Sources of Energy

Objective Section (1 mark each)

Q. 1. Answer question numbers 1(a) to 1(d) on the basis of your understanding of the following paragraph and the related studies concepts.

The Tehri dam is the highest dam in India and one of the highest in the World. The Tehri dam withholds a reservoir of capacity 4.0 km^3 and surface area 52 km^2. It is used for irrigation, municipal water supply and the generation of 1000 MW of hydroelectricity.

The Tehri dam has been the object of protests. Environment activist Shri Sunder Lal Bahuguna led the "Anti Tehri Dam Movement" from 1980s to 2014. The protest was against the displacement of town inhabitants and environmental consequences of the weak ecosystem. The relocation of more than 1,00,000 people from the area has led to protracted legal battles over resettlement rights and ultimately resulted in the delayed completion of the project.

(a) How is hydropower harnessed?

(b) Define 1 MW.

(c) Mention two disadvantages of constructing Tehri Dam.

(d) What happens when water from great heights is made to fall on blades of turbine? [CBSE OD, Set 1, 2020]

Ans. (a) Hydro power plants convert the potential energy of water stored at great heights to kinetic energy of flowing water at high speed, then into electricity.

(b) A megawatt is a unit for measuring power that is equivalent to one million watts. Megawatts are used to measure the output of a power plant or the amount of electricity (energy in per second) required by an entire city. One megawatt (MW) = 1,000 kilowatts = 1,000,000 watts.

(c) Major disadvantages of constructing dams are:

(i) People living in Tehri were relocated. They lost their farms and businesses.

(ii) The building of large dams can cause serious geological damage.

(d) When water from great height is made to fall on turbine it spins the motor of an electricity generator and creates a magnetic field that induces an electric current.

Note: Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

(a) Both (A) and (R) are true and (R) is correct explanation of the assertion.

(b) Both (A) and (R) are true but (R) is not the correct explanation of the assertion.

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

Q. 2. Assertion (A): In the process of nuclear fission, the amount of nuclear energy generated by the fission of an atom of uranium is so tremendous that it produces 10 million times the energy produced by the combustion of an atom of carbon from coal.

Reason (R): The nucleus of a heavy atom such as uranium, when bombarded with low energy neutrons, splits apart into lighter nuclei. The mass difference between the original nucleus and the product nuclei gets converted to tremendous energy.

[CBSE Delhi, Set 1, 2020]

Ans. (a) Both A and R are true and R is the correct explanation of the Assertion.

Q. 3. Assertion (A): A solar cooker cooks the meal due to green house effect.
Reason (R): The plane mirror is responsible for producing the green house effect. [CBSE Delhi, Set 3, 2020]

Ans. (c) A solar cooker uses concave mirror for producing green house effect . Thus, A is true, but R is false.

Very Short Answer Type Questions (1 mark each)

Q. 1. Why is biogas considered an excellent fuel? [CBSE Delhi, Set 1, 2019]

Ans. Biogas is considered as an excellent fuel because:

(i) It causes no pollution, as it is environmental friendly and burns completely.
(ii) Biogas plant from which biogas is produced serves as an excellent way of waste disposal and burns without smoke.
(iii) It is economical and produces a large amount of heat per unit mass.

Q. 2. Write the name of the main constituent of biogas. Also state its percentage. [CBSE Delhi, Set 2, 2019]

Ans. Methane is the main constituent of biogas. Its formula is CH_4. Its percentage is approximately 50–75%.

Q. 3. If you could use any source of energy for heating your food which one would you prefer? State one reason for your choice. [CBSE Delhi, Set 3, 2019]

Ans. I would prefer a solar cooker for heating food because solar cooker is environmental friendly and causes no pollution.

Q. 4. Write the energy conversion that takes place in a hydropower plant. [CBSE, 2018]

Ans. In a hydropower plant, the potential energy of the water stored in a dam is converted into kinetic energy then the turbine converts the kinetic energy of falling water into mechanical energy and after that generator converts mechanical energy into electrical energy.

Q. 5. Why is lake considered to be a natural ecosystem? [CBSE Delhi, Term 2, Set 3, 2017]

Ans. A lake is considered as a natural ecosystem as it consists of both biotic and abiotic components, both these components in a lake are interdependent and do not require any human interference for their sustenance.

Q. 6. Write any two applications of biogas. [CBSE, Term 1, Set 1, 2016]

Ans. (i) Biogas is used as a fuel for heating purpose like cooking.
(ii) Biogas can also be used in production of electricity.

Q. 7. Define the process of nuclear fission. [CBSE, Term 1, Set 1, 2015]

Ans. The splitting of nucleus of a heavy atom when bombarded with low-energy neutrons into lighter nuclei along with the release of large amount of energy, is known as nuclear fission.

Q. 8. Name the part of a biogas plant where reactions take place in the absence of oxygen. [CBSE, Term 1, Set 2, 2015]

Ans. Digester tank.

Short Answer Type Questions-I (3 marks each)

Q. 1. What are solar cells? Explain the structure of solar panel. List two principal advantages associated with solar cells. [CBSE OD, Set 1, 2019]

Ans. Solar cells are the devices which convert solar energy into electricity.

A simple solar cell is made up of sandwich of a silicon-boron layer and a

silicon-arsenic layer. Boron and arsenic are present in a very small amount. A piece of wire is soldered into the top of upper layer of cell and another piece of wire is soldered at the bottom of the lower layer to pass on the current. The solar cell is covered with a glass cover for protection.

Advantages of solar cells:

1. Solar cells have no moving parts.
2. It requires less maintenance.

Q. 2. List three environmental consequences of using fossil fuels. Suggest three steps to minimise the pollution caused by various energy sources.

[CBSE OD, Set 2, 2019]

Ans. The combustion of fossil fuels releases different harmful products. Three environmental consequences of using fossil fuels are:

(i) It releases CO_2 which is a greenhouse gas which traps the solar energy falling on earth and it leads to global warming.

(ii) Carbon monoxide is poisonous gas which when enters in the blood stream stops the functioning of red blood cells to carrying oxygen from lungs to other parts of the body. It also causes death.

(iii) Sulphur dioxide released during the burning of fossil fuels is harmful for lungs and causes bronchitis and other diseases.

Steps to minimize the pollution caused by various energy sources are:

(i) Solar cookers should be used to cook food wherever possible.

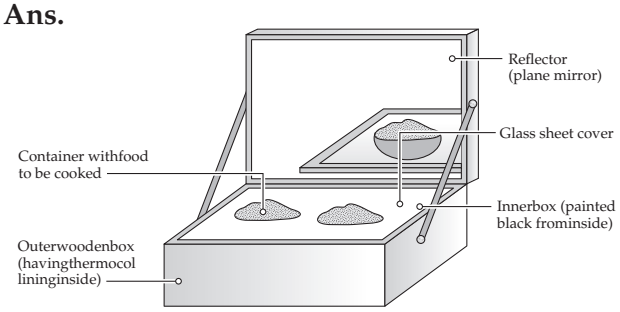
(ii) Use of Biogas as domestic fuel should be encouraged in rural areas.

(iii) Five R's strategy–Reduce, Reuse, Repurpose Refuse and Recycle should be practiced.

Q. 3. Draw a well labelled diagram of a solar cooker. Identify two components in its structure that helps in maximizing heat absorption in it.

[CBSE, Term 1, Set 1, 2016]

Ans.



A Solar cooker

Two components that help in maximizing the heat absorption in solar cooker are:

(i) Focused Mirror: It reflects the solar energy onto the food.

(ii) Black point or Inner Box: It absorbs more heat.

Q. 4. Explain how is geothermal energy harnessed to produce electricity?

[CBSE, Term 1, Set 1, 2015]

Ans. Geothermal energy is produced by the heat of earth's molten interior. The extremely hot rocks present below the surface of the earth heat the water and convert it into steam. So, two holes can be drilled into the earth in the region of hot rocks and two pipes can be put into them. From one pipe, water is supplied into the earth. Hot rocks convert the water into steam. The steam so formed comes up through the second pipe and run turbines to generate electricity.

Q. 5. Anita visited her village during summer vacation and saw her grandmother burning firewood to cook food. This caused lots of smoke and resulted in the bad health of Anita's grandmother. Anita suggested some alternatives to her family in the village and offered to help them. Now answer the following questions:

(i) List any two alternatives that Anita must have suggested to her grandmother.

(ii) How will Anita's grandmother benefit herself and the community by not burning the firewood? Give one reason each.

(iii) Which qualities of Anita are reflected in her way of thinking?

[CBSE, Term 1, Set 2, 2015]

Ans. (i) Two alternatives suggested by Anita are:

(a) Use of biogas

(b) Use of charcoal

(ii) Disadvantages of burning firewood are:

(a) Burning of firewood causes lots of smoke which harms the person who is cooking the food and causes air pollution which is harmful for the environment and harms the society as a whole.

(b) Use of firewood causes deforestation and is not eco-friendly.

(iii) Answer is not given due to change in present syllabus.

Q. 6. State the principle of working of ocean thermal conversion plant. Explain how the plant works? Write one essential condition for it to operate properly.

[CBSE, Term 1, Set 2, 2015]

Ans. The energy available due to the difference in the temperature of water at the surface of the ocean and at deeper levels is called **Ocean Thermal Energy (OTE).**

Condition for it to operate properly:

Ocean thermal energy plants can operate if the temperature difference between the water at the surface and water at depths upto 2 km is 293 K (20°C) or more.

Working: The devices used to harness ocean thermal energy are called ocean thermal energy conversion power plants (or OTEC power plants). A temperature difference of 20°C (or more) between the surface water of ocean and deeper water is needed for operating OTEC power plants. In one type of OTEC power plant, the warm surface water of ocean is used to boil a volatile liquid like ammonia or a CFC. The high pressure vapours of the liquid are then used to turn the turbine of a generator and produce electricity. The colder water from the deeper ocean is pumped up to cool the used up vapours and convert them again into a liquid. This process is repeated again and again.