CBSE Test Paper 01

Chapter 14 Source of Energy

1. Which of the following is non-conventional source of energy **(1)**

   A. Solar energy

   B. Hydro energy

   C. OTE

   D. Wind energy

   a. A and C

   b. A and D

   c. A and B

   d. B and C

2. The main component of natural gas is **(1)**

   a. Carbon monoxide

   b. Oxygen

   c. Ethene

   d. Methane

3. Match the following with correct response. **(1)**

(1) Biomass	(A) Uncontrolled
(2) Chain reaction in atom bomb	(B) Nuclear fusion
(3) Fuel used in nuclear power plant	(C) U-235
(4) Process by which energy is produced in the sun	(D) Fossil fuels

   a. 1-C, 2-B, 3-D, 4-A

   b. 1-B, 2-D, 3-A, 4-C

   c. 1-D, 2-A, 3-C, 4-B

   d. 1-A, 2-C, 3-B, 4-D

4. How many number of neutrons are released in a fission of U – 235? **(1)**

   a. 1.0

   b. 3.0

   c. 2.0

   d. 4.0

5. Match the following with correct response. **(1)**

(1) The group of solar cells joined together in definite pattern	(A) Dam
(2) The device used for obtaining energy for flowing water	(B) Solar panel
(3) A barrier constructed on the river to store the flowing water	(C) LPG
(4) A domestic fuel which contains butane	(D) Water wheel

   a. 1-B, 2-D, 3-A, 4-C
   b. 1-D, 2-A, 3-C, 4-B
   c. 1-C, 2-B, 3-D, 4-A
   d. 1-A, 2-C, 3-B, 4-D
6. Mention the purpose of blackening the interior of a solar cooker. **(1)**
7. Why is a car parked in the sun with windows closed found to be hotter inside than outside? **(1)**
8. Why does acid rain happen? **(1)**
9. Name the kind of energy possessed by wind and the device used to harness it. **(1)**
10. A student constructed a box type solar cooker. He found that it did not work efficiently. What could this be due to? Give any four possible mistakes in the construction and operation of the solar cooker. What maximum temperature can ordinarily be reached inside a solar cooker? **(3)**
11. Define the process of nuclear fission. Write the steps involved in generating electricity in a nuclear reactor. **(3)**
12. Hydrogen compounds are abundantly available on earth and they have a high calorific value but this gas is not commonly used as a domestic fuel. Give any two reasons for this. **(3)**
13. Why is their need to harness non-conventional sources of energy? Give two main reasons. **(3)**
14. Compare biomass and biogas. **(5)**
15. Give the construction and working of a solar cooker. **(5)**

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Answers

1. a. A and C

   Explanation: Because these sources of energy can be easily renewed with minimum effort and money, pollution free and eco friendly

2. d. Methane

   Explanation: Natural gas is primarily composed of methane, but also contains ethane, propane and heavier hydrocarbons. It also contains small amounts of nitrogen, carbon dioxide, hydrogen sulphide and trace amounts of water.

3. c. 1-D, 2-A, 3-C, 4-B

   Explanation:

   i. **Biomass is made of Fossil fuels**--*Biomass* most often refers to plants or plant-based materials that are not used for food or feed, and are specifically called lignocellulosic *biomass*. As an energy source, *biomass* can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of biofuel

   ii. **Chain reaction in atom bomb is Uncontrolled**-A *c*hain reaction is a sequence of *reactions* where a reactive product or by-product causes additional *reactions* to take place. In a chain reaction, positive feedback leads to a self-amplifying *chain* of events.

   iii. **Fuel used in nuclear power plant is U-235**--Nuclear power plants do not burn any fuel. Instead, they use **uranium** fuel, consisting of solid ceramic pellets, to produce electricity through a process called fission. Watch our interactive graphic on how nuclear fuel is produced, used and stored.

   iv. **Process by which energy is produced in the sun Nuclear fusion--** The Sun is about halfway through its main-sequence stage, during which **nuclear** fusion reactions in its core fuse hydrogen into helium. Each second, more than four million tonnes of matter are converted into energy

within the Sun's core, producing neutrinos and solar radiation.

4. b. 3.0

   Explanation: A uranium-*235* atom absorbs a neutron and fissions into two new atoms (fission fragments), releasing *three* new neutrons and some binding energy.

5. a. 1-B, 2-D, 3-A, 4-C

   Explanation:

   i. **The group of solar cells joined together in definite pattern is solar panel-**---Solar panels are those devices which are used to absorb the sun's rays and convert them into electricity or heat. Description: A solar panel is actually a collection of solar (or **photovoltaic**) cells, which can be used to generate electricity through **photovoltaic** effect

   ii. **The device used for obtaining energy for flowing water is water wheel**----A *water wheel* is a machine for converting the energy of flowing or falling water into useful forms of power, often in a watermill

   iii. **A barrier constructed on the river to store the flowing water is dam**---A **dam** is usually **constructed**across a **river** to create a reservoir in the valley behind by storing the water that flows into it naturally. ... Small **rivers** and streams are usually diverted through a tunnel, or a channel that is **constructed** around the side of the **dam**

   iv. A domestic fuel which contains butane is LPG---Liquefied petroleum gas or liquid petroleum gas (LPG or LP gas), also referred to as simply propane or butane, are flammable mixtures of hydrocarbon gases

6. In a solar cooker, the inside area is painted black because black colour absorbs sun rays and does not reflect back which helps in increasing the inside temperature of the solar cooker rapidly.

7. Glass traps heat inside the car due to the greenhouse effect. That’s why it is hotter inside the car with a closed window than outside.

8. Acid rain happens because of burning of fossil fuels which release oxides of carbon, nitrogen and sulphur in the atmosphere. These oxides of carbon, nitrogen and

sulphur when get mixed up with water form acids like carbonic acid, nitric acid and sulphuric acid which results in the form of acid rains..

9. The wind posses **wind energy** which is harnessed by using **windmill.**

10. He might have done the following mistakes.
    i. Interior of the solar cooker is not painted with black colour.
    ii. Instead of glass sheet, plastic sheet is used to cover it.
    iii. Solar cooker is without insulation.
    iv. Black containers have not been used.

    Maximum temperature that can be obtained inside a solar cooker is $140^{O}C$.

11. The process in which the heavy nucleus of a radioactive atom (such as Uranium, Polonium or Thorium) splits up into smaller nuclei when bombarded with low energy neutrons, is called "**nuclear fission".**

    The steps involved in generating electricity in a nuclear reactor are as follows:
    i. The enriched uranium-235 rods are inserted in a core made of graphite.
    ii. The Boron rods help in controlling the fission reaction by absorbing extra neutrons.
    iii. The controlled fission of uranium-235 in the nuclear reactor produces a lot of heat energy.
    iv. Liquid sodium or CO_2 gas is pumped continuously through the pipes embedded in the reactor. Sodium absorbs the heat energy produced in the reactor.
    v. The hot sodium is then passed into the coil of heat exchanger containing water. The water absorbs heat from hot sodium and gets converted into steam.
    vi. This steam at high pressure is used to rotate the turbine. The shaft of the turbine is connected to the electric generator. When the turbine rotates, its shaft also rotates and drives the generator. The generator thus produces electricity.

12. Hydrogen is not used as a domestic fuel because of following reasons :

    i. Hydrogen is highly combustible and is difficult to handle safely. Because of its high combustible nature, it burns with explosion.
    ii. It is not easy to store or transport hydrogen from one place to another safely.

13. The reasons to harness the non-conventional source of energy are as follows:

i. The increase in population.
ii. Greater use of machines due to industrialisation.
iii. Limited supply of fossil fuels.

14. Comparison between Biomass and Biogas as fuel.

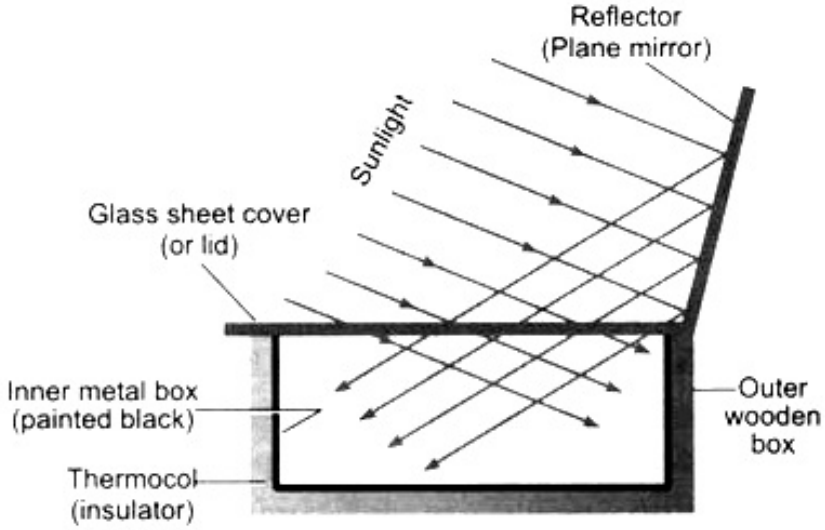
Biomass (Wood/Cow dung cakes)

i. It produces too much smoke.
ii. Its calorific value is very low.
iii. Ash is left as residue.
iv. Organic manure gets burnt when cow dung cakes are burnt.
v. Using wood as a fuel requires cutting of tree. Deforestation leads to many problems. Again cow dung cakes burn organic manure. Hence less manure is available to make land fertile.

Biogas

i. It does not produce any smoke.
ii. Its calorific value is very high.
iii. It does not leave any ash.
iv. Organic matter gets enriched as spend slurry.
v. Biogas uses waste biomass. It makes environment neat and clean.

15. A device that utilises solar energy for cooking purposes is called a solar cooker. The most commonly used form of solar cooker is known as box-type solar cooker. A box-type solar cooker is shown in the figure.



Construction of a box-type solar cooker:

A box-type solar cooker consists of the following components:

The food absorbs heat from the black surface and gets cooked. The thick glass sheet does not allow the heat produced to escape and thus, helps in raising the temperature in the box to a sufficiently high degree to cook the food.

i. Box (B): This is an insulated metal or a wooden box. It is painted black from inside because black surface absorbs more heat. The box may be provided with four roll-wheels.
ii. Glass cover (G): A cover made of two sheets of toughened glass held together in an aluminium frame is used as a cover of the box B.
iii. Plane mirror reflector (R): A plane mirror reflector fixed in a frame is fixed to the box B with the help of hinges. The mirror reflector can be positioned at any desired angle to the box. The mirror is positioned so as to allow the reflected sunlight fall on the glass cover of the box.
iv. Cooking containers (C): A set of containers made of aluminium and blackened from outside are kept in the box B. These containers are also painted black because black surface absorbs more heat.

Working:

The food is cooked in a shallow vessel of the container. The box has a transparent covering of glass sheet over it. The solar cooker is placed in sunlight and reflector (plane mirror) is adjusted in such a way that a strong beam of sunlight enters the box through the glass sheet. The blackened metal surfaces in the wooden box absorb infra-red radiations from the beam of sunlight and heat produced raises the temperature of blackened metal surface to about $100^{\circ}C$.