CBSE Class 10 Science
NCERT Solution

Science Chapter 14 - Sources of Energy

In text Questions

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Question 1:-What is a good source of energy?
Answer:
A good source of energy is one that

1. does a large amount of work per unit volume or mass
2. can be easily accessible
3. is easy to store and transport, and
4. is economical.

Question 2:-What is a good fuel?
OR
Write any three characteristics of a good fuel.
Answer:
A good fuel is one which has the following properties :

1. It should be fairly cheap.
2. It should be easily available.
3. Its ignition temperature should be well above normal temperature.
4. It should be conveniently handled and transported.
5. It should not produce any poisonous material during burning.
6. Its combustion rate should be steady and controllable.
7. It should not leave any residue or ash after burning.
8. A good fuel should have high calorific value so that higher amount of heat may be obtained by burning a little fuel.

Question 3:-If you could use any source of energy for heating your food, which one should you use and why?
Answer:
I would prefer to use cooking gas like LPG. It fulfils many of the criteria of a good fuel like its ignition temperature, good calorific value and non-polluting characteristics.

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Question 1:-What are the disadvantages of fossil fuels?
Answer:

(i) The burning of fossil fuels produces large amount of carbon dioxide that causes increased greenhouse effect.
(ii) The burning of fossil fuels (such as coal) produces smoke which pollutes the air.
(iii) The burning of fossil fuels produces acidic gases such as sulphur dioxide and nitrogen oxide. These acidic gases cause acid rain that affects our water and soil resources.
(iv) Fossil fuels cannot be replenished in short time because it takes millions of years to form them.

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

Answer:
We are looking at alternate sources of energy because of the following reasons.

- The fossil fuels and nuclear fuels on the earth are limited which may not last for long.
- The undesirable effects of pollution, both from the burning of fossil fuels and from the radioactive nuclear wastes of nuclear power plants are creating threat to our environment.

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

Answer:
(i) Wind mill farms are constructed to produce electricity.
(ii) The traditional use of energy of flowing water has been modified by establishing hydro-power plants. At hydro-power plants, the energy of falling water or flowing water is tapped by using a water turbine and then made to drive generators.

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

Answer:
A concave mirror would be best suited in a solar cooker because it focuses the sunlight in a very small area of the solar cooker and a high temperature is produced in it which is sufficient to cook the food.

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

Answer:
The energy from the oceans can be obtained mainly in three forms. These are
(i) tidal energy
(ii) wave energy and
(iii) ocean thermal energy

- **Limitations of Tidal Energy:**
  (i) There are very few sites around the world which are suitable for building tidal dams.
  (ii) The rise and fall of sea-water during high and low tides is not enough to generate electricity on a large scale.
- **Limitations of wave energy:** The movement of ocean waves is associated with kinetic energy. Such sites in the world are limited where the waves strike the shore lines with sufficient power.

- **Limitations of ocean thermal energy:** NCERT Solutions for Class 10 Science Chapter 14 Sources of Energy To convert ocean thermal energy into electricity, a temperature difference of 20°C (or more) between the surface water of ocean and deeper water is needed for operating OTEC power plants. This involves high cost.

Question 3:-What is geothermal energy?

Answer:

Energy stored as heat in certain regions of the earth (called hot spots) is called geothermal energy. Hot spots are the locations below earth's crust where upward moving magma gets collected due to geological changes. When underground water comes in contact with the hot spots, steam is generated. This steam is utilised to generate electricity using pipes and turbines. Sometimes hot water from the hot spot finds outlet at the surface. Such outlets are called hot springs.

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

Answer:

The advantages of nuclear energy are that :

1. It produces a large amount of useful energy from a very small amount of a nuclear fuel (like uranium-235).
2. Once the nuclear fuel (like uranium-235) is loaded into the reactor, the nuclear power plant can go on producing electricity for two to three years at a stretch. There is no need for putting in nuclear fuel again and again.
3. It does not produce gases like carbon dioxide which contributes to greenhouse effect or sulphur dioxide which causes acid rain.

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

Answer:

No source of energy can be pollution free because even if it is clean, its assembly could have caused some environmental damage.

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

Answer:

Hydrogen is cleaner fuel than CNG. This is because the burning of hydrogen produces only water, which is totally harmless. On the other hand, burning of CNG produces carbon dioxide gas and water. The carbon dioxide can produce greenhouse effect in the atmosphere and lead to the excessive heating of the environment in long run.

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

Answer:

(i) Energy derived from biomass is a renewable source of energy because waste products are continuously produced. Plants and trees are also grown at reasonable intervals.

(ii) The energy derived from flowing water, wind, sun and ocean are renewable sources because these sources can be harnessed into energy so long as the present solar system exists.

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

Answer:

Fossil fuels like coal and petroleum are exhaustible sources of energy. The estimated reserves of these fuels are said to last us for about another 200 years, while it takes millions of years for these to be formed.

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Chapter 14

Textbook Chapter End Questions

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 cloudy 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.

Question 2:-Which of the following is not an example of a biomass energy source?

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

Answer:

(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.

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) Biomass

Answer:

(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 of 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.

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

Answer:

Fossil fuels	Sun
(i) Non-renewable source of energy.	(i) Renewable source of energy.
(ii) Cause a lot of air pollution.	(ii) Pollution-free, doesn't cause any pollution.
(iii) They will exhaust in future.	(iii) It is a non-exhaustible source.
(iv) Energy can be tapped throughout the year.	(iv) Energy cannot be tapped during night and cloudy and rainy days.

Question 5:-Compare and contrast biomass and hydro-electricity as sources of energy.

Answer:

Biomass	Hydroelectricity

(i) Renewable source of energy.	(i) Renewable source of energy.
(ii) Biomass plants can be installed at any place to produce biomass as energy source.	(ii) Plants can be installed only at the places where dams can be constructed.
(iii) To collect waste materials is a tough and costly process.	(iii) Once the plants start to work, it is not difficult to collect water.

Question 6:-What are the limitations of extracting energy from
(a) the wind ?
(b) waves?
(c) tides?

Answer:

(a) Limitations of wind energy

(i) Wind energy farms cannot be established everywhere. The wind energy farms can be established only at those places, where wind blows for most part of the year.
(ii) The wind required for generating electricity should be strong and steady to maintain the desired level of generation. The minimum wind speed necessary for satisfactory working of the wind generator is about 15 km/h. This is not always so.
(iii) The wind energy farms require a large area of land.
(iv) The setting up of wind energy farms is very expensive.

(b) Limitations of wave energy: The harnessing of sea-waves energy would be a viable proposition only at those places where sea-waves are very strong. This has constraints of time and location.

(c) Limitations of tidal energy:

(i) There are very few sites around the world which are suitable for building tidal dams.
(ii) The rise and fall of sea-water during high and low tides is not enough to generate electricity on a large scale.

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?

Answer:

(a) Renewable sources : The sources of energy which are being produced continuously in nature and are inexhaustible, are called renewable sources of energy. The energy derived from flowing water, wind, tides, ocean waves, or wood are examples of energy from such sources.

Non-renewable sources: These sources are produced over millions of years under special conditions. Once consumed, these are not replaceable for a very long time. Fossil fuels like coal, petroleum and natural gas are non-renewable sources.
(b) Exhaustible sources are non-renewable sources, while inexhaustible sources are renewable sources.
Yes, the options given in (a) and (b) are the same.

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

Answer:
An ideal source of energy

- Must give an adequate amount of net energy.
- Must be convenient to use so as to give energy at a steady rate.
- Must be easy to store and transport.

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

Answer:
Advantages of using solar cooker :

1. The use of solar cooker for cooking food saves precious fuels like coal, kerosene and LPG.
2. The use of solar cooker does not produce smoke due to which it does not pollute air.
3. When food is cooked in solar cooker, its nutrients do not get destroyed. This is because in a solar cooker, food is cooked at a comparatively lower temperature.
4. In a solar cooker, up to four food items can be cooked at the same time.

Disadvantages of using solar cooker:

1. The solar cooker cannot be used to cook food during night because sunshine is not available at that time.
2. If the day sky is covered with clouds, even then solar cooker cannot be used to cook food.
3. The direction of reflector of solar cooker has to be changed from time-to-time to keep it facing the sun.
   Sources of Energy
4. The box-type solar cooker cannot be used for baking (making chappattis, etc.) or for frying.
   The places that receive rain most of the year or where the sky remains cloudy, the solar cooker has limited utility.

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

Answer:
Some of the environmental consequences of the increasing demand for energy are the following :

1. The combustion of fossil fuels is producing acid rain and damaging plants (crops), soil and aquatic life.
2. The burning of fossil fuels is increasing the amount of greenhouse gas carbon-dioxide in the atmosphere. It has also affected the rainfall.
3. The cutting down of trees from the forest for obtaining fire-wood is causing soil erosion and destroying wild life.

4. The construction of hydro-power plants is disturbing ecological balance.
5. Nuclear power plants are increasing radioactivity in the environment.

The following steps can be taken to reduce energy consumption:

1. Switch off lights, fans, TV and other such electrical appliances when not needed, to save electricity.
2. Use energy efficient electrical appliances to save electricity. This can be done by using compact fluorescent lamps (CFL) and tube lights in place of conventional filament- type electric bulbs.
3. Good quality stoves should be used to burn fuels like kerosene and LPG so as to obtain maximum heat.
4. Pressure cookers should be used for cooking food to save fuel.
5. Solar cookers should be used to cook food whenever possible and solar water heaters should be used to get hot water.
6. The use of biogas as fuel should be encouraged in rural areas.
7. Bicycles should be used for short distances to save fuel like petrol which is used in cars, scooters and motorcycles.