil fuels like coal and petroleum results in air pollution as there is release of huge amount of pollutants.
- Gases such as carbon dioxide is released when a fossil fuel is burnt which causes global warming.
- Soil fertility and potable water is affected by the oxides of carbon, nitrogen, sulphur, etc. that are released from fossil fuels.

## 2. Why are we looking at alternate sources of energy?

Solution:

The reason why we are looking at alternate sources of energy is because the fossil fuels are non-renewable source of energy i.e. they are not available in large quantities and it cannot be replenished. Fossil fuels will get exhausted if their consumption is not controlled. Therefore, it is better to switch to alternate source of energy.

## 3. How has the traditional use of wind and water energy been modified for our convenience?

Solution:

In olden days, wind energy was trapped used windmills to do mechanical works like lifting or drawing water from a well. But these days, windmills are used to generate electricity. The kinetic energy of wind is trapped and converted into electricity with the help of rotatory motion of the blades which turns the turbine of the electric generator to produce electricity.

Similarly, waterfalls were the source of potential energy in olden days. But these days as the number of waterfalls has reduced, water dams are constructed and are used as a source to trap the potential energy. Here, the water falls from a certain height on the turbine producing electricity.

### **3 ALTERNATE OR NON-CONVENTIONAL SOURCE OF ENERGY**

#### **1. What kind of mirror – concave, convex or plain would be best suited for use in a solar cooker? Why?**

Solution:

For a solar cooker the heat source is sunlight for heating and cooking. The reason why a mirror is used is to reflect and focus the sunlight at one point. So a concave mirror can be used in a solar cooker, as it focuses all the sunlight at one point resulting in increase in temperature, thereby heating and cooking the food.

#### **2. What are the limitations of the energy that can be obtained from the ocean?**

Solution:

The different forms of energy that can be obtained from the ocean are tidal energy, wave energy and ocean thermal energy. Following are the limitations of the energy obtained from ocean:

- The relative positioning of the earth, the sun and the moon as an impact on the tidal energy.
- For the conversion of tidal energy into electricity, high dams are required.
- To obtain electricity from wave energy, very strong waves are required.
- For trapping the ocean thermal energy, there should be a temperature difference of more than 20°C between hot surface water and the cold water at a depth.

#### **3. What is geothermal energy?**

Solution:

Geothermal energy can be defined as the energy that is obtained from the earth. The energy can be obtained from the hot spots that are formed when the molten rocks at the core of the earth are pushed to the earth's crust. Hot springs are used for the production of electricity in the geothermal power plants.

#### **4. What are the advantages of nuclear energy?**

Solution:

Following are the advantages of nuclear energy:

- Amount of energy produced per unit mass is large
- As it does not produce any pollutants, it is clean
- Fission of 1 atom of uranium produces 10 million times the energy that is obtained by burning 1 atom of carbon

### **4. ENVIRONMENTAL CONSEQUENCES**

#### **1. Can any source of energy be pollution-free? Why or why not?**

Solution:

No source of energy can be pollution-free. But solar cells are considered to be pollution-free. But their manufacturing may cause environmental damage. In case of nuclear energy, the waste produced after fusion is zero. But the wastes that are produced during fission are hazardous. Hence, no source of energy is pollution-free.

#### **2. Hydrogen has been used as a rocket fuel. Would you consider it a cleaner fuel than CNG? Why or why not?**

Solution:

Hydrogen gas is cleaner than CNG as CNG contains hydrocarbons. Carbon is a form of pollutant in CNG. On the other hand, hydrogen is waste-free and the fusion of hydrogen does not produce any waste. Hence, hydrogen as a rocket fuel is cleaner than the CNG.

**1. Name two energy sources that you would consider to be renewable. Give reasons for your choices.**

Solution:

Following are the two sources of energy that are renewable:

(i) Wind: Wind energy is obtained from the air which is blowing at a high speed. Wind energy is trapped using windmills so as to generate electricity. Blowing of air is dependent on uneven heating of the earth. Since the heating of the earth is forever, wind availability will also be forever.

(ii) Sun: The energy obtained from the sun is known as solar energy. It is produced by the fusion of hydrogen into helium, fusion of helium into other heavy metals and it continues. A large amount of hydrogen and helium is available in sun which will never be exhausted. Hence solar energy is renewable source of energy.

**2. Give the names of two energy sources that you would consider to be exhaustible. Give reasons for your choices.**

Solution:

Following are the two sources of energy that are exhaustible:

(i) Wood: The source of wood are forests. Due to deforestation the number of forests are reducing. We know that it takes years to grow forest. If the rate of deforestation increases, the availability of wood will decrease. Hence, wood is an exhaustible source of energy.

(ii) Coal: The source of coal is from the dead remains of the plants and animals that remained buried for years. Industrialization has increased the demand for coal and it cannot be replenished. Hence, coal is also an exhaustible source of energy.

**1. A solar water heater cannot be used to get hot water on**

- a) A sunny day
- b) A cloudy day
- c) A hot day
- d) A windy day

Solution:

b) A sunny day

A solar water heater uses solar energy to heat water. On a cloudy day, the sunlight won't be intense and bright enough and it gets reflected back in the sky from the clouds. This holds the sunlight from reaching the ground. Therefore, solar energy won't be available for the solar water heater to heat the water.

**2. Which of the following is not an example of a bio-mass energy source?**

- a) Wood
- b) Gobar-gas
- c) Nuclear energy
- d) Coal

Solution:

c) Nuclear energy

Bio-mass is obtained from the dead plants and animal wastes. In these dead plants and animals there is a chemical change as they react with water and sunlight. But nuclear energy is obtained by fusion and fission of atoms resulting in tremendous release of energy. Both nuclear fusion and fission can be carried out in the absence of the sunlight.

Wood is a part of plant, gobar-gas is obtained from the animal dung and coal is obtained by the dead remains of the plants and animals. Therefore, they are all bio-mass energy products.

**3. Most of the sources of energy we use represent stored solar energy. Which of the following is not ultimately derived from the sun's energy?**

- a) Geothermal energy
- b) Wind energy
- c) Nuclear energy
- d) Bio-mass

Solution:

c) Nuclear energy

Nuclear energy is produced by nuclear fusion and nuclear fission. In nuclear fission, uranium atoms are bombarded with low energy neutrons resulting in splitting of the atom into two relatively lighter nuclei. In nuclear fusion, lighter nuclei are fused together to form a relatively heavier nuclei. The energy produced in nuclear reaction is tremendous and can be carried out in the absence of sunlight.

Geothermal energy is obtained from the deep stored energy in the form heat in the earth's crust. The uneven heating of the earth's surface results in wind movement and bio-mass is obtained from the dead remains of the plants and the animals.

#### **4. Compare and contrast fossil fuels and the sun as direct sources of energy.**

Solution:

Fossil fuels are obtained from the earth's crust as they are the remains of the dead plants and animals.

They are similar to coal and petroleum and readily available for the use. These are non-renewable source of energy and cannot be replenished.

Whereas solar energy is abundant in nature and can be replenished.

#### **5. Compare and contrast bio-mass and hydroelectricity as sources of energy.**

Solution:

Bio-mass is obtained from the dead plants and animals. It renewable source of energy. Examples of bio-mass sources of energies are wood, gobar-gas.

Hydroelectricity is obtained from the potential energy of the stored water at a certain height. Water from a certain height is made to fall on the turbines of the generator resulting in electricity. Dams and reservoirs are used in hydroelectricity.

Both bio-mass and hydroelectricity are renewable sources of energies.

#### **6. What are the limitations of extracting energy from:**

- a) **The wind?**
- b) **Waves?**
- c) **Tides?**

Solution:

a) The wind: Wind energy is trapped using windmills. One of the limitations of the wind energy is that the windmills requires a speed more than 15 km/h to generate electricity. And the number of windmills will be more to cover a huge area.

b) Waves: In order to extract energy from the waves, very strong ocean waves are needed.

c) Tides: In order to extract energy from the tides, the sun, the moon and the earth should be in a straight alignment and the tides should be very strong.

#### **7. On what basis would you classify energy sources as:**

- a) **Renewable and non-renewable?**
- b) **Exhaustible and inexhaustible?**

**Are the options given in (a) and (b) the same?**

Solution:

(a) Renewable and non-renewable:

Renewable energy sources are those which replenish on their own and are easily available in nature. Like solar energy, tidal energy, wind energy, bio-mass.

Non-renewable energy sources are those which do not replenish on their own and have limited in availability in nature. Like fossil fuels which includes petroleum, coal and natural gas.

(b) Exhaustible and inexhaustible:

Exhaustible source of energy are those which deplete after few hundred years. Like coal and petroleum.

Inexhaustible source of energy are those which do not deplete and are available in abundant quantity. Like solar and wind energy.

**8. What are the qualities of an ideal source of energy?**

Solution:

Following are the qualities of an ideal source of energy:

- It should be economical
- It should be easily available
- Pollution free
- Easy transportation and storage
- The amount of energy produced when burnt should be huge.

**9. What are the advantages and disadvantages of using a solar cooker? Are there places where solar cookers would have limited utility?**

Solution:

Advantages:

The heat source for a solar cooker is sunlight. It is a clean renewable and inexhaustible source of energy. As its availability is unlimited, it will be pocket-friendly.

Disadvantages:

It doesn't work on a cloudy day.

**10. What are the environmental consequences of the increasing demand for energy? What steps would you suggest to reduce energy consumption?**

Solution:

Industrialization demands for more energy and to fulfil these demands fossil fuels are used as they are readily available. Due to their harsh usage, it has an impact on the environment. Too much exploitation of fossil fuels has led to greenhouse effect resulting in global warming.

But there are few possibilities of reducing this by reducing the usage of fossil fuels and opting for alternate sources of energy. Reducing the unnecessary usage of electricity and water. Opting for public transportation and reducing using own vehicles. These are few small steps that can be implemented for reducing the energy consumption.