

# Chapter 14

## Sources of Energy

### Intext Questions

#### On Page 243

**Question 1:** What is a good source of energy?

**Solution:** A good source of energy will be having following characteristics:

- (I) It is easily accessible
- (II) It is economical.
- (III) It produces a lot of heat.
- (IV) It is easy to store and transport.
- (V) It does a huge amount of work
- (VI) It produces less amount of smoke.

**Question 2:** What is a good fuel?

**Solution:** A good fuel produces large amount of heat on burning. It is easily available & produces less smoke.

**Question 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 food, natural gas can be used. This is because it is a clean source of energy. It produces less smoke on burning. Although it is highly inflammable, it is easy to use, transport, and it produces a huge amount of heat on burning.

### On Page 248

**Question 1:** What are the disadvantages of fossil fuels?

**Solution:** The disadvantages of fossil fuels are as follows:

- It causes air pollution.
- It causes global warming.

Fossil fuels release oxides of carbon, nitrogen, sulphur, etc. that cause acid rain, which affects the soil fertility and potable water.

**Question 2:** Why are we looking at alternate sources of energy?

**Solution:** Fossil fuels are non-renewable sources of energy. They occur naturally and their sources are limited and cannot replenish on their own. They are being consumed at a large rate. If this rate of consumption continues, then the fossil fuels would be exhausted from the Earth. Thus, we have to consider for alternate sources of energy.

**Question 3:** How has the traditional use of wind and water energy been modified for our convenience?

**Solution:** Earlier, waterfalls were used as a source of potential energy. They were used for the production of electricity. As waterfalls are few in number, water dams have been constructed in large numbers. Nowadays, hydro-dams are used in order to harness potential energy of stored water. In water dams, water falls from a height on the turbine, which produces electricity.

Earlier, the windmills were used to harness wind energy to do mechanical work such as lifting water from a well. Today, windmills are used to generate electricity. In windmills, the kinetic energy of wind is harnessed and converted into electricity.

### On Page 253 - A

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

**Solution:** Solar cooker works on the principle of solar energy. Thus, a mirror is required for focusing all the incident sunlight at a point. Concave mirror can be used for this purpose. The temperature at that point increases, thereby cooking and heating the food placed at that point.

**Question 2:** What are the limitations of the energy that can be obtained from the oceans?

**Solution:** Tidal energy, wave energy, and ocean thermal energy are the forms of energy that can be obtained from the ocean.

Tidal energy depends on the relative positioning of the Earth, moon, and the Sun.

High dams are required to be built to convert tidal energy into electricity.

Very strong waves are required to obtain electricity from wave energy.

**Question 3:** What is geothermal energy?

**Solution:** Geothermal energy is produced by using heat of the earth through geothermal power plants.

**Question 4:** What are the advantages of nuclear energy?

**Solution:** The advantages of nuclear energy are as follows:

- (a) Large amount of energy is produced
- (b) It is a clean energy as it does not produce smoke
- (c) Fission of one atom of uranium produces 10 million times the energy released by burning of one atom of carbon.
- (d) Fusion of four hydrogen atoms produces huge amount of energy

### On Page 253 - B

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

**Solution:** No, this is not possible. For example- solar cells are pollution-free. However, even their making causes environmental damage indirectly.

Also, in the case of nuclear energy, there is no waste produced after the fusion reactions. However, it is not totally pollution-free. To start the fusion reactions, approximately  $10^7$  K temperature is required, which is provided by fission reactions. The wastes released from fission reactions are very hazardous. Hence, no source of energy is pollution-free.

**Question 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. On the other hand, hydrogen is waste-free. The fusion of hydrogen does not produce any waste. Hence, hydrogen is cleaner than CNG.

### On Page 254

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

**Solution:** Two renewable sources of energy are:

**Sun:** solar energy is a renewable source of energy. As we know that, solar energy is produced by the fusion of hydrogen into helium, fusion of helium into other heavy elements, and so on. A large amount of hydrogen and helium is present in the Sun. Hence, solar energy can replenish on its own.

**Wind:** Air blows because of uneven heating of the Earth. Since the heating of the Earth will continue forever because of sun, wind energy will also be available forever. Wind energy is harnessed by windmills in order to generate electricity. Wind energy is derived from air blowing with high speed.

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

**Solution:** Two exhaustible energy sources are :

**Coal:** It is produced from dead remains of plants and animals that remain buried under the earth's crust for millions of years. It takes millions of years to produce coal. Hence, it is a non-renewable or exhaustible source of energy.

**Wood:** It is obtained from forests. Deforestation at a faster rate has caused a reduction in the number of forests on the Earth. It takes many years to grow a forest. If deforestation is continued at this rate, then there would be no wood left on the Earth. Hence, wood is an exhaustible source of energy.

### Exercise

**Question 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 cloudy day

**Question 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

**Question 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

**Question 4:** Compare and contrast fossil fuels and the Sun as direct sources of energy.

**Solution:** Fossil fuels are directly available to human beings for use. Hence, fossil fuels are the direct source of energy. These are non-renewable sources of energy because these cannot be replenished in nature. Fossil fuels take millions of years for their formation. If the present fossil fuel of the Earth gets exhausted, its formation will take several years. They are also very costly.

On the other hand, solar energy is a renewable and direct source of energy. Solar energy is available free of cost to all in unlimited amount. It replenishes in the Sun itself.

**Question 5:** Compare and contrast bio-mass and hydro electricity as sources of energy.

**Solution:** Bio-mass and hydro-electricity both are renewable sources of energy. Bio-mass is derived from dead plants and animal wastes. Hence, it is naturally replenished. It is the result of natural processes. Wood, gobar gas, etc. are some of the examples of bio-mass.

Hydro-electricity, on the other hand, is obtained from the potential energy stored in water at a height. Energy from it can be produced again and again. It is harnessed from water.

**Question 6:** What are the limitations of extracting energy from –

(a) The wind? (b) Waves? (c) Tides?

**Solution:** (a) Wind energy is harnessed by windmills. One of the limitations of extracting energy from wind is that a windmill requires wind of speed more than 15 km/h to generate electricity. Also, a large number of windmills are required, which covers a huge area.

(b) Very strong ocean waves are required in order to extract energy from waves.

(c) Very high tides are required in order to extract energy from tides. Also, occurrence of tides depends on the relative positions of the Sun, moon, and the Earth.

**Question 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) The source of energy that replenishes in nature is known as renewable source of energy. Sun, wind, moving water, bio-mass, etc. are some of the examples of renewable sources of energy.

The source of energy that does not replenish in nature is known as non-renewable source of energy. Coal, petroleum, natural gas, etc. are some of the examples of non-renewable sources of energy.

(b) Exhaustible sources are those sources of energy, which will deplete and exhaust after a few hundred years. Coal, petroleum, etc. are the exhaustible sources of energy.

Inexhaustible resources of energy are those sources, which will not exhaust in future. These are unlimited. Bio-mass is one of the inexhaustible sources of energy.

Yes. The options given in (a) and (b) are the same.

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

**Solution:** An ideal source of energy must be:

- I. Economical
- II. Easily accessible
- III. Smoke/pollution free
- IV. Easy to store and transport
- V. Able to produce huge amount of heat and energy on burning

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

**Solution:** Solar cooker uses Sun's energy to heat and cook food. It is inexhaustible and clean renewable source of energy. It is free for all and available in unlimited amount. Hence, operating a solar cooker is not expensive.

Disadvantage of a solar cooker is that it is very expensive. It does not work without sunlight. Hence, on cloudy day, it becomes useless.

The places where the days are too short or places with cloud covers round the year, have limited utility for solar cooker.

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

**Solution:** Today, because of industrialization, demand for energy increases. Fossil fuels are easily accessible sources of energy. The increased use of fossil fuels has a very bad effect on the environment. If we exploit fossil fuels at this rate, it will continuously raise the level of green house gas content in the atmosphere. It results in global warming and a rise in the sea level.

Since, it is not possible to completely reduce the consumption of fossil fuels still we can control their usage. However, some measures can be taken such as using electrical appliances wisely and not wasting electricity. Unnecessary usage of water should be avoided. Public transport system with mass transit must be adopted on a large scale. These small steps may help in reducing the consumption of natural resources and conserving them.

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