



NCERT SOLUTIONS

Source of Energy

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Source of Energy

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IN CHAPTER QUESTIONS

PART - 1

Q1. What is a good source of energy ?

Ans. A good source of energy should be

- (1) Capable of doing large amount of work per unit mass or volume.
- (2) Easily accessible i.e., it should be convenient to use.
- (3) Easy to transport and store.
- (4) Capable of delivering desired quantity of energy at a steady rate over a long period of time.
- (5) Should be economical.

Q2. What is a good fuel ?

Ans. (1) It should have a high calorific value [calorific value is defined as the number of heat units produced when unit mass of fuel is burnt] Thus, a good fuel should liberate more heat per unit mass.

- (2) It should have low moisture content.
- (3) It should have low non-combustible matter like ash, etc. That is, it should leave low ash and other residual matter after combustion.
- (4) Its products of combustion should not be harmful. An ideal fuel should not produce any type of harmful products/gases which create air pollution, water pollution, and harmful effects to the human body.
- (5) It should have moderate ignition temperature. Low ignition temperature may cause fire hazards, whereas high ignition temperature may cause difficulty in combustion.
- (6) It should be easy to store and transport.
- (7) It should have moderate rate of combustion and its combustion should be controllable.
- (8) It should be readily available at low cost.

Q3. If you could use any source of energy for heating your food, which one would you use and why ?

Ans. We would use a microwave oven for heating the food as it heats uniformly and cleanly without loss in its nutritional value. Also, we can use solar cooker if bright sunlight is available because the nutrients are not lost during heating in solar cooker.

PART - 2

Q1. What are the disadvantages of fossil fuels ?

Ans. Fossil fuels (coal, petroleum and natural gas) have the following disadvantages :

- (1) The fossil fuels are non-renewable sources of energy, if we continue to consume these sources at alarming rates, we would soon run out of energy.
- (2) There are no such alternate sources of energy developed till today which can replace fossil fuels. Thus, large dependency on fossil fuels for most of our energy requirements may create problem in future.
- (3) Air pollution is caused by burning fossil fuels.
- (4) Carbon-dioxide produced by burning these fuels contributes to greenhouse effect.

Q2. Why are we looking at alternate sources of energy?

Ans. Fossil fuels were formed due to extraordinary circumstances that took place millions of years ago. No new reservoirs of these fuels are being formed due to the absence of those circumstances. Thus, they are non-renewable sources of energy. If we continue to use these sources at the present rate, we would soon be deprived of these sources. That is why, we are looking for alternate sources of energy.

Q3. How has the traditional use of wind and water energy been modified for our convenience ?

Ans. The traditional use of wind energy has been modified by using windmills (or wind turbines) and that of water by constructing hydro power plants.

PART - 3

Q1. What kind of mirror - concave, convex or plane - would be best suited for use in a solar cooker ? Why?

Ans. A concave mirror is best suited for use in a solar cooker. This is because a concave mirror concentrates solar energy from over a large area into a small area (at its focus). As a result, high temperatures can be achieved. Such a mirror is called solar concentrator.

Q2. What are the limitations of energy that can be obtained from the oceans ?

Ans. The energy obtained from the oceans is

- (1) tidal energy, for which very few suitable sites are available for construction of dams and the generation is intermittent and not very large.
- (2) sea-waves energy, where power output is variable and the currently available technologies are quite expensive.
- (3) ocean thermal energy, where the conversion efficiency is quite low but a lot of capital investment is required.

Q3. What is geothermal energy ?

Ans. The heat energy inside the earth's crust is known as geothermal energy. The geological changes in some regions push the hot magma upwards which gets collected at some depth below the surface of earth. Such places are called hot spots. These hot spots serve as a source of heat energy (or geothermal energy). The geothermal energy is utilised to convert water into steam which rotates a steam turbine.

Q4. What are the advantages of nuclear energy ?

Ans. (1) The mass of nuclear fuel like uranium-235 required is extremely small as compared to a fossil fuel to produce the same amount of energy.

(2) In a nuclear power plant, the nuclear fuel supplies energy over a long period of time.

PART - 4

Q1. Can any source of energy be pollution-free ? Why or why not ?

Ans. No source of energy is totally pollution-free, only the degree and the manner of pollution vary. For example, solar cells seem to be non-polluting but environmental pollution is caused in the manufacturing of solar cells.

Q2. Hydrogen has been used as a rocket fuel. Would you consider it a cleaner fuel than CNG ? Why or why not ?

Ans. Hydrogen is a cleaner fuel than CNG. This is because it produces water on burning whereas CNG on burning, produces CO_2 , H_2O and CO .

PART - 5

Q1. Name two energy sources that you would consider to be renewable. Give reasons for your choices.

Ans. (1) Water energy (hydro-energy), water on Earth can be used again and again to generate hydro energy as it is stored again and again in dams due to the water cycle that exists in nature.

(2) Bio-mass energy, bio-mass can be managed by replacing the trees that have been cut down for fire-wood, cattle dung will be available as long as life exists on Earth. Thus, we can get a constant supply of energy at a practically usable rate.

Q2. Give the names of two energy sources that you would consider to be exhaustible. Give reasons for your choices.

Ans. (1) Coal (2) Petroleum

Both these sources are present only in limited amounts and will be exhausted soon if we continue to use them at the present rate. These sources were formed over millions of years under special circumstances.

EXERCISES

Q1. 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

Ans. Option (b) is correct. On cloudy day, heat radiations coming from the Sun do not reach the solar water heater.

Q2. Which of the following is not an example of bio-mass energy source ?

- (a) wood (b) gobar gas (c) atomic energy (d) coal

Ans. Option (c) is correct.

Q3. 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) fossil fuels (d) bio-mass

Ans. Option (a) is correct.

Q4. Compare and contrast fossil fuels and the Sun as sources of energy.

Ans. (1) The reserves of fossil fuels are limited i.e., exhaustible and they have high cost. But, solar energy is available in abundance i.e., it is inexhaustible and that too, without any cost.
(2) Fossil fuels cause air pollution on burning whereas solar energy is pollution-free.
(3) Fossil fuels can provide energy at any required time whereas solar energy is not available every time. For example, on a cloudy day solar energy is not available.

Q5. Compare and contrast bio-mass and hydro-electricity as sources of energy.

Ans. (i) Bio-mass is a renewable source of energy only if we plant trees in a planned manner while hydro-electricity can be renewed by the natural water cycle.
(ii) The energy from bio-mass can be obtained by using a chulha or a gobar gas plant which is less costly as compared to hydro-electricity which requires high capital in the construction of dams on rivers and the hydro power plant.
(iii) Bio-mass provides pollution-free energy only when converted into bio-gas whereas hydroelectricity is totally pollution-free.

Q6. What are the limitations of extracting energy from

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

Ans. (a) Limitations of Wind Energy

- (1) The wind is very unpredictable, destructive source of energy.
- (2) It is not steady and consistent at all places. Thus, it can be used at the places where it is available, with consistent and steady characteristics. Wind energy farms can be established only at those places where wind blows for the greater part of a year.
- (3) Establishment of wind energy farms requires large area of land. For a 1 MW generator, the farm needs about 2 hectares of land.
- (4) It is not available all the time. There should be some back-up facilities (like storage cells) to take care of the energy needs during a period when there is no wind.
- (5) Wind mill structures are very big whereas their outputs are very low. The initial cost of establishment of the farm is quite high. Thus, it is expensive to use wind energy.
- (6) Since the tower and blades are exposed to the vagaries of nature like rain, Sun, storm and cyclone, they need a high level of maintenance

(b) Limitations of Waves Energy

Power output of such plants is variable. Also, such plants require large maintenance as equipments used in them withstand severe stresses in storms.

(c) Limitations of Tidal Energy

- (1) The rise and fall of water during tides is not high enough to generate electricity on a large scale.
- (2) There are very few sites that are suitable to build dams.
- (3) A continuous output of electric power can not be obtained by using tidal energy.
- (4) The cost of installation of a tidal energy power plant is extremely high. But the efficiencies of such plants are quite low.

Q7. 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 ?

Ans. (a) Renewable sources of energy are those which

- (i) can be replaced as we use them and
- (ii) can be used to produce energy again and again. Non-renewable sources of energy are those which cannot be replaced once these are used.

(b) Exhaustible sources of energy are those whose supply is limited, e.g., coal, petroleum and natural gas. Inexhaustible sources of energy are those whose energy supply is unlimited, e.g., water energy, wind energy, etc.

Renewable sources of energy are inexhaustible whereas non-renewable sources of

energy are exhaustible with some exceptions. For example, bio-mass is a renewable source of energy, only if we plant trees in a planned manner.

Q8. What are the qualities of an ideal source of energy?

Ans. (1) It should have a high calorific value [calorific value is defined as the number of heat units produced when unit mass of fuel is burnt] Thus, a good fuel should liberate more heat per unit mass.

(2) It should have low moisture content.

(3) It should have low non-combustible matter like ash, etc. That is, it should leave low ash and other residual matter after combustion.

(4) Its products of combustion should not be harmful. An ideal fuel should not produce any type of harmful products/gases which create air pollution, water pollution, and cause harmful effects to the human body.

(5) It should have moderate ignition temperature. Low ignition temperature may cause fire hazards, whereas high ignition temperature may cause difficulty in combustion.

(6) It should be easy to store and transport.

(7) It should have moderate rate of combustion and its combustion should be controllable.

(8) It should be readily available at low cost.

Q9. What are the advantages and disadvantages of using a solar cooker ? Are there places where solar cookers would have limited utility ?

Ans. Advantages of solar cooker

- (1) Using solar cooker saves our conventional fuels.
- (2) Solar cookers do not cause any environmental pollution.
- (3) The nutrients in the food are not destroyed if the food is prepared in solar cooker as the temperature inside it is not so high.
- (4) Four food items can be cooked at a time in a box type solar cooker.

Disadvantages/limitations of solar cooker

- (1) Solar cooker cannot be used during night time.
- (2) During cloudy day, solar cooker cannot be used to cook the food.
- (3) Direction of the reflector of solar cooker has to be adjusted time to time according to the position of the sun.
- (4) In box type solar cooker, only limited food items can be prepared.
- (5) It takes lot of time to cook food.

Solar cookers have limited utility at places which remain cloudy or have longer winter duration, e.g., hilly areas.

Q10. What are the environmental consequences of the increasing demand for energy ? What steps would you suggest to reduce energy consumption ?

Ans. (i) Burning of fossil fuels to meet increasing demand for energy causes air-pollution.

(ii) Construction of dams on rivers to generate hydro-electricity destroys large ecosystems which get submerged under water in the dams. Large amounts of methane (which is a greenhouse gas) is produced when submerged vegetation rots under anaerobic conditions.

In order to reduce energy consumption

(i) Fossil fuels should be used with caution to get their maximum benefit

(ii) Energy efficient devices such as pressure cookers, compact fluorescent lamps (CFLs), etc. should be used

(iii) The devices/machines used for energy conversion should be maintained or repaired regularly in order to keep them efficient

(iv) We should use electricity or any other source of energy judiciously as ‘energy saved is energy produced’-