CBSE Class 10 Science

NCERT Exemplar Solutions

Chapter 14

Sources of Energy

Exercise

Multiple Choice Questions (MCQs)

1. Which of the following is a non-renewable source of energy?

(a) Wood

(b) Sun

(c) Fossil fuels

(d) Wind

Ans. (c) Fossil fuels

Explanation: It takes millions of Years of the formation of fossil fuels. So, they cannot be renewed in near future.

2. Acid rain happens because

(a) sun leads to heating of upper layer of atmosphere

(b) burning of fossil fuels release oxides of carbon, nitrogen and sulphur in the atmosphere

(c) electrical charges are produced due to friction amongst clouds

(d) earth atmosphere contains acids

Ans. (b) burning of fossil fuels release oxides of carbon, nitrogen and Sulphur in the atmosphere

Explanation: Oxides of carbon, nitrogen and sulphur mix with rain water to form acids. This causes acid rain.

3. Fuel used in thermal power plants is

(a) water

(b) uranium

(c) biomass

(d) fossil fuels

Ans. (d) fossil fuels

Explanation: Coal is the major fuel used in thermal power plants. Additionally, natural gas and petroleum gas are also used.

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4. In a hydro power plant

(a) Potential energy possessed by stored water is converted into electricity

(b) Kinetic energy possessed by stored water is converted into potential energy

(c) Electricity is extracted from water

(d) Water is converted into steam to produce electricity

Ans. (a) Potential energy possessed by stored water is converted into electricity

Explanation: Water is stored behind dams. The stored water has potential energy. When water is released from the dam; Potential energy changes into kinetic energy. This kinetic energy is utilized to turn the turbine to generate electricity.

5. Which is the ultimate source of energy?

(a) Water

(b) Sun

(c) Uranium

(d) Fossil fuels

Ans. (b) Sun

Explanation: Fossil fuels were made from biomass and biomass is made because of photosynthesis. We know that solar energy is converted into biomass through photosynthesis. Water cycle is driven by sun and hence kinetic energy in water is because of sun. Hence, it is said that sun is the ultimate source of energy.

6. Which one of the following forms of energy leads to least environmental pollution in the process of its harnessing and utilisation?

(a) Nuclear energy

(b) Thermal energy

(c) Solar energy

(d) Geothermal energy

Ans. (c) Solar energy

7. Ocean thermal energy is due to

(a) energy stored by waves in the ocean

(b) temperature difference at different levels in the ocean

(c) pressure difference at different levels in the ocean

(d) tides arising out in the ocean

Ans. (b) temperature difference at different levels in the ocean

Explanation: Energy from warm surface is used to boil a volatile liquid. Vapours of this liquid are utilized to turn the turbine. Then vapours are channelized to deeper oceans so that they can cool down.

8. The major problem in harnessing nuclear energy is how to

(a) split nuclei?

(b) sustain the reaction?

(c) dispose off spent fuel safely?

(d) convert nuclear energy into electrical energy?

Ans. (c) dispose off spent fuel safely?

Explanation: Spent fuel from a nuclear plant contains highly radioactive material. This can be very harmful for living beings and for the environment.

9. Which part of the solar cooker is responsible for green house effect?

(a) Coating with black colour inside the box

(b) Mirror

(c) Glass sheet

(d) Outer cover of the solar cooker

Ans. (c) Glass sheet

10. The main constituent of biogas is

(a) methane

(b) carbon dioxide

(c) hydrogen

(d) hydrogen sulphide

Ans. (a) Methane

11. The power generated in a windmill

(a) is more in rainy season since damp air would mean more air mass hitting the blades

(b) depends on the height of the tower

(c) depends on wind velocity

(d) can be increased by planting tall trees close to the tower

Ans. (c) depends on wind velocity

Explanation: Higher wind velocity will turn the turbine at higher speed. This will help in more power generation.

12. Choose the correct statement

(a) Sun can be taken as an inexhaustible source of energy

(b) There is infinite storage of fossil fuel inside the earth

(c) Hydro and wind energy plants are non polluting sources of energy

(d) Waste from a nuclear power plant can be easily disposed off

Ans. (a) Sun can be taken as an inexhaustible source of energy

13. In a hydroelectric power plant more electrical power can be generated if water falls from a greater height because

(a) its temperature increases

(b) larger amount of potential energy is converted into kinetic energy

(c) the electricity content of water increases with height

(d) more water molecules dissociate into ions

Ans. (b) larger amount of potential energy is converted into kinetic energy

Explanation: Potential energy increases with increase in height.

14. Choose the incorrect statement regarding wind power

(a) It is expected to harness wind power to minimum in open space

(b) The potential energy content of wind blowing at high altitudes is the source of wind power

(c) Wind hitting at the blades of a windmill causes them to rotate the rotation thus achieved can be utilised further

(d) One possible method of utilising the energy of rotational motion of the blades of a windmill is to run the turbine of an electric generator

Ans. (b) The potential energy content of wind blowing at high altitudes is the source of wind power

Explanation: A windmill works on kinetic energy of wind.

15. Choose the incorrect statement

(a) We are encouraged to plant more trees so as to ensure clean environment and also provide bio-mass fuel

(b) Gobar-gas is produced when crops, vegetable wastes etc., decompose in the absence of oxygen

(c) The main ingredient of bio-gas is ethane and it gives a lot of smoke and also produces a lot of residual ash

(d) Bio-mass is a renewable source of energy

Ans. (c) The main ingredient of bio-gas is ethane and it gives a lot of smoke and also produces a lot of residual ash

Explanation: The main ingredient of biogas is methane. It burns without smoke and leaves no residue.

Short Answer Questions

16. Why is there a need to harness non-conventional sources of energy? Give two main reasons.

Ans. Two reasons for the need to harness non-conventional sources of energy are as follows:

(a) Conventional sources are going to be exhausted in near future.

(b) Burning of fossil fuels causes environmental pollution.

17. Write two different ways of harnessing energy from ocean.

Ans. Two ways of harnessing energy from ocean are as follows:

(a) Tidal energy

(b) Ocean thermal energy

18. What steps would you suggest to minimise environmental pollution caused by burning of fossil fuels?

Ans. (i) Use of smokeless appliances.

(ii) Afforestation

19. What is the role of a plane mirror and a glass sheet in a solar cooker?

Ans. Plane mirror reflects the sunlight in the solar cooker and thus increases the intensity of solar energy. Glass sheet prevents heat from escaping the solar cooker. In other words, the glass sheet produces greenhouse effect.

20. Mention three advantages of a solar cell?

Ans. (i) Solar cells have no moving parts

(ii) Requires little maintenance

(iii) They can be set up in remote areas

21. What is biomass? What can be done to obtain bio-energy using biomass?

Ans. Biomass is a fuel that is obtained from organic materials. Following are some methods of harnessing biomass:
(a) Using firewood as fuel

(b) Using cow dung cakes as fuel

(c) Production of gobar gas

22. What are the limitations in obtaining energy from wind?

Ans. a. Energy cannot be harnessed continuously.

b. Large areas are required for wind farms.

c. minimum wind speed should be 15km/h.

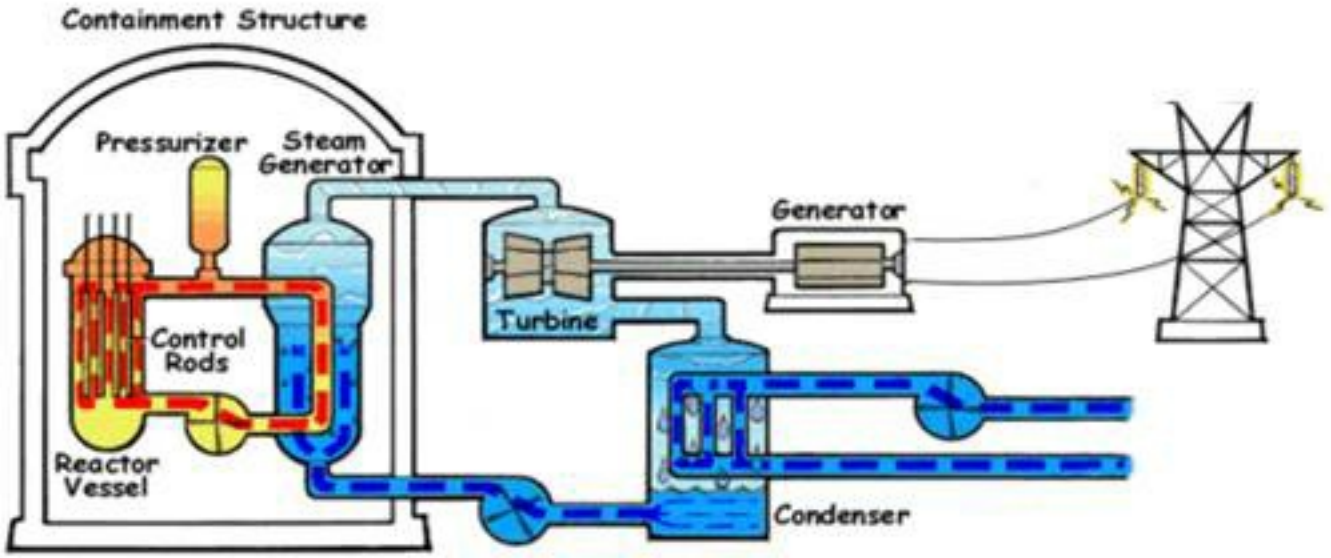
Long Answer Questions

23. Which is the process used to harness nuclear energy these days? Explain it briefly.

Ans. Nuclear energy is harnessed in nuclear power plants. It contains a nuclear reactor, a boiler and a turbine.

- The nuclear reactor is the place where nuclear fission is carried out. Nuclear fission produces a huge amount of energy.
- Energy produced during nuclear fission is utilized to boil water, so that steam can be generated.
- Steam is utilized to turn the turbines to produce electricity.

The following figure shows the working of a nuclear power plant.



24. How can solar energy be harnessed? Mention any two limitations in using solar energy. How are these limitations overcome?

Ans. Methods of harnessing solar energy:

Solar Cooker: Solar cooker is a simple device. It is composed of a rectangular box with a mirror at the top. The box has a glass cover. Mirror is kept in erect position so that reflected sunlight can go inside the box. Utensils are kept in the box. Glass cover on top prevents heat from escaping the box.

Solar Cell: A solar cell is also called photovoltaic cell. It converts solar energy into electrical energy. Electrical energy thus produced needs to be stored in inverters so that it can be used even during night.

Solar Furnace: Solar furnace is made of concave mirror. The heating device is kept at the focus of this furnace. Heat from sun is concentrated at the focus which helps in generating lot of heat. Solar furnace can be used to heat water and steam generated by this process can be used to generate electricity.

Limitations of Solar Energy:

- Can be harnessed only at those places which get plenty of sunlight.
- Cannot be harnessed beyond certain latitudes.
- Cannot be harnessed during night.
- Current technologies are very costly.

Ways to overcome limitations: Batteries can be used to store electrical energy from photovoltaic cells. Cheaper technologies need to be discovered.

25. Make a list of conventional and non-conventional sources of energy. Give a brief description of harnessing one non-conventional source of energy.

Ans.

Conventional Sources of Energy	Non-conventional Sources of Energy
Coal, petroleum, firewood, hydel energy.	Solar energy, wind energy, nuclear energy, biogas, tidal energy, ocean thermal energy, wave energy, etc.

Methods to Harness Tidal Energy:

- For this, a cylindrical structure is vertically placed in coastal areas where tides come.
- A turbine is fitted at the top of this cylinder.
- When the tide comes, air gushes through the cylinder. This turns the turbine and electricity is generated.
- When the tide goes, air moves in opposite direction. This also turns the turbine and electricity is generated.

26. Why is there a need for harnessing non-conventional sources of energy? How can energy be harnessed from the sea in different ways?

Ans. Following are the main reasons: because of which there is a need to harness non-conventional sources of energy:

(a) **Non-renewable fuels:** Fossil fuels are the main energy sources for us. But it takes millions of years for the formation of fossil fuel. The rate at which we are using them means they are not going to last many years from now. They would be definitely exhausted sooner rather than later.

(b) **Polluting fuels:** Burning of fossil fuels releases oxides of carbon, nitrogen and Sulphur. These are polluting gases. Carbon dioxide is a greenhouse gas. Carbon monoxide can be poisonous even in low concentration. Oxides of Sulphur and nitrogen cause acid rain. Air pollution also results in increased cases of respiratory problems.

Following are various ways of harnessing energy from sea:

- Wave energy
- Tidal energy
- Ocean thermal energy

27. What are the environmental consequences of using fossil fuels? Suggest the steps to minimise the pollution caused by various sources of energy including non-conventional sources of energy.

Ans. Environmental consequences of using fossil fuels are as follows:

(a) Increased level of carbon dioxide is resulting in global warming. Global warming is causing drastic changes in weather patterns across the globe.

(b) Oxides of Sulphur and nitrogen cause acid rain. Acid rain is harmful for building and monuments and also for living beings.

(c) Increase in air pollution is causing more cases of respiratory diseases.

(d) Smog is a major problem in cities because it reduces visibility. It creates a problem for pilots and drivers.

Steps to minimize pollution caused by various sources of energy:

- Increased use of public transport.
- Increased use of bicycle.
- Follow the principles of three Rs of conservation, i.e. reduce, reuse and recycle. By doing this, we can minimize the demand for energy. This will help in reducing pollution.

28. Energy from various sources is considered to have been derived from the sun. Do you agree? Justify your answer.

Ans. Sun is the ultimate source of energy. It is true that energy from various sources have been derived from the sun. Following are explanations for this:

(a) Plants harness solar energy to make biomass. This biomass was converted into fossil fuels. So, energy in fossil fuels came from sun.

(b) Firewood and gobar gas have got energy from sun; as explained in previous point.

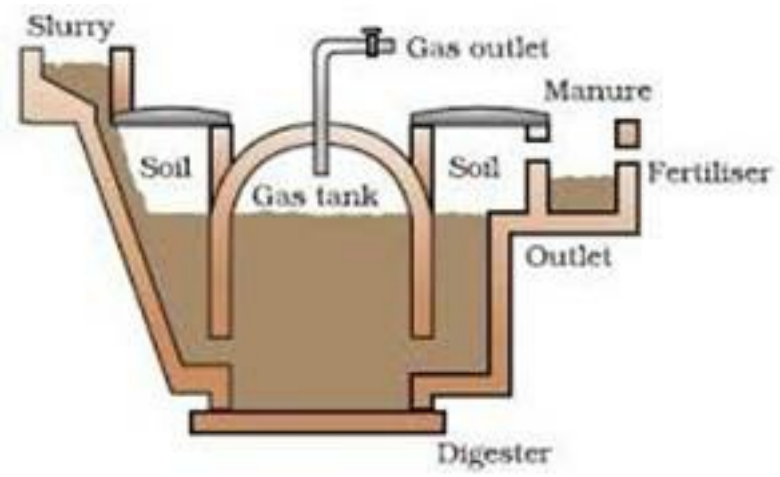
(c) Water cycle on earth happens because of heat from the sun. So, kinetic energy in water is because of sun.

(d) Waves and ocean currents are caused because of heating from the sun. So, different kinds of energy from ocean have sun in their root.

(e) The earth was made after a piece from the sun took shape of this planet. So, geothermal energy or energy from nuclear power plant have come from the sun.

29. What is biomass? Explain the principle and working of a biogas plant using a labelled schematic diagram.

Ans. Biomass is a fuel that is obtained from organic materials.



Principle of Biogas: Biogas is produced by decomposition of organic matter. Biogas is mainly composed of methane. It burns with negligible smoke and leaves no residue. It can be used as kitchen fuel. It can also be used for generating electricity.

Working of Biogas Plant:

- A mixture of farm waste is fed into the biogas plant. This waste is mixed to make a slurry.
- Slurry is then fed into the digester. Digester is an air-tight chamber and oxygen is not present in it.
- Anaerobic bacteria in digester carry out decomposition of slurry. This results in production of biogas.
- Biogas is sent out through an outlet so that it can be suitably used.
- Decomposed matter is taken out and it can be used as manure.