

NCERT Solutions Class 10 – Sources of Energy [cbsephysics.com]

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Question 1: What is a good source of energy?

Answer:

- (a) A good energy source is more efficient than any other energy source. They are called good sources because they can produce lots of heat per unit mass.
- (b) They are easily available in nature and cause very less amount of pollution.
- (c) They are very cheap in price and easily accessible.

Question 2: What is a good fuel?

Answer: A good fuel can produce a huge amount of heat on burning, does not produce much pollution, and is easily available at a low price.

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

Answer: Natural gas should be used for heating and cooking food because it is a good source of energy. It is eco-friendly and highly combustible. We can produce it in our home also by making a biogas chamber.

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Question 1: What are the disadvantages of fossil fuels?

Answer: The disadvantages of fossil fuels are:

- (a) The burning of fossil fuels produces a lot of greenhouse gas like carbon dioxide, Sulphur dioxide, carbon monoxide, etc.
- (b) Fossil fuels release oxides of carbon, nitrogen, sulfur, etc., which cause acid rain, which affects soil fertility and potable water.
- (c) The Source of Fossil fuels are limited in nature. Hence it will come to an end.

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

Answer: Fossil fuels are traditionally used by humans as a major energy source, But they are non-renewable sources of energy. These sources of energy are limited, and that's why fossil fuels will be exhausted from the Earth. Therefore, we have to use renewable energy sources. Hence, we should look for alternate sources of energy.

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

Answer: we always use waterfalls as a source of potential energy and convert it to electricity with the help of turbines. Since waterfalls are few, water dams have been constructed in large numbers. Nowadays, hydro-dams are used to harness the potential energy of stored water.

Earlier, the windmills were used to harness wind energy to do mechanical work like lifting/drawing water from a well. Today, windmills are used to generate electricity. In windmills, wind's kinetic energy is harnessed and converted into electricity.

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

Answer: A solar cooker uses the heat of sunlight to cook and heat food. Here the mirror helps to reflect and focus sunlight at a point. A concave mirror is convergent in nature. The mirror focuses all the incident sunlight at a point—the temperature at that point increases, which helps in cooking the food fast.

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

Answer: The forms of energy we can obtain from the ocean are tidal energy, wave energy. There are several limitations in order to harness these energies.

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

Very high technology is required to be built to convert tidal energy into electricity. Which is quite costly

To harness ocean thermal energy efficiently, the difference in surface water temperature (hot) and the water at depth (cold) must be 20°C or more.

Question 3: What is geothermal energy?

Answer: Geothermal power plants use Earth's core heat energy to generate electricity. This type of heat energy of the Earth is known as geothermal energy.

If somehow, the molten rocks present in the core of the Earth are pushed to the Earth's crust. This forms regions of hot-spot. Steam is generated when the underground water comes in contact with these hot spots forming hot springs. This trapped steam is used to generate electricity in geothermal power plants.

Question 4: What are the advantages of nuclear energy?

Answer: The advantages of nuclear energy are as follows:

- (a) A large amount of energy is produced per unit mass.
- (b) It does not produce smoke. It is one type of green energy.
- (c) The fission of uranium can produce 10 million times the energy released by burning coal
- (d) The fusion of hydrogen atoms can produce more energy than nuclear fission.

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

Answer: No source of energy is completely pollution-free. It is considered that solar cells are pollution-free. However, even chemical batteries cause 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, an approximately 10^7 K temperature is required, provided by fission reactions. The wastes released from fission reactions are radioactive elements.

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

Answer: Hydrogen gas is cleaner than CNG. CNG contains hydrocarbons. Therefore, it has carbon contents. Carbon is a form of pollutant present in CNG. On the other hand, hydrogen is waste-free. The fusion of hydrogen does not produce any waste. Hence, hydrogen is cleaner than CNG.

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

Answer: Two renewable sources of energy are as follows:

Sun Energy: The energy derived from the Sun is known as solar energy. Solar energy is produced by the fusion of hydrogen into helium, the fusion of helium into other heavy elements, and so on. A large amount of hydrogen and helium is present in the Sun. Therefore, solar energy can replenish on its own. The Sun has 5 billion years more to burn. Hence, solar energy is a renewable source of energy.

Wind Energy: Wind energy is derived from the air blowing at high speed. Windmills harness wind energy in order to generate electricity. Air blows because of the uneven heating of the Earth. Since the heating of the Earth will continue forever, wind energy will also be available forever.

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

Answer: Two exhaustible energy sources are as follows:

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. Industrialization has increased the demand for coal. However, coal cannot replenish within a short period of time. 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 hundreds of 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.

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

Answer: (b) A solar water heater uses solar energy to heat water. It requires bright and intense sunlight to function properly. On a cloudy day, the sunlight reflects in the sky from the clouds and is unable to reach the ground. Therefore, solar energy is not available for the solar heater to work properly. Hence, the solar water heater does not function on 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

Answer: (c) Bio-mass is a source of energy that is obtained from plant materials and animal wastes. Nuclear energy is released during nuclear fission and fusion. In nuclear fission, the uranium atom is bombarded with low-energy neutrons. Hence, the uranium atom splits into two relatively lighter nuclei. This reaction produces a huge amount of energy. Lighter nuclei are fused together to form a relatively heavier nucleus in a nuclear fusion reaction. This reaction produces a tremendous amount of energy. Hence, nuclear energy is not an example of a bio-mass energy source.

Wood is a plant material, gobar gas is formed from animal dung, and coal is a fossil fuel obtained from the buried remains of plants and animals. Hence, these are bio-mass products.

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

Answer: (c) Nuclear energy is released during nuclear fission and fusion. In nuclear fission, the uranium atom is bombarded with low-energy neutrons. Hence, the uranium atom splits into two relatively lighter nuclei. This reaction produces a huge amount of energy. In a nuclear fusion reaction, lighter nuclei are fused together to form a relatively heavier nucleus. The energy required to fuse the lighter nuclei is provided by fission reactions. This reaction produces a tremendous amount of energy. These reactions can be carried out in the absence or presence of sunlight. There is no effect of sunlight on these reactions. Hence, nuclear energy is not ultimately derived from Sun's energy.

Geothermal energy, wind energy, and bio-mass are all ultimately derived from solar energy.

Geothermal energy is stored deep inside the Earth's crust in the form of heat energy. The heating is caused by the absorption of atmospheric and oceanic heat. It is the sunlight that heats the atmosphere and oceans.

Wind energy is harnessed from the blowing of winds. The uneven heating of the Earth's surface by the Sun causes wind.

Bio-mass is derived from dead plants and animal wastes. Chemical changes occur in these dead plants and animal wastes in the presence of water and sunlight. Hence, bio-mass is indirectly related to sunlight.

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

Answer: Fossil fuels are energy sources, such as coal and petroleum, obtained from underneath the Earth's crust. They are directly available to human beings for use. Hence, fossil fuels are the direct source of energy. These are limited in amount. These are non-renewable sources because they 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. Fossil fuels are also very costly.

On the other hand, solar energy is a renewable and direct energy source. The Sun has been shining for several years and will do so for the next five billion years. Solar energy is available free of cost to all in unlimited amounts.

Question 5: Compare and contrast bio-mass and hydroelectricity as sources of energy.

Answer: Bio-mass and hydroelectricity 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.

On the other hand, hydroelectricity 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 and obtained from mechanical processes.

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

the wind? (b) waves? (c) tides?

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

Very strong ocean waves are required to extract energy from waves.

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

Question 7: On what basis would you classify energy sources as

Renewable and non-renewable?

Exhaustible and inexhaustible?

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

Answer: (a) The source of energy that replenishes in nature is known as a renewable source of energy. Sun, wind, moving water, biomass, etc., are some of the examples of renewable sources of energy.

The source of energy that does not replenish in nature is known as a 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 exhaustible sources of energy.

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

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

Question 8: What are the qualities of an ideal source of energy? An ideal source of energy must be:

Economical

- (a) Easily accessible
- (b) Smoke/pollution-free
- (c) Easy to store and transport
- (d) Able to produce a 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?

Answer:

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

The disadvantage of a solar cooker is that it is very expensive. It does not work without sunlight. Hence, on a 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 cookers.

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

Answer: Industrialization increases the energy demand. Fossil fuels are easily accessible sources of energy that fulfill this demand. The increased use of fossil fuels has a harsh effect on the environment. Too much exploitation of fossil fuels increases the level of greenhouse gas content in the atmosphere, resulting in global warming and a rise in the sea level.

It is not possible to completely reduce the consumption of fossil fuels. However, some measures can be taken to use electrical appliances wisely and not waste 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 reduce the consumption of natural resources and conserve them.